

**Philippines – Australia
Land Administration and Management
Project**

**Report on Cadastral Survey,
Orthophoto Mapping and Cost Analysis**

28 May 2004

REPORT D34



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PART A. REPORT OF THE INTERNATIONAL TA CADASTRAL ADVISER APRIL-MAY 2004

The overall purpose of this activity of PA LAMP is to (i) support the prototype 1 in its writing of the detailed guidelines for cadastral surveying and verification of surveys, and the validation of past surveys; (ii) assist the PMO to prepare an implementing guideline on the draft cadastral surveying regulation (the replacement to DAO 98-12).

The new guideline would provide a clear set of responsibilities and would encompass the appropriate features of international best practice in cadastral surveying while at the same time recognizing the existing state of the local industry and cadastral records. It would accommodate the existing requirement for isolated surveys and the requirement of LAMP for systematic surveys.

The draft regulation provides a vehicle for reform and in particular, provides a foundation for greater flexibility and efficiency, and a sustainable and lower cost cadastral surveying in the planned LAMP reform program.

(Note: There is an urgent need to review the three key documents prepared by PIO-1: “Lessons and Methodology Report”, “Administration Operations Manual” and the “Field Operations Manual”)

As of April 1st the ToRs are (work to be completed by 31st May 2004) are to:

1. Provide input to the lessons and methodology report of PIO1 and comment on the possible removal of the numeric technical description and its replacement by a graphical description and/or reference to a surveying document (the earlier reports of the law study, the NLRMS study and the land registration study are references).
2. Support the prototype 1 in its writing of the detailed guidelines for cadastral and control surveying and verification of surveys and management of survey contracts in support of the LAM program of systematic registration. Assess the survey related issues in the 2004 land titling program being implicated by PIO1 and make recommendations.
3. Assist PIO1 to develop and describe the best approaches for validation of past surveys.
4. Assist PIO1 to prepare training curriculum to meet the required competencies. (This will be based on the competency based analysis training to be provided by the HRD team in mid April).
5. Assist the DENR/TA team to prepare an implementing guideline on the draft cadastral surveying regulation (the replace to AO 98-12). Suggest improvements to the draft regulation in light of discussions and decisions taken in drafting the implementing guideline. Consult widely with stakeholders and including industry representatives.
6. Prepare a brief exit report (max 5 pages) mentioning (i) the work accomplished by reference, (ii) the key lessons overall which should be included in the PRC; (iii) the approach that the project should take in developing the capacity and

improving the performance of the GE industry in both the near term and longer term; (iv) any other recommendations to the TA team leader for follow up.

1.0 Work Accomplished by Reference

1.1 Survey Methods

Inputs provided on the Executive Summary, Chapters 6 (Survey Pilots) and 12 (Summary of Methodology and costing) of the Lessons and Methodology Report (LMR). Preferred methodologies for survey were assessed and are described in the following table. Additional tests designed to evaluate time, cost, accuracy and reliability of OPM and GPS for lot survey were formulated. The OPM and SNS testing have not concluded, but indications are that in areas of over 25% cover identification of boundaries is difficult. The OPM Adviser’s report comments on the usability of these methods. The GPS testing is to check the validity of accuracy claimed for GPS Code (low accuracy/low cost). Earlier tests show repeatable accuracy of 0.5meter, with results being within 0.2meter of GPS Phase (high accuracy/high cost), but the test was limited and is being repeated to provide a level of confidence in the results and the “Preferred Methods” table below.

| Activity / Timber cover (over the Project area) | Preferred method(s)* | | |
|---|---|---|---|
| | 0% - 25% cover | 25% - 50% cover | > 50% cover |
| Survey control (Third Order; 1:20,000 or 50 part per million) | GPS and/or Ground Survey | GPS and/or Ground Survey | GPS and/or Ground Survey |
| Validation of existing surveys | SNS by tape and compass supported by GPS and/or Tape and compass Supported by OPM | SNS by tape and compass supported by GPS and/or Tape and compass Supported by OPM | SNS by ground Survey |
| SNS Process | SNS by Tape and compass | SNS by Tape and compass | SNS by Tape and compass |
| Lot survey by Traverse | Possible | Preferred | Preferred |
| Lot Survey by GPS | Preferred | Possible | No |
| Lot Survey by OPM | Preferred | No | No |
| Verification of new surveys | GPS and/or OPM and/or Ground Survey | GPS and/or OPM and/or Ground Survey | Tape and compass and/or Ground Survey |

**Note that in many areas the canopy cover can vary widely from lot to lot, and it may be more efficient to use ground survey methods. Experience during the Pilot suggests ground cover assessment must be made prior to field survey, because the technology will vary and lead times for procurement are lengthy. In general, as the ground cover increases, conventional ground survey methods using Total Station are more effective.*

Use of alternative survey methods is conditioned by canopy cover. GPS and OPM can not be used effectively in areas of over 25% tree cover (subject to the results of the field trial during May). Even though a generalized classification of 0-25% has been used, it should be understood

that cover is extremely variable even within a class (or a lot) and can range from 0 to 100% (i.e. heterogeneous and not homogeneous). Therefore methods, accuracy and costs will vary depending on the canopy cover. This will also require the contract GE to make a decision on which method to use, and more realistically what equipment to purchase or hire. GPS is expensive, OPM involves long lead times and lower accuracy. Conventional survey costs on average are a total of 1,700 pesos per lot (including 145 pesos for geodetic control). This includes the cost of total station equipment hire stated to be 1,500 pesos per day (the equipment is about 800,000 pesos new, although refurbished units are considerably cheaper). Therefore, contract GEs will only hire on a needs basis, and will plan the survey so that all measurements requiring total station are done at one time.

1.2 Contract Cadastral Surveys

The following key issues resulted from the lessons learnt from the LAMP I prototype and should be considered when preparing cadastral survey contracts. In addition analysis of contracts completed to date is important to know the cost breakdown of various stages of the survey. The bi-weekly reporting from contractors should assist in evaluating progress of the survey and cost allocation for each stage.

- New survey processes have been introduced for contractors, and there is a need for careful orientation and training. The type and level of support to be provided by DENR (as the entity responsible for the contract) should be specified in the contract. This must include the role and functions of the field survey verifier, and the proposed streamlined survey approval process, which will place an office verifier in the field to check survey computations and preparation of survey returns at pre-determined stages of the contract survey. This training must be included in the relevant training manual.
- Contract Management and liaison/coordination with other operations units to ensure contract outputs are on target, and the Project Plan submitted by the contractor is adhered to; i.e. stronger contract management and reporting.
- The bidding process should encourage bids from as many potential contractors as possible and particularly local firms who have local knowledge and are based in the region. To overcome the general lack of modern technology among smaller firms, joint ventures should be encouraged whereby multi-skilled and competent bidders can submit strong bids.
- The use of modern technology for surveying and office practices should be permitted, provided DENR operations units have the capacity and capability to process the resulting survey returns in an efficient manner.
- To benefit from the use of new processes and modern technology in field and office survey, there must be skilled and well trained field verifiers and support staff.
- The data prepared by DENR for use by the contractor must be complete and available when needed to avoid delays and errors in the field, and consequent coordination issues with the SAT team and other operations units. Contractors must satisfy themselves that the data is complete.

- Contract conditions may be varied to allow more efficient workflow; such as, the submission of survey returns by Barangay rather than by module (if applicable).

Therefore, it was concluded that the key factors in producing successful survey contract results included:

- Appropriate cost structure and contractual conditions, particularly progressive payments aligned to agreed streamlined survey approval procedures.
- Strong contract management and training components.
- Enforce contract and sanctions.
- Encourage the use of alternative survey approaches using new technology and new procedures as part of the contract.
- Ensure DENR provides reliable and sufficiently dense survey control and complete survey information as part of the contract, but it is still the responsibility of the contractor to satisfy themselves that the data is complete.

1.3 Validation of Existing Surveys

Procedures for the systematic selection of a sample of lots were developed to test the validity of past approved surveys (at the extent and centre of the barangay). Experience within the project area suggests that as many as 30% of approved surveys could be in error. These procedures are documented in the Field Operations Manual (FOM) and the Administration Operations Manual (AOM).

Before testing there was a need to do an ocular inspection to locate existing corners and monuments. This was difficult, as many marks had disappeared, even though the original survey was less than 20 years old (validation has been predominantly in rice fields and areas of less than 25% canopy cover). It was therefore difficult to re-establish the lot corners based on marks and measurements alone. It was necessary to use land claimant agreement for boundary relocation in these cases and undertake an SNS process. The resulting measurements show large discrepancies between agreed positions and original measured positions, and the difficulty in establishing original lot corners. Where monuments were found GPS (differential code) was used with results indicating varying levels of agreement between original measurements and re-measurement, generally outside acceptable tolerances (over 2-3m). The comparisons are shown in the tables at **Attachment 5**.

Based on the results of the validation survey, a decision is made on whether there is a need to correct the previous survey and survey plan. The criteria used are:

- 15% of the total 20% of validated lots/area are erroneous
- At least 10% of the total lots validated had misconnections.
- The intent of the land claimant concerning the boundaries of their lot is not reflected on the cadastral map.
- Boundary conflicts currently exist.

Testing of OPMs has been reported, but trials show their best value is in areas of well-defined land use patterns (but difficult in timbered areas). OPMs combined with CIM are most useful in determining areas of erroneous surveys before undertaking field activities. It is therefore important that OPMs be available early in the land titling process.

Identification of general land vegetation cover should be assessed early using available low resolution/low cost Landsat archival data. NAMRIA have access to this information.

1.4 Streamlined Survey Approval Process (Refer LMR)

Of the 12 modules of contracted cadastral surveys, 5 have been submitted to DENR for office verification and final inspection prior to survey approval. This phase is targeted to take four (4) weeks, however most have been at this verification stage for up to six (6) months. Survey returns are noted as being incomplete due to survey error, technical data lacking or documentation missing. It appears delays are inevitable because the contractor leaves the area under survey shortly after the survey returns are completed and submitted, making rectification of errors a lengthy process and general communication difficult. A workshop was held with DENR, Survey Division staff and the Regional Technical Director (Region 8) to agree a strategy to progressively approve surveys. Stages and certifications agreed were: SNS (monumenting and sketching), field survey (project control, political boundaries, and lot survey), field verification of survey (concurrent), preparation of survey returns, verification of survey returns and approval of survey, with the target of 4 weeks between survey return submission and survey approval also agreed. The phased approval process will be implemented in June, following the issuance of a DENR Administrative Order reflecting the agreement of the LAMP Prototype Manager and Regional Technical Director.

There is still excessive checking (field verifiers, PIO 1 staff, DENR) and dual certifications. Activity is to be located as far as practical at the Base Camp. The role of CENRO was questioned and will be reviewed by the RTD.

1.5 Traverse and Lot Surveys

Survey contractors (Leyte) are using total station survey equipment (rented at 1500 pesos per day, including operator). Data loggers are not used (including automatic download of data to computer) and computer aided software for calculation/plotting of survey results is limited to only a few contractors. Production is varied, and depends on the size of the lots, vegetation density and weather, but can be up to 15 lots per day (8-10 is normal). The SNS and monumenting can only proceed at the speed of adjudication and depends on land claimant availability and level of agreement. Therefore, faster lot survey methods may save time/cost for lot survey, but the savings could be neutralized by the time taken for adjudication (i.e. targeted at 5 adjudications per day per adjudicator, actual rate is very variable due to land claimant availability and dispute level (about 10%) and weather), and delays in survey approval.

The effectiveness of field survey is impacted by the availability of field verifiers who are responsible for checking control survey, lot monumentation and measurement. They are poorly trained and supervised and require more complete training (training manuals), work load supervision (from the Base Camp, by a GE) and specified performance targets. Duties are reflected in the AOM, and competencies have been identified as part of the Training workshops in mid-May.

1.6 Use of Technology

Evaluation of survey contractor performance is ongoing, but it must include identification of those contractors who are efficient, and who are using modern technology. Some of the better contractors are using automated survey calculation and adjustment software, and the full functionality of Total Station equipment; that is, electronic data logging for direct input into survey calculation and survey plan plotting software programs. These methods reduce the chances of survey error and speed survey return preparation.

Therefore, software for survey computation and plan preparation should be assessed by PIO1 survey staff for use by all survey contractors to improve their survey return and computation performance. If all survey contractors and staff of the Aggregate Survey Section use the same software, there will be less survey error and faster survey approval. International best practice shows that if the government (through LAMP) provides such software to DENR and the survey contractor as part of the contract, efficiencies will follow, errors will be minimized and the time taken to approval surveys will be considerably reduced. (Extract from the LMR).

There are contractual, resource and capability issues in introducing these reforms; however, acceptance of digital survey information through the PIO 1 Survey Pilots has demonstrated the potential efficiency possible in the survey return/verification processes.

1.7 Costing

The contract survey process is the only competitively costed component of the titling process, and therefore represents actual cost. One costing model is to fully assess all office and field costs, materials, administration and external costs for each activity each time the process is done. Another model is to chart and cost all activities and compute a cost per land parcel to apply to the contract survey cost. This assumes these overhead costs are constant, while the survey costs vary according to the terrain, survey complexity and lot area. There is a computed cost per Geodetic control point (2nd Order P17, 000, 3rd Order P6, 500) and this would need to be apportioned as an overhead per lot.

A unit costing based on a per lot basis, is a costing model which can be readily applied and understood. It is also easily calculated and updated, once the initial charting and cost allocations are determined, and is therefore recommended.

| Activity per lot | Average Total | | AverageTotal | |
|-------------------------|---------------|---------|--------------|--------|
| | Cost | | % | |
| | E | A | E | A |
| Research | | | | |
| Mobilisation | | | | |
| Initial Pulong-Pulong | | | | |
| Reconnaissance | | | | |
| Sketching SNS | | | | |
| Monumenting | | | | |
| Sub-Total | 730.66 | 372.76 | 40.83 | 24.24 |
| Forest Boundaries | | | | |
| Political bdry. | | | | |
| Marking Gov't Lands | | | | |
| Distribution of SNS | | | | |
| Ident CARP | | | | |
| Sub-Total | 11.05 | 229.27 | 0.62 | 14.91 |
| Project control | | | | |
| Sub_Total | 23.21 | 211.13 | 1.30 | 13.73 |
| Lot survey | | | | |
| Preparation/Office work | | | | |
| Final Pulong-Pulong | | | | |
| Compilation/Editing | | | | |
| Submit Returns | | | | |
| Mobilisation | | | | |
| Correction survey | | | | |
| Sub-Total | 1024.60 | 724.43 | 57.26 | 47.11 |
| Total | 1789.50 | 1537.60 | 100.00 | 100.00 |

Costs By Conventional Survey Methods

Table showing cost summary of estimated and actual contract bid costs for Survey Modules 1 to 12

(Note: the contractor is paid 25% of the total bid price after completion of monumenting and sketching, another 40% after survey of all lots and submission of survey returns, and the final 35% when the survey is approved).

The table shows the contract costs estimated by DENR and as submitted by the contractor, note the wide variance, particularly in the cost of sketching (SNS) and project control. The sketching was a new component of the survey, therefore the contractors generally under-estimated its cost (50% of DENR estimate), basing their estimates on the sketching required under DAO98-12. The contractors loaded costs in political boundaries and project controls, however the total cost of the contract per lot averaged about P1, 540, below the estimated P1, 790 per lot. Densification of existing geodetic control added an additional cost of P145 per lot. Costs per lot (estimated) ranged from P1146 to P3475, actual cost ranged from P920 to P2000. The wide range for both estimated and actual bids is due to varying lot sizes, canopy cover, and terrain, and the mix of un-surveyed, surveyed and titled land.

To support conventional survey methods, geodetic control densification costs have been estimated for the PIO I area at 3,818,000 pesos, resulting in **145 peso** per land parcel.

Geodetic control to support the aero-triangulation of aerial photography to produce OPMs is required to be 2nd Order , therefore costs would be PHP 648,000 (for Leyte, but it is assumed

there would be similar densification required in other areas where marks have been destroyed, or are inadequate). This computes at **24 pesos** per lot.

Geodetic control densification to support GPS lot survey is less than needed for conventional survey but more than OPM based on a mix of low and high accuracy lot survey requirements. The density of control would be about half that required for conventional survey, or **80 peso** per lot.

The OPM cost per lot was based on average cost per sheet (OPM) / number of lots. This amount to $27578 / 118$ (aver lots per sheet in pilot area) = **234 peso per lot** (for OPM from aerial photography), used for costing purposes. Note that OPMs are used for many purposes including planning, survey validation, survey verification, CIM preparation and lot survey (where canopy cover allows); therefore the full cost of OPM could be spread across these activities. However, for costing purposes the full acquisition cost has been allocated to lot survey to allow comparison with other methods of lot survey. Costs for satellite data (Ikonos) are $33,968/118 = 288$ pesos per lot, some 54 pesos per lot more expensive than OPM.

Costs for GPS (GPS code) are **283 pesos per lot**, which includes calculation costs. GPS control costs are less than for conventional survey but more than needed for OPM. The cost of monumenting, political boundaries, SNS, etc. are the same for each survey method tested. Therefore:

| | |
|---|------------|
| Total Station conventional survey..... | 936 |
| GPS code..... | 283 |
| OPM..... | 234 |

The cost of lot survey as a percentage of the total costs is about 40%. Efficiencies in using OPM (low cost, less accurate), GPS (good accuracy, more expensive) or conventional survey (most expensive, using total station and automated computation methods) may reduce this cost by up to 75% (variable and dependent on tree coverage).

Costs for survey validation of existing approved surveys are 283 pesos per lot based on a 10% sample, this results in an overhead of **28 pesos per lot**.

The overall cost matrix is attached (attach1), and shows the comparative cost of titling using conventional survey, orthophoto map, and GPS (code). The cost basis adopted is per lot (which can be variable due to lot size, terrain, and vegetation cover) and the assumption that CRS and adjudication costs are 376 pesos each (refer email from Rae Porter, 20 May 2004). A per hectare cost is more consistent for survey and is used by survey contractors, however, because all other titling components are lot based, survey costs have been calculated on the same basis.

Total costs are therefore:

| Method used | Total titling Cost per lot (pesos) | Survey costs * |
|---------------------|------------------------------------|------------------------|
| Conventional Survey | 3,816 (US\$68) | 1,824 (US\$32.6) (48%) |
| Orthophoto Survey | 2,861 (US\$51) | 932 (US\$16.6) (33%) |
| GPS Survey | 3,002 (US\$53.5) | 1,073 (US\$19.2) (36%) |

* Includes geodetic control, CIM, database, SNS, political boundaries and monumenting. Overhead costs for project management and DENR have not been calculated.

1.8 Capacity Issues

Within Region 8, there are approximately 70 GEs, and only one total station available, although the GEP have recently donated one unit to the Regional GEP for training and hire purposes. The predominant method used for survey is transit theodolite and tape, because technology costs are high and training limited (Region 8 has only recently (June 2003) introduced a GE course at the Leyte State University with some 20 enrolled students). Therefore capacity is very limited. Joint venture contract bidding has been recommended to allow larger Manila based firms to introduce new technology and use local GE expertise for field survey and quality assurance purposes. Experience suggests as the contractors gain experience, production and quality of survey results can be expected to improve. The situation in Leyte is indicative of capacity of other Regions in the Philippines (except Manila). Short and long term training needs are being addressed through competency based training curriculum development and the training manuals.

As recommended in the 2003 Survey Report, strengthened GEP/GEB continuing education requirements are needed to assist updating GE skills, while the disciplinary powers of the GEB need to be enforced against errant GEs. These requirements are reflected in the proposed survey regulations.

Active participation in defining LAMP competency standards as input to training course development as a pre-cursor to writing/compiling the training manuals, assisted in matching competencies with those activities contained in the FOM and the AOM. There was initial confusion on the concept of competency based standards, however a matrix of competencies matched with the FOM/AOM identified missing training material for development during June 2004.

1.9 Technical Description (TD)

A summary of the issues related to the inclusion of a numerical technical description (TD) on title has been prepared in conjunction with the National Adviser (Cadastral Survey) as attached. The problems are well known, and there are various solutions which provide the same (better) functionality as the current TD. The requirement is for the title to refer to a spatial description of the lot. Several LAMP reports detail the issues and possible solutions. Refer attach 3.

Ideally, the title should refer to an approved survey plan. This is the practice in most countries including countries in the region. Given that the purpose of the existing TD is to accurately identify the location and dimensions of the lot, then the approved plan will provide a solution, and the

complication of the existing TD is removed. The inclusion of a sketch on the title showing the lot and adjoining lots would produce the same result and be more meaningful to the public. A Torrens land title registration system does not guarantee dimensions. The inclusion of the existing numerical TD on the title is implicitly including the TD in the guarantee, an unnecessary complication to the Philippines land titling system.

It is suggested that a further Administrative Order from DENR be issued, and the TD be permitted to be in a different format. The administrative order could also reinforce the provisions of Section 16 of the Cadastral Act (Act 2259).

To expedite the consideration of a lasting solution to this issue, it is recommended that a joint DENR and Department of Justice working party be convened to firstly acknowledge the complications caused by the current TD and secondly formulate an agreed order to discontinue placing the TD on the title.

1.10 Survey Regulations

The lessons learnt from the PIO 1 Survey Pilots have been included in the proposed Survey Regulations through discussion and field inspection/evaluation with the National Adviser (Cadastral) at Leyte. In addition, a wider definition of the role of the GE Board has been included, and the SNS process clarified. The CIM is given a prominent role in better administration and control of surveying processes. Accuracy statements to support GPS are still being tested to ensure they are reliable and repeatable.

The proposed regulations require that the SNS be prepared and certified before lot survey. If the land claimant fails to appear after due notice has been given then the FOM now allows the adjudication of the adjoining lots to proceed (provided there is sufficient evidence to establish the boundaries of the affected lot from the adjoining owners and the community representatives). The proposed survey regulation will be re-worded to allow lot survey to proceed in these circumstances. The objective is to allow the adjudication and lot survey to continue.

A Working Committee to review the draft regulations has been constituted, but has yet to meet. A final draft of the proposed regulations and guidelines is available and will be circulated prior to the convening of the Working Committee. The National Adviser (Cadastral) is a member, but will require support from LAMP during June-July to advocate the changes.

1.11 Evaluation of the Survey Process

A framework was developed for the Evaluation of the Survey Processes used and tested during PIO1. Workshops were designed to examine the processes in detail, identify strengths and weaknesses, and suggest improvements and methods for LAMP 2.

Workshop 1: to identify and discuss major issues, strengths and weaknesses (3 groups), each key activity to discuss dependencies, resource mobilization, timing, management inputs, capacity building and methodology tested.

Workshop 2: Lessons generated and recommendations to improve procedures and activity, present results and determine the next steps and responsibilities.

A summary of the Workshop outcomes is attached as Attach 2 . The main issues identified have been incorporated in the LMR or the FOM. They concern the project planning and management, contract management, data records, technology issues, capacity of DENR, the SNS process, validation surveys, and the verification process.

2.0 Key Lessons:

1. **Lead times for contracts and project management/timetabling impacts.** The importance of assessing OPM, geodetic control and contract survey early in the process cannot be over-stressed. Lead times for contract approval and letting are fixed. The need for the early appointment of qualified GE staff to manage the process is also essential. Many activities are dependant on this information (e.g. validation of existing surveys, project planning, project control, etc).

Recommended that to minimize delays in procurement of OPM, geodetic control and contract cadastral surveys, an appropriately qualified Geodetic Engineer be appointed when the LAMP 2 management team is established in a new region.

2. **Survey methods are dependant on canopy cover.** While testing is still underway on which method is most suitable, the use of various methods is strongly influenced by not only the land value, but also the terrain and tree canopy cover.

Recommended that an initial assessment of canopy cover is made in a new region prior to deciding which survey method will be adopted. This assessment to be made using available Landsat imagery and existing mapping.

3. **Better costing method needed.** A consistent costing method is needed for all aspects of the titling process. The lessons of LAMP show that wide variations in cost occur for various reasons, but primarily because there is no consistent cost model used.

Recommended that a cost model be adopted which allows ready calculation of title costs per lot, and progressive assessment against budget.

4. **Stronger contract management.** Analysis of contract survey costs enabled a better understanding of actual cost, and therefore the cost components. Reporting on progress of surveys prevents bottlenecks in the titling process, and early correction can occur. Delegation of some contract management to the Base Camp will reduce the time required to implement changes and improve work throughput.

Recommended that cadastral survey contract management be strengthened through better progress reporting and clear allocation of day-to-day responsibilities to the Base Camp geodetic engineer.

5. **Capacity building is critical in both the short and long term.** Continued attention to comprehensive competency based training manuals and curriculum development and early implementation is needed to support the medium term requirements of LAMP.

Recommended that the current strategy for short and medium term capacity building continues to focus on competency based training and the development of comprehensive training manuals.

6. **Clearer delegations (LAMP-DENR) for survey process.** The cadastral survey contract conditions include both DOA 98-12 and PIO 1(SNS) specifications resulting in a level of confusion on delegations and certifications of the work. In addition, the survey approval process illustrates the duplication and delays that result from unclear approval processes.

Recommend that the accelerated survey approval process be adopted including clarification of the survey return requirement for SNS.

1.0 INTRODUCTION

The main task of the International Orthophoto Mapping (OPM) Advisor was to assist in the identification of options for improved survey and mapping methods to produce land parcel descriptions that are appropriate to support land titling. In particular, this included methods for producing, updating, verifying and integrating the CIM by utilizing a variety of tools including rectified imagery.

Image products have proven to be an excellent guide to land use delineation and hence, have been used for; identifying occupation, systematic adjudication, office and field verification/validation, SNS surveys and CIM production. The emphasis of this third assignment was on assisting the Prototypes to document these methodologies based on lessons learned and cost analysis. In particular:

1.1 The work accomplished by reference

Activity (a): Assist PIO1 to complete the “Lessons and Methodologies” report.

Progress: Assistance was provided in developing the Lessons and Methodology report. In particular, contributions were made to the following sections:

- Executive Summary
- 3.3 Pilots in period to December 2003.
 - Digital CIM
 - Evaluation of orthophotos
 - Evaluation of satellite imagery
- 4.1 The 2004 Pilots
 - Validation of survey
 - Orthophoto for parcel definition
- 6.7 Management & procurement of orthophotos
- 6.8 Use of Orthophotos for validating approved surveys
- 6.9 Use of orthophoto to control parcel definition
- 6.10 Evaluation of satellite imagery
- 6.13 Using orthophoto to verify new surveys
- 6.14 Use of orthophoto to validate political boundaries
 - Table: Streamlining the approval process – Office processes.
 - New Table: suitable application for % timber coverage
 - Orthophoto – possible methodology
- 7.1 CIM Pilot
 - Introduction
- 7.2 Hand-drawn CIM
- 7.3 Digital CIM
- 7.4 Use of orthophoto for generating CIM
- 12.3 Table: Summary of methodology for Phase 11
 - Table: Summary of Costs
 - Table: Ortho justification
 - Table: Attachment 1
 - Cost Analysis

Issues: Time constraints and non aligned costing models restricted the development of concise methodology comparisons.

For updates to the “Lessons and Methodologies” report see:

Attachment 1 Advantages and disadvantages of graphical approaches to cadastral surveying.

Attachment 2 Cost comparisons of graphical and conventional approaches.

Attachment 3 Feature Comparison Matrix.

Action: Standard charge out rates and common evaluation criteria should be provided to each work unit for cost calculation purposes.
Work continuing on these areas in the form of a pilot designed to tighten up comparisons.

Activity (b): **Assist PIO1 to complete the Field and Office Manuals, concerning the functions of CIM production and survey validation.**

Progress: Assistance was provided in developing the Field and Administrative Operations Manuals. In particular, contributions were made to the following sections:

Administrative Manual

Attachment 7- CIM manual

The CIM manuals for both PIO 1 & 2 have been edited and updated. Content is now subject to final review by both areas and sign off.

Field Operations Manuals 1&2

- 4.1 Validation methodology – Method, conduct of measurement by orthophoto
- 4.2 Equipment/Materials Specification - Orthophoto maps
- 4.3 Basic Procedures in the conduct of validation – validation by orthophoto techniques
- 6.2 Agreement process for political boundary
- 8.3 The interview meeting
- 8.4 Sketching and Survey Notification Sheet
- 8.8 Conduct of ocular inspection
- 10.3 Cadastral survey activities and procedures – procedures in the preparation of cadastral map

Issues: Time constrains restricted the full integration of the various operational manuals however much progress has been made.

Action: Work is continuing on these areas. It is recommended that a gant chart be constructed in order to provide more precise pre and post requisites.

Activity (c): Provide advice to PIO1 on the direction for development of the data base and GIS.

Progress: A combined Workshop was conducted. See: Attachment 4 - Information systems requirements

Issues: Full user requirements study required.
 The land record database at PIO 1 has no UPI field but has the CrossIndex field. The crossIndex field exists in all the tables (eg. CENRO, ROD, DENR, DAR, etc.) This field includes the UPI. Its format consists of the longitude, latitude and the PI. This field will link the database to the map. The problem is that there is no field that will link all the tables in the database. As of now, a field called Linkage is being added using the format (Municipal name-lot No-Cad No-Isolated Survey No-Barangay Name). This will be added to all tables and will be the basis for their linking.

LAMP PIO 1 Database for Register of Deeds

ROD Data Input

Linkage

3 (ROD) 02-073 Municipality Code : 3 Brgy. CODE : 3026

Region: Region VIII Province: Leyte Municipality of: Alang-Alang Barangay of:

Cadastral Plan No. Isolated Survey No. Lot No. Patent No. Title No. Date Patented

Csd-08-005932-D 9996-B 083739-96-26 P-43395

Reconstituted Area Remarks Existing

370.00

OwnersNamesSubformROD

| Lot | Street | Residential Address 1 | Residential Address 2 | Residential Address 3 | Residential Address 4 | Residential Address 5 | Cross Index | NameType | ID No |
|-----|--------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------|----------|---------------------|
| ▶ | | Pawing | Palo | Leyte | | | | | 3 (ROD) 02-073 |
| * | | | | | | | | | umber) (ROD) 02-073 |

Record: 1 of 1

Record: 2 of 8817

Action: PIO 1 & 2 teams to compare and document data fields.
 PIO 1 & 2 teams to document user requirements.
 Further TA assistance required

Activity (d) : Assist the PIO2 to complete documentation on production of the CIM, maintenance and use of the CIM in the OSS and linking the spatial identifier into the data base.

Progress: CIM manuals have been combined and updated.
Issues: Contents need to be cross referenced to key competency requirements.
Action: PIO1&2 CIM groups to review for accuracy and completeness.

Activity (e): **Other tasks at PIO1**

Progress: **Training: Assist the prototypes in forming suitable training curriculum for LAMP2 based on the documented processes and the HRD competency based training.**

Contribution via workshop has been provided in forming suitable training curriculum for LAMP2 based on the documented processes and the HRD competency based training. See;
Attachment5 - Competency standards for CIM

Update of the CIM in the Base Camp: Assess the CIM update procedure at the base camp and propose any necessary changes.

The currently:

- Preliminary CIM and Lot Index are taken to the field.
- New data is gathered from surveyors and adjudicators
- The information is verify/validate on the Database and lot index
- The CIM, Lot Index and database are then updated - QA
- New parcel identifiers (PI's) are allocated if the has been a subdivision of a mother lot - QA
- Final CIM layout.

One Stop Shop at PIO1 (OSS): Describe the approach for the integration of the CIM into the OSS, the updating of the CIM and its effective use in day to day operations.

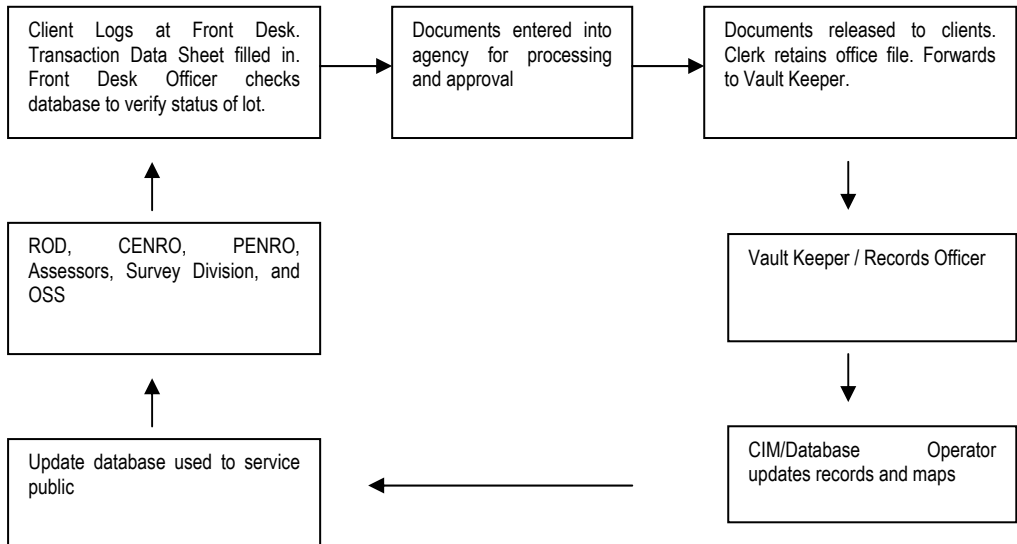
Use and Collection of Transaction Data Sheets (TDS) for ROD:

- Front Desk logs transaction and assists clients with application form. Front Desk Officer checks database to verify status of lot. Forwards to Receiving Clerk for action.
- TDS is filled out by the clerk and the by the Examiner as registration progresses.
- The Releasing Clerk or Examiner transmits a duplicate of the completed TDS to the front Desk Officer for updating of the Document tracking System (DTS).
- After registration of documents and issuance of OCT/TCT, the Records Officer/Vault Keeper endorses retained documents to Database Operator foe CIM updating. Thereafter, documents are returned to the vault Keeper for filing.

How to Update the CIM

- Database operator/Cartographer will get a copy of the plan/subdivision plan for projection on the CIM.
- Projection must be done by colouring the subject lot.
- For subdivided lots the database operator/Cartographer must:
 - Project the subdivision plan on the CIM by colouring also the subject lot.
 - Plot the subdivision lines as indicated on the subdivision plan.
 - Lots altered by either subdivision or consolidation will have the originally assigned Parcel Identifier (PI) retired and the new (PI) is assigned on the CIM, which can be determined from the CIM lot index.
 - Any alteration of the lots and its information , the CIM lot index must also be updated by filling up the new information on the column provided for.

Flow Chart



Issues: Map storage and management system required.

Action: OSS to draft up an implementation plan.

2.0 The key lessons overall which should be included in the PCR

- The use of mixed approaches over a barangay (graphical & survey) should be avoided.

- The provinces of the Philippines should be examined to determine those locations that have extensive areas of open to < 50% canopy cover. A review of archival landsat imagery may assist in providing initial site locations that are suitable for the graphical approach. Additionally, those areas should be examined for evidence of previous survey activity.
- Given that the additional costs of traditional survey are outweighed by the CRS costs, efforts need to be made to ensure the highest possible participation rates. In the cost sheet provided, a rise in participation rates from 45% to 80% will reduce the CRS component from P1717 to P980.
- All imagery should be held digitally to facilitate the production of aids such as enlargements and field work sheets.
- Standard charge out rates and common evaluation criteria should be provided to each work unit for cost calculation purposes
- Where the graphical approach is to be used, the SNS of lot with > 50% canopy should be done with the assistance of compass bearings

3.0 Any recommendations to the TA team leader for follow up.

- Results of pilot to be included in the lessons and methodology report.
- Results of accuracy test be reviewed against the proposed changes to the Survey regulations.
- Alternative (cheaper than MapInfo) GIS software be evaluated. Recommend some one look at **manifold.net** and evaluate the enterprise edition.
- All available image products should be pushed out to the base camps for integration into their processes.

ATTACHMENT 1

Advantages and disadvantages of graphical approaches to cadastral surveying.

Background

The Cadastral survey program in the Philippines commenced around 1909 and was formalised with the Cadastral Act 2259 in 1913. This Act provided the mechanism for the compulsory registration of all landholdings covered by cadastral survey. There are two processes of acquiring title, one is judicial and the other is administrative.

In judicial titling there are two proceedings, one is ordinary judicial proceeding which is governed by Property Registration Decree and the other is cadastral proceedings which is governed by the Cadastral Act. In both cases, it is the Court that issues order of registration.

In the administrative process, the disposition of lands by administrative titling (patents) is vested in the DENR Secretary through the Director of Lands. With the promulgation of Executive Order 192, it was further delegated to the Regional Executive Directors (REDs) and the Provincial Environment and Natural Resources Officers (PENROs), depending on the land area involved.

There are now four government agencies involved in surveying and titling activities for Administrative titling, namely, DENR/LMB/LMS, Department of Agrarian Reform (DAR), National Commission on Indigenous Peoples (NCIP), and for Cadastral proceedings, the Judicial Court, Regional Trial Court (RTC) and/or the Municipal Trial Court (MTC).

There are seventeen (17) Regions of which one is autonomous, seventy nine (79) provinces, one thousand four hundred ninety six (1,496) municipalities one hundred fourteen (114) cities and forty one thousand nine hundred forty five (41,945) barangays. The provinces are headed by governors, the municipalities and cities by mayors, all are elected by popular votes.

As of December 2002, the status of Cadastral Survey in the Philippines is as follows:

- From a total of 1,496 municipalities, there are 827 with approved cadastral survey, 321 are in-progress, 280 are partially surveyed, 65 are still unsurveyed and 3 are abandoned.
- Out of 114 cities, 89 are with approved cadastral surveys, 16 are in-progress, 9 are partially surveyed and there is no unsurveyed.

The municipalities and cities with approved cadastral surveys covers 4,487,311 lots with a total area of 17,848,035 hectares, roughly 59% of the total area of the country. However, the information stored in the different Regional Offices of the DENR remains paper based.

Numerical/Graphical Cadastral Systems

In general terms it can be said that there are two types of Cadastral Systems being reviewed by LAMP, one is Graphical Cadastre and the other is Numerical Cadastre. Basically, the numerical cadastre is associated with surveying measurements for the determination of position by computations while the graphical cadastre uses photo interpretation to indicate position. In both cases a set of survey records for describing the parcel, locating the parcel within its neighbouring parcels and for re-establishing the boundaries in the future are established. These records include the SNS, the CIM and survey field notes. The Numerical Cadastre consists of bearings and distances, co-ordinates and a computed area from conventional traverse or GPS ground measurements. The graphical cadastre gives the shape of the lots with the distances of the boundary lines shown on the SNS which is spatially located by means of maps (orthophotos).

Maps (orthophotos) are produced to the NAMRIA endorsed standard which state that:

- Ninety percent of all images of well-defined features, at natural surface level shall be within 0.25 mm. of their true-scaled position, and
- No image of a well-defined feature at natural surface level shall be more than 0.5mm. from its true scaled position.

In order to derive meaningful cost/time savings by implementing a “graphical cadastre solution, the land area to be covered by this approach must be maximised. That is, over areas of low land value, techniques must be applied that ensure a consistent approach to the capture of the SNS graphics, regardless of surface obstacles such as timber. The mixed nature of cultivation over Leyte however, presents many challenges for the use of such techniques. Of the imagery available to the Project, analysis has revealed that on average there is 47% canopy coverage.

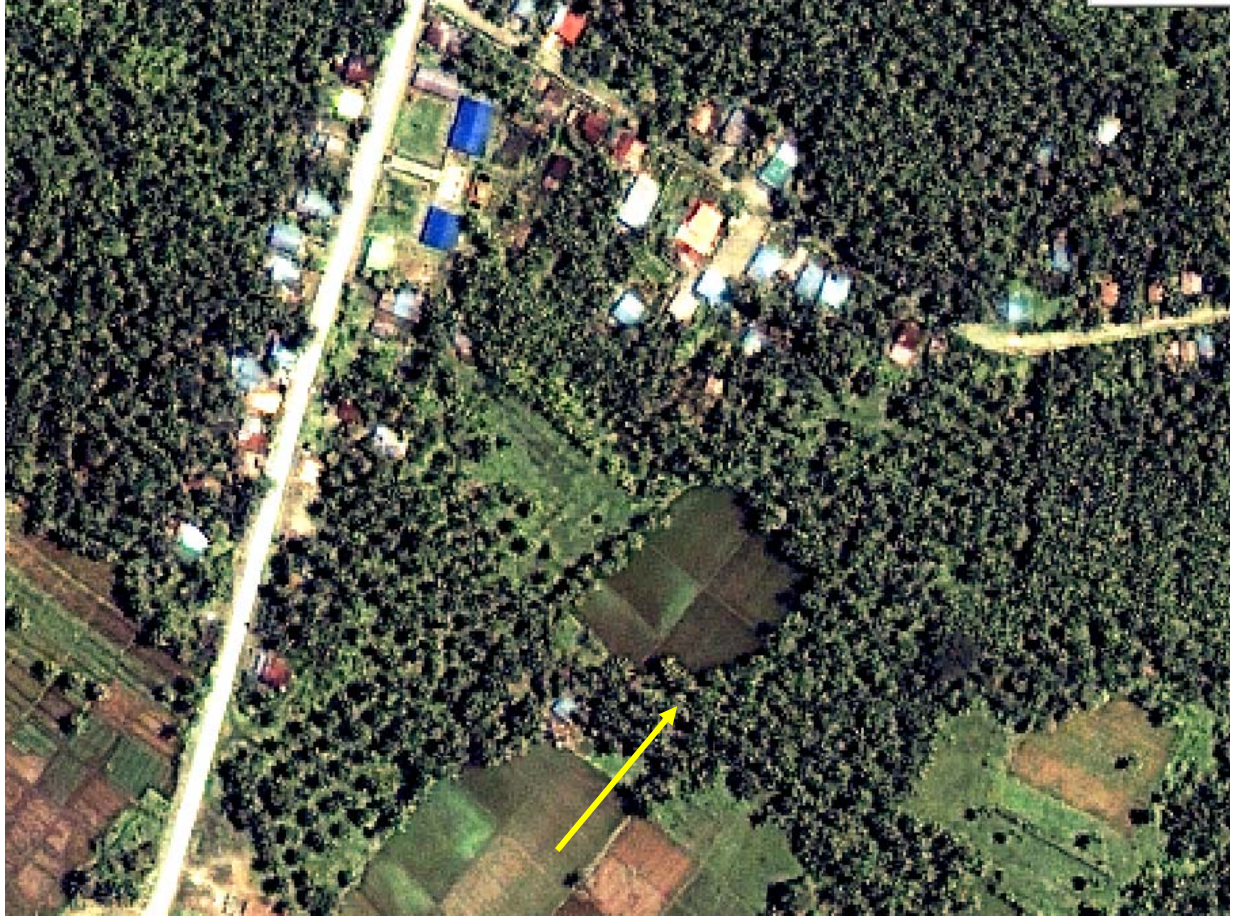
When viewing the landscape it appears obvious that rural land of Leyte is a consistent mix of small open rice land areas surrounded and or bordered by coco/banana crops. Whilst the internal rice paddy levies are easily identifiable, the lot corners adjoining or contained within the coco/banana areas are difficult to accurately identify by OPM techniques. Similarly, GPS is only suitable for areas of < 50% canopy coverage. This raises the possibility of having to use a combination of techniques over this type of terrain. This is an option that should be avoided if at all possible.

The following images are representative of the conditions encountered throughout the project area. Picture 1 shows the placement of a corner monument at the intersection of rice paddy and coco land. Picture 2 is extracted from rectified satellite imagery.

PICTURE 1 – MONUMENTATION



PICTURE 2 – SATILLITE IMAGERY



New Pilot Activity

Resulting from the numerous pilots conducted at PIO 1, the Lessons and Methodology report has been produced which outline the proposed methodology to be adopted for Phase II. The report has been submitted for review and consideration by PMO and contains reference to alternative approaches such as GPS and orthophoto graphical approaches.

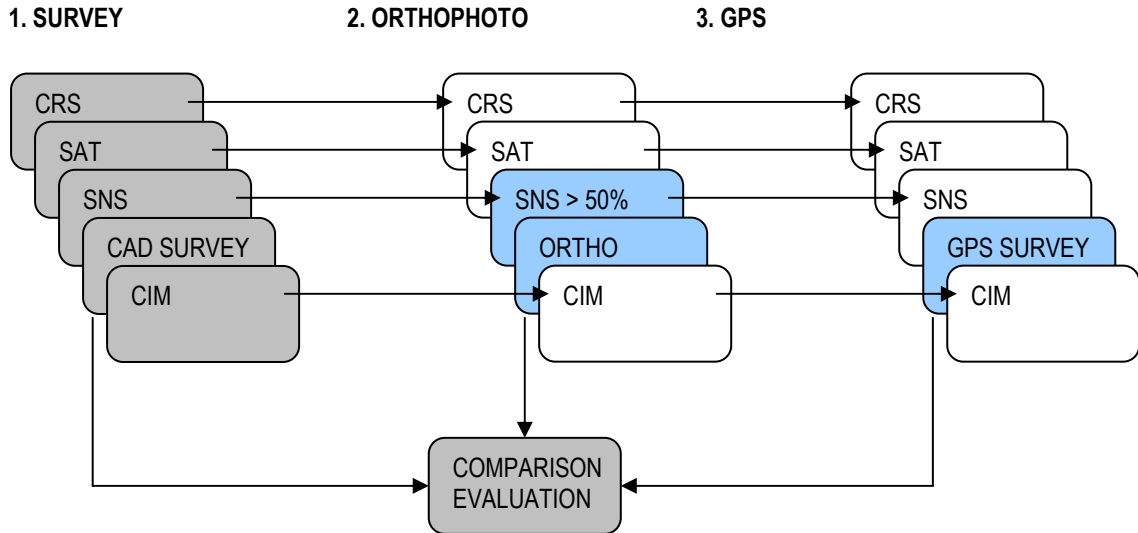
Given that many of the pilot activities were conducted over disparate localities, utilised differing evaluation criteria and costing measures and did not contain spatial comparison, it was decided to undertake a pilot as a means of confirming the alternative methodologies proposed for Phase II.

As previously mentioned, in order to realize / maximize potential savings through this methodology, whole barangays of low land value must be titled in a uniform manner.

This required the testing of orthophoto/SNS techniques through small areas of timber to determine the limit for the use of these methods. The test will use the orthophoto as the positional controlling agent at the surrounding extremities of the timbered area. By conventional SNS methods (supported by GPS if and or when available), the team will then work systematically to the centre, ensuring a close is achieved from one side to the other. In these areas the SNS team will be required to use compass bearings, offsets etc. The results will be compared with the traditional survey coordinates and cross related to % timber coverage.

The following activities are currently in progress:

Select a barangay that is representative of the average/typical conditions that will be encountered (nation wide – rural). This will be based on % timber coverage, accessibility, program requirements and must have been recently surveyed.



Under the leadership of the SAT field manager, undertake activities for comparison as follows:

- CRS
- SNS by orthophoto techniques over a 10 lots cluster with > 50% canopy coverage.
- Survey by GPS of 10 lot clusters with 0 to 25% and 25 to 50% canopy coverage
- Survey verification by GPS and Orthophoto techniques
- Digitise SNS in GIS and spatially compare Survey, GPS and SNS coordinates
- Compare cost elements based on predetermined costing methodology.
- Document outcomes and undertake comparative analysis of previous pilots.
- Report on the advantages and disadvantages of GPS and graphical (Orthophoto) approaches compared to cadastral surveying by traversing for a mass titling program in the Philippines, from all aspects:
 - Technical
 - Cost
 - time
 - processes
 - lead times
 - legal obstacles
 - institutional
 - community acceptance
 - other

- Present findings in the “Lessons and Methodologies” report.

| Cadastral definition by a graphical approach for mass titling in the Philippines | | |
|---|-------------------|----------------------|
| | Advantages | Disadvantages |
| Technical | | |
| Cost | | |
| time | | |
| processes | | |
| lead times | | |
| legal obstacles | | |
| institutional | | |
| community acceptance | | |
| other | | |

ATTACHMENT 2

Cost comparisons of graphical and conventional approaches.

Attachment 1
Activity Evaluation Workshop on the Cadastral Survey Procedures

Hotel Alejandro, Tacloban Cty

May 17 to 18, 2004

I. Description:

The Activity Evaluation Workshop on Cadastral Survey Procedure is a two day workshop assessing the effectiveness and efficiency of the procedures tested and generates lessons and recommendations for future implementation.

A. Objectives

The following are the specific objectives of the workshop:

- To confirm the procedures followed in the implementation of the Cadastral Survey Procedures (including alternative procedures tested and all minor changes to procedures/processes)
- To evaluate the effectiveness and efficiency of procedures followed by the Cadastral Survey pilots
 - Based on perception of key staff involved in the implementation,
 - Perception of other agency partners
 - Secondary information collected from service users/community beneficiaries (where relevant information are available)
- To generate recommendations for improvement in procedures and activity implementation
- To identify any lessons that may be of value to the design and implementation of the longer term LAM Program

B. Expected Outputs

Furthermore, the following are the expected output of the evaluation workshop:

- An annotated flowchart of the procedures followed in undertaking the implementation of the Cadastral Survey procedures;
- An estimation of time and resources required for each step in the process;
- A summary of achievements of the key steps in the process;
- An evaluation of the procedures followed in undertaking the major sub-activities or tasks;
- Recommendations for improving procedures of the implementation of the activity, and any lessons for the longer term LAM Program

C. Activity Evaluation Schedule of Activities

The Evaluation workshop follows the following schedule of activities:

Day 1

AM

- Presentation of Evaluation Workshop Procedure
- Presentation of procedures undertaken by the survey, innovations and best practices identified.

PM

- Workshop 1: Identification of Major Roadblocks, strengths and weaknesses of survey procedures

Day 2

AM

- Synthesis of the 1st day activities
- Workshop 2: Generate lessons and recommended actions to improve procedures based on specific issues or concerns

D. Evaluation Framework

The Activity Evaluation Workshop follows a standard framework in assessing the effectiveness and efficiency of the procedures employed in the implementation of the cadastral survey, both in Cadastral Survey by Contract and by Administration. The following are the parameters used in the evaluation workshop:

- Dependency
- Resource Mobilization
- Timing
- Management Inputs
- Capacity Building, and
- Methodology Tested

The parameters listed above were assessed based on the following major activities of the Cadastral Survey Procedures:

1. Data Research and Compilation
2. Project Operation Planning
3. Project Control establishment
4. Political Boundary establishment
5. Lot Surveying
6. SNS
7. Field Verification
8. Preparation of Survey Returns
9. Verification of Survey Returns
10. Survey Approval
11. Validation of Surveys
12. Densification of Project Controls

E. Workshop Mechanics

The Evaluation Workshop undertakes two major group works. Workshop one (1) focuses on the identification of major roadblocks strengths and weaknesses. On the other hand, lessons and recommendations for future implementation of cadastral survey procedures are generated using template two under workshop two (2).

Participants of the workshop was divided into three groups focusing on a pre-identified group of major activities and based on their field of expertise on the activities. The following were the workshop groupings and the major activities to assess based on the parameters set:

Team 1

- Data Research and Compilation
- Project Operations Planning
- Validation and correction of survey

Team 2

- Project Control Establishment
- Political Boundary Establishment
- Lot Survey
- SNS
- Field Verification

Team 3

- Preparation of survey returns
- Verification of survey returns
- Survey Approval
- Densification of Project Controls

II. Workshop 1: Identification of Roadblocks, Strengths and Weaknesses

Team 1

| 1. Data Research and Compilation | | |
|---|---|---|
| Parameters | Strengths | Weaknesses |
| Dependency | - willingness of partner agencies (e.g. NAMRIA, DENR, DAR and ROD) to provide lot data & maps to LAMP - availability of survey records of the six pilot municipalities Rating- S 3 | - lacking records of technical description & maps - difficulty in gathering data due to the numerous files to look into - duplications in lot data causes confusion regarding lot status Rating- W4 |
| Resource Mobilization | - skilled and competent staff to do data research Rating- S 3 | insufficient mobile access delays field data research and collection Rating- W 4 |
| Timing | - Available data gathered on time Rating- S 3 | - insufficient time to gather adequate information needed (min. 2 months) Rating- W 3 |
| Management Inputs | - availability of photo copy machine & map copier Rating- S 4 | - Limited priority in providing resources for the operation & poor access to land records data Rating- W 3 |
| Capacity Building | - identified | - insufficient training to implementers |

PART B – Orthopho Mapping

| | | |
|--------------------|---|--|
| | responsibility for every implementers Rating- S 2 | Rating- W 3 - poor records management Rating- W 5 |
| Methodology Tested | - CIM available electronically Rating- S 3 | - manual searching of records consumes a lot of time Rating- W 4 |

| 2. Project Operation Planning | | |
|--------------------------------------|---|--|
| Parameters | Strengths | Weaknesses |
| Dependency | - Availability of baseline data and relevant information on the project site before planning Rating- S 3 | - inadequate data gathered -Dependency with the DENR Regional Office on the verification, approval, political boundaries and validation of survey Rating- W 3 |
| Resource Mobilization | - staff recruited and equipment necessary for implementation identified Rating- S 3 | - Limited availability of experienced/skilled geodetic engineers, data encoders and cartographers Rating- W 5 |
| Timing | - Plans completed and approved prior implementation Rating- S 3 | - long procurement lead times - recruitment of staff takes time Rating- W 4 |
| Management Inputs | - orientation and training courses for new staff and field implementers available Rating- S 3 | - limited support of the management on field activities (delays in the processing and or provision of operational services) Rating- W 3 |
| Capacity Building | - sufficient training provided to field implementers (field test activities, scholarships granted) Rating- S 4 | - field operations & training manuals are not yet full used by field operators Rating- W 3 |
| Methodology Tested | - Survey Contractors adopted innovations of the project - OPM acquired and used in selected barangays. Rating- S 3 | - slow contracting process (contract survey, OPM & NAMRIA control) Rating- W 4 |

| 3. Validation and Correction of Survey (for surveyed area) | | |
|---|--|---|
| Parameters | Strengths | Weaknesses |
| Dependency | - initial data gathered and validated on the ground using SNS/GPS - validation conducted prior adjudication Rating- S 4 | - initial data gathered does not match the actual situation on the ground - time consuming Rating- W 3 |
| Resource Mobilization | - Availability and access to GPS & OPM in the validation of survey Rating- S 3 | - poor technical skills of staff in the use of equipments Rating- W 4 |
| Timing | - Validation conducted prior the adjudication Rating- S 4 | - if there are defects, re-survey causes delay Rating- W 4 |
| Management Inputs | - resources are available e.g. GPS & OPM Rating- S 3 | - slow decision making of the management Rating- W 3 |
| Capacity Building | - technical competencies identified - Dedicated survey verifiers Rating- S 3 | - insufficient supervision of survey verification Rating- W 3 |
| Methodology Tested | - new methods tested and operations manuals prepared Rating- S 4 | - GPS and OPM technology not available in all barangays Rating- W 4 |

Team 2

| 4. SNS | | |
|-------------------|---|--|
| Parameters | Strengths | Weaknesses |
| Dependency | <ul style="list-style-type: none"> ▪ Monumenting is scheduled prior to SNS (AS-CS) ▪ Presence of CRS in Survey Activity (AS-CS) | <ul style="list-style-type: none"> ▪ Low participation of claimants and adjoining claimants during the conduct of SNS (CS-AS) ▪ Inaccurate validated list of claimant (AS) |

PART B – Orthopho Mapping

| | | |
|-----------------------|---|--|
| | <ul style="list-style-type: none"> ▪ Availability of validated list of claimants prior to SNS ▪ Rating- S 5 | <ul style="list-style-type: none"> ▪ Rating- W 4 |
| Resource Mobilization | <ul style="list-style-type: none"> ▪ Presence of survey contractor, survey verifier, adjudicator, local CRS, brgy. Representatives during the conduct of SNS (AS-CS) ▪ LGU Support on survey activities (AS-CS) ▪ Rating- S 4 | |
| Timing | <ul style="list-style-type: none"> ▪ Conduct of SNS after establishment of corner monument ▪ Rating- S 4 | |
| Management Inputs | <ul style="list-style-type: none"> ▪ Hiring of competent personnel (AS) ▪ Rating- S 3 | |
| Capacity Building | <ul style="list-style-type: none"> ▪ Orientation/Training conducted for survey implementers (AS-CS) ▪ Procedural guidelines designed for SNS activity (AS) ▪ Rating- S 5 | <ul style="list-style-type: none"> ▪ Some contractors do not follow the procedural guidelines of SNS (CS) ▪ Rating- W 3 |
| Methodology Tested | <ul style="list-style-type: none"> ▪ SNS Tested, documented and updated based on experience and lessons (AS-CS) ▪ OPM Tested and documented (AS) ▪ Rating- S 5 | |

5. Lot Survey and Computations

| Parameters | Strengths | Weaknesses |
|-----------------------|---|---|
| Dependency | <ul style="list-style-type: none"> ▪ Existing PRS'92 Geodetic Control duly certified/approved by NAMRIA (AS) ▪ Traverse loop computation within allowable error (CS-AS) ▪ Rating- S 5 | <ul style="list-style-type: none"> ▪ Incomplete survey records (AS) ▪ Delayed computation due to frequent power failure (CS)-4 (Pastrana & Sta. Fe) ▪ Rating- W 5 |
| Resource Mobilization | <ul style="list-style-type: none"> ▪ Availability of GPS instrument and total station and logistical support by private contractor (CS FFCruz) ▪ Rating- S 5 | |
| Timing | Lot survey conducted after SNS (AS-CS) Rating- S 4 | Unfavorable weather condition delays lot survey (AS-CS) Rating- W 3 |
| Management Inputs | Availability of Survey Verifiers assigned in the activity (AS) Rating- S 4 | No personnel from the Regional office assigned in the project (AS) Rating- W 3 |
| Capacity Building | Availability of competent survey operators (AS-CS) Availability of survey software (CS) Rating- S 4 | |
| Methodology Tested | OPM Tested and documented (AS) Rating- S 5 | |

6. Field Verification

| Parameters | Strengths | Weaknesses |
|-----------------------|--|---|
| Dependency | Field verifiers assigned facilitate survey activity (AS) Rating- S 5 | No personnel from the regional office assigned in the project Rating- W 5 |
| Resource Mobilization | Availability of Transport in the conduct of field activities Availability of TEV for field personnel (PS and Regular staff) | |

PART B – Orthopho Mapping

| | | |
|--------------------|---|--|
| | Rating- S 2 | |
| Timing | | |
| Management Inputs | Monitoring tools designed for field operation(AS) Rating- S4 | Not all issues/problems captured by the verifiers (AS) Rating- W 4 |
| Capacity Building | A series of Orientation/Training and on the job mentoring conducted for survey implementers(AS-CS) Rating - S 4 | |
| Methodology Tested | Simultaneous survey and adjudication tested and documented Rating- S 3 | |

| 7. Project Control Establishment | | |
|---|---|---|
| Parameters | Strengths | Weaknesses |
| Dependency | Existing PRS'92 Geodetic Control duly certified/approved by NAMRIA (AS) Sufficient lead time of Project Control (CS) Rating- S 5 | In appropriate spacing of 3rd order geodetic control within 2km. recommended 1km spacing (AS and CS) Rating- W 2 Expensive establishment of Geodetic Control. (AS) Rating- W 5 Non approval of project control prior to the start of lot survey (CS) Rating- W 4 |
| Resource Mobilization | Availability of GPS instrument and total station and logistical support by private contractor (CS FFCruz) Rating – W 5 Good Reconnaissance survey for the establishment of project control in strategic positions (AS-CS) Rating– W 5 | Limited financial/resource capabilities by administration in the conduct of project control establishment (AS) Rating- W 3 Delayed procurement of GPS and Total stations due to bureaucratic process in the government. (AS) Rating– W 5 Expensive GPS and Total Station equipment Rating- W 5 (CS-AS) |
| Timing | Established/observed before the actual lot survey. (CS) Rating– S 5 | Delayed approval due to non submittal of project control for approval to NAMRIA/FNSP prior to lot survey (CS) Rating– W 2 Delayed establishment and issuance of approve geodetic control by NAMRIA (AS) Rating– W 4 |
| Management Inputs | Availability of competent field personnel (CS) Rating- S 3 | Limited capability by Regional office for approval of GPS data (AS) No mark maintenance (AS-CS) Rating- W 5 |
| Capacity Building | Capability of private contractors to operate and process GPS observation and submit documents needed for approval to the NAMRIA (CS FFCruz) Rating– S 5 | Limited capability of FNSP/LAMP to evaluate GPS data for approval (AS) Does not abide what is stated in the contract and in the Manual for Land Surveys in the Philippines.(CS) Rating- W 4 |
| Methodology Tested | GPS Survey Tested and documented (AS) Rating- S 5 | Expensive GPS instrument (AS-CS) Cost and time efficient in GPS observation (CS-AS) Rating- W 5 |

| 8. Political Boundary Establishment | | |
|--|--|---|
| Parameters | Strengths | Weaknesses |
| Dependency | Existing PRS'92 Geodetic Control duly certified/approved by NAMRIA (AS) Rating – S 5 | In appropriate spacing of 3rd order geodetic control within 2km. recommended 1km spacing (AS and CS) Rating– W 2 |

PART B – Orthopho Mapping

| | | |
|-----------------------|---|--|
| | | Expensive establishment of Geodetic Control. (AS) Rating- W 5 |
| Resource Mobilization | Strong support from LGU (AS-CS) Rating- S 5 | Limited funding/resource capabilities by administration (AS) Rating- W 3 |
| Timing | | Delayed establishment of Political Boundary in newly Cadastral surveyed area prior to the conduct of lot survey (CS) Rating- W5 Destruction of political boundary mark on the ground (AS-CS) Rating- W3 |
| Management Inputs | Agreement on the boundary by the LGU documented (AS-CS) Rating- S5 | No mark maintenance (AS-CS) Rating- W 5 |
| Capacity Building | Capability of private contractors to operate and process GPS observation and submit documents needed for approval to the NAMRIA (CS FFCruz) Rating- S 5 | Limited capability of FNSP/LAMP to evaluate GPS data for approval (AS) Does not abide what is stated in the contract and in the Manual for Land Surveys in the Philippines.(CS) Rating- W 4 |
| Methodology Tested | GPS Survey Tested and documented (AS) OPM Tested and documented (AS) Rating- S 5 | Expensive GPS instrument (AS-CS) Non approval of Political Boundary using OPM by FNSP (AS-CS) Rating- W 5 |

Team 3

| 9. Preparation of Survey Returns | | |
|---|---|--|
| Parameters | Strengths | Weaknesses |
| Dependency | <ul style="list-style-type: none"> ▪ Availability of checklist of complete survey returns ▪ Rating- S 5 | <ul style="list-style-type: none"> ▪ Incomplete records of old survey of titled lots ▪ Delayed approval of project controls and political boundaries ▪ Rating- W 4 |
| Resource Mobilization | <ul style="list-style-type: none"> ▪ Skilled and knowledgeable staff in the preparation of survey returns(AS) ▪ Availability of equipments for the preparation of survey returns (CS) ▪ Rating- S 4 | <ul style="list-style-type: none"> ▪ Limited staff in the preparation of survey returns(AS) ▪ Limited materials/equipments used(AS) ▪ Unskilled staff in the conduct of survey by contract results poor quality survey returns (CS) ▪ Rating- W 4 |
| Timing | | Delayed approval of project controls and political boundaries Rating- W 4 |
| Management Inputs | Strong management support in the preparation of survey returns Rating- S 4 | <ul style="list-style-type: none"> ▪ Weak monitoring and supervision of preparation of survey returns ▪ Weak coordination between PIO1 and DENR Survey Division ▪ Manual preparation of Survey returns Rating- W 4 |
| Capacity Building | Trained staff assigned in the preparation of survey returns(AS) Rating- S 3 | <ul style="list-style-type: none"> ▪ Negative attitude of some field personnel (e.g. absenteeism & tardiness) delays operation ▪ Lack of training in preparation of survey returns (CS) ▪ Rating- W 3 |
| Methodology Tested | <ul style="list-style-type: none"> ▪ Computerized computation of survey returns (CS) Computer aided map production (CS) ▪ Rating- S 4 | <ul style="list-style-type: none"> ▪ Poor quality of materials and equipment used in the preparation of survey returns(CS) ▪ Cadastral Map asymmetrically prepared ▪ Rating- W 4 |

| 10. Verification of Survey Returns | | |
|---|------------------|-------------------|
| Parameters | Strengths | Weaknesses |

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|-----------------------|--|--|
| Dependency | <ul style="list-style-type: none"> ▪ Parallel verification which resulted to minimal errors in the survey returns ▪ Rating- S 3 | <ul style="list-style-type: none"> ▪ Duplication in the conduct of survey verification by PIO1 and DENR Survey Division (AS & CS) ▪ Incomplete survey records ▪ Rating- W 3 |
| Resource Mobilization | <p>Knowledgeable personnel assigned in the verification of survey returns (AS) Rating- S 4</p> | <p>Insufficient personnel assigned in the verification of survey returns(AS & CS) Rating- W 4</p> |
| Timing | | <p>Wait until the survey returns are prepared by the contractor Rating – W4</p> |
| Management Inputs | <p>Provision of administrative support in the operation Rating- S 5</p> | <ul style="list-style-type: none"> ▪ Weak monitoring and supervision in the verification of survey returns ▪ Weak coordination with the PIO1 and DENR Surveys Division ▪ Limited number of personnel assigned in the verification of survey returns ▪ Rating- W 4 |
| Capacity Building | | <ul style="list-style-type: none"> ▪ Lack of training of the new verification process (i.e. digital process) (AS) ▪ Needs team building with the Surveys Division ▪ Rating- W 5 |
| Methodology Tested | <ul style="list-style-type: none"> ▪ Expert on manual procedures ▪ Proposed streamlined process of survey approval ▪ Rating- S 3 | <ul style="list-style-type: none"> ▪ Manual verification ▪ Not capable of verifying digital survey returns ▪ Rating- W 4 |

11. Survey Approval

| Parameters | Strengths | Weaknesses |
|-----------------------|--|---|
| Dependency | <ul style="list-style-type: none"> ▪ Strong support of the RTD on Lands ▪ Rating- S 5 | <ul style="list-style-type: none"> ▪ Delayed feedback on the result of the verification ▪ Rating- W 4 |
| Resource Mobilization | | |
| Timing | <ul style="list-style-type: none"> ▪ Approval of survey returns right after the verification is completed ▪ Rating- S 5 | |
| Management Inputs | <ul style="list-style-type: none"> ▪ Strong support by the RTD ▪ Regular technical meeting with the DENR Surveys personnel ▪ Rating- S 5 | |
| Capacity Building | | <ul style="list-style-type: none"> ▪ |
| Methodology Tested | <p>Proposed streamlined process of survey approval Rating- S 5</p> | <ul style="list-style-type: none"> ▪ Old system of survey approval is still being used in the approval of survey ▪ Rating- W 4 |

12. Densification of Project Controls

| Parameters | Strengths | Weaknesses |
|-----------------------|--|--|
| Dependency | <ul style="list-style-type: none"> ▪ Availability of previously established controls (BLLMs, BLBMs, MBMs, BBMs, etc) ▪ Rating- S5 | <ul style="list-style-type: none"> ▪ Limited number of 1st and 2nd order control points ▪ Rating- W 3 |
| Resource Mobilization | <ul style="list-style-type: none"> ▪ Availability of vehicles, equipments and materials ▪ CRS support in field operation ▪ Rating- S 5 | <ul style="list-style-type: none"> ▪ Limited NAMRIA personnel to establish the processing of the 1st and 2nd order control points ▪ Limited knowledge of LAMP and DENR Surveys personnel to establish and process 3rd and 4th order control points ▪ Limited skills and knowledge of survey contractor personnel to establish and process project control using GPS |

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| | | ▪ Rating- W 4 |
| Timing | <ul style="list-style-type: none"> ▪ Densification of project controls conducted prior to lot survey and SA activities ▪ Rating- S 3 | |
| Management Inputs | <ul style="list-style-type: none"> ▪ Availability of GPS equipment and software and the orthophoto maps ▪ Partnership with NAMRIA and Swedesurvey <p>Rating- S 5</p> | |
| Capacity Building | | <ul style="list-style-type: none"> ▪ Lack of training on the processing and adjustment of GPS field data ▪ Limited NAMRIA personnel to process and evaluate GPS field data <p>Rating- W 5</p> |
| Methodology Tested | Total Station, GPS, OPM, etc | ▪ Rating- S 5 |

III Workshop II: Identification of Lessons and Recommendations based on specific concerns and issues

| Activity | Major Issue/ Constraints | Lessons | Recommendations |
|-------------------------------|---|---|--|
| Data Research and Compilation | <ul style="list-style-type: none"> ▪ Reliance of the Survey Contractor on the LAMP in the research of old survey and relevant data | | <ul style="list-style-type: none"> ▪ Survey contractor must investigate/validate/gather relevant the data ▪ Agreement stipulated under the contracts with the survey contractor on the research and collection of secondary data should be modified ▪ Contractor must satisfy themselves that all information is correct and complete |
| | <ul style="list-style-type: none"> ▪ Difficulty in the conduct of data research due to poor records management (some data missing, duplication of lot data, etc) | <ul style="list-style-type: none"> ▪ Poor records management of the source agency of lot data delays the conduct of research and data collection ▪ Systematic indexing method facilitate in the collection and retrieval of lot data | <ul style="list-style-type: none"> ▪ Assign LAMP personnel in the records section to facilitate data gathering ▪ Adopt CIM methodology in land records management ▪ Provide ample time in the conduct of data research prior implementation (at least two month before data needed) |
| | <ul style="list-style-type: none"> ▪ Reluctance of some agencies in providing data on land information | <ul style="list-style-type: none"> ▪ Regular technical meeting with concerned agencies to discuss major the progress, major issues and concerns of the operation facilitate coordination in providing land records (e.g. OSS Meeting, Technical Meeting with Survey, etc.) | <ul style="list-style-type: none"> ▪ MOA with concerned agencies should be made in the data sharing ▪ One single agency to manage land records (LAA) to streamline land records management processes |
| | <ul style="list-style-type: none"> ▪ Insufficient training of implementers | <ul style="list-style-type: none"> ▪ On the job training and mentoring provide an effective process in orienting field implementers | <ul style="list-style-type: none"> ▪ Preparation of training manual and continuous mentoring and on the job trainings to field staff. |
| Project Operation Planning | <ul style="list-style-type: none"> ▪ dependency with DENR RO 8 on the verification, approval, political boundaries and validation of survey | <ul style="list-style-type: none"> ▪ Slow approvals of survey causes delay in the processing of title | <ul style="list-style-type: none"> ▪ adopt streamlined survey approval process |
| | | <ul style="list-style-type: none"> ▪ limited availability of experienced/ skilled geodetic engineers, data encoders and cartographers in the region resulted to limited quality output | <ul style="list-style-type: none"> ▪ provide trainings or short-term courses on project operations, planning & supervision ▪ provide longer-term courses at universities in the region |
| | <ul style="list-style-type: none"> ▪ procurement of | <ul style="list-style-type: none"> ▪ Delayed procurement of | <ul style="list-style-type: none"> ▪ streamline procurement process |

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| | equipment and staff recruitment takes time because of the bureaucratic process | equipments for operation and recruitment of staff delays operation and production of output. | <ul style="list-style-type: none"> ▪ contracts to be standardized ▪ PMO to delegate PIO 1 to recruit personnel and procure equipments |
| Project Control establishment | <ul style="list-style-type: none"> ▪ Non approval of project control prior to the conduct of lot survey | | <ul style="list-style-type: none"> • Project control must be approved prior to the conduct of lot survey. Secondary points observed by GPS must be approved to the NAMRIA. • Guidelines and procedures must be followed from the MLSP |
| | <ul style="list-style-type: none"> ▪ Non capability of the Regional Office particularly FNSP in evaluating and approving GPS data. | | <ul style="list-style-type: none"> ▪ Partner agencies (FNSP) must be trained in GPS operations and processing. |
| Political Boundary establishment | <ul style="list-style-type: none"> • Non establishment and approval of Political Boundary prior to the conduct of survey. • Boundary disputes encountered during lot survey <ul style="list-style-type: none"> ▪ Existing previously disputed political boundary in newly surveyed area. (Municipal Level) | <ul style="list-style-type: none"> ▪ Establishment/Settlement/Approval of Political Boundary should be conducted prior to survey activity | <ul style="list-style-type: none"> • Conduct joint council meeting for the concern LGUs for settlement. ▪ Municipal SB must be invited in the joint council meeting for dispute settlement |
| SNS | <ul style="list-style-type: none"> ▪ Some claimants do not participate in the SNS activity due to lack of documents, election period, payment of fees, non-residents, mostly tenants | <ul style="list-style-type: none"> ▪ Strong LGU support ensures high participation of land owners | <ul style="list-style-type: none"> ▪ If claimant/adjoining claimant were properly notified but do not participate in the activity then his/her rights will be waived and SNS will proceed. ▪ Inclusion of waiver & default after sufficient notification to land owners (in Survey Regs) ▪ Inclusion of the authorization of the representative facilitates adjudication activity. ▪ Municipal Mayor to impose mandate in the strong support of the project activities |
| | <ul style="list-style-type: none"> ▪ Some contractors do not follow the procedural guidelines of SNS | <ul style="list-style-type: none"> ▪ Ground validation is effective in areas where no land records are available. It must be anticipated that the data research/compilation prior to the implementation of the project. | <ul style="list-style-type: none"> ▪ Survey personnel (contractor) must be oriented in the SNS activity |
| | <ul style="list-style-type: none"> ▪ Lacking land data/information e.g. names of land claimants, adjoining owners etc. | <ul style="list-style-type: none"> ▪ | <ul style="list-style-type: none"> ▪ Issues/problems must be reported to the management for action taking. ▪ Conduct ground validation |
| | <ul style="list-style-type: none"> ▪ Information overload of the landowners creates a negative impact on them | <ul style="list-style-type: none"> ▪ | <ul style="list-style-type: none"> ▪ CRS to define appropriate strategies |
| Lot Surveying | <ul style="list-style-type: none"> ▪ Incomplete survey records | <ul style="list-style-type: none"> ▪ | <ul style="list-style-type: none"> ▪ CIM must conduct extensive research of survey records in the |

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| | | | Regional and Central office. (certification must be issued if there is no record available) |
| | <ul style="list-style-type: none"> No personnel from the regional office assigned in the project | <ul style="list-style-type: none"> | <ul style="list-style-type: none"> Draft memorandum to the RTD to assign competent survey field personnel from the Surveys Division |
| | <ul style="list-style-type: none"> Although the contractors were using total station in lot survey, recording of data is still done manually. | <ul style="list-style-type: none"> | <ul style="list-style-type: none"> Regional Office to approve surveys done by electronic data log from the Total Station. |
| Field Verification | <ul style="list-style-type: none"> No personnel from the regional office assigned in the project | <ul style="list-style-type: none"> Strong participation and cooperation from the Regional Surveys Division facilitates survey activity. | <ul style="list-style-type: none"> Draft memorandum to the RTD to assign competent survey field personnel from the Surveys Division |
| | <ul style="list-style-type: none"> Issues/problems were not captured by the survey verifier | | <ul style="list-style-type: none"> Implement monitoring tool for the survey activity. M&E focal person conduct regular field monitoring in the base camp.(weekly) |
| | <ul style="list-style-type: none"> No certification issued every after survey activity | | <ul style="list-style-type: none"> Certification must be drafted and signed by the survey verifier in charge and SAT leader that the survey activity is satisfactorily complied by the contractor. |
| Preparation of Survey Returns | <ul style="list-style-type: none"> Incomplete records of old surveys, titled lots and reservations Delayed approval of project controls and political boundaries | <ul style="list-style-type: none"> Incomplete lot data/ records delays the computation of lot data and the preparation of survey returns | <ul style="list-style-type: none"> implement the proposed streamlined verification process |
| | <ul style="list-style-type: none"> Limited resources (staff, materials and equipments) Poor quality of materials and equipments in the preparation of survey returns | <ul style="list-style-type: none"> | <ul style="list-style-type: none"> leads time to recruit appropriate staff & the procurement of materials & equipments |
| | <ul style="list-style-type: none"> Unskilled staff Manual Preparation and lack of training in the preparation of survey returns Negative attitude of some survey personnel Weak monitoring and supervision in the preparation of survey returns | <ul style="list-style-type: none"> Unskilled staff and weak monitoring and supervision on field activities contribute to poor quality of survey returns | <ul style="list-style-type: none"> PIO1 must develop criteria in the selection / hiring of contractual staff & contractors. Implement the proposed streamlined verification process Provide trainings regarding the preparation of survey returns using the latest technology; Orientation on the surveying software & digital process to be conducted |
| | <ul style="list-style-type: none"> Weak coordination between the PIO1 and DENR Survey Division | <ul style="list-style-type: none"> Weak coordination between PIO 1and DENR resulted to poor quality of survey returns and delay in the process of verification | <ul style="list-style-type: none"> Conduct regular technical meeting & team building activity with the Surveys Division & implement the streamlined verification process |
| | <ul style="list-style-type: none"> Asymmetrically prepared cadastral | <ul style="list-style-type: none"> | <ul style="list-style-type: none"> Appropriate scale must be followed Follow the system as reflected in the MLSP |

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| | map. | | |
| Verification of Survey Returns | <ul style="list-style-type: none"> ❖ Duplication in the conduct of survey verification by the PIO1& DENR Survey Division which often delays verification process ❖ Incomplete survey records | <ul style="list-style-type: none"> ▪ | <ul style="list-style-type: none"> ▪ Implement the proposed streamlined integrated verification process |
| | <ul style="list-style-type: none"> ❖ Weak monitoring & supervision in the verification of survey returns | <ul style="list-style-type: none"> ▪ Weak monitoring and supervision in the verification of survey returns may result to poor quality of survey returns being approved | <ul style="list-style-type: none"> ▪ do |
| | <ul style="list-style-type: none"> ❖ Weak coordination with the PIO1 & DENR Survey Division | <ul style="list-style-type: none"> ▪ Weak coordination between PIO 1 and DENR Surveys Division may result to poor quality of survey returns & delay in the process of verification | <ul style="list-style-type: none"> ▪ Conduct regular technical meeting & team building act. With the surveys division and implement the streamlined integrated verification process |
| | <ul style="list-style-type: none"> ❖ Lack of training of the new verification process & not capable of verifying digital survey returns | <ul style="list-style-type: none"> ▪ | <ul style="list-style-type: none"> ▪ Provide trainings for the new verification process (digital) |
| | <ul style="list-style-type: none"> ❖ Delayed feedback on the result of the verification | <ul style="list-style-type: none"> ▪ Delays on the feedback on the result of the verification of survey causes correction works not acted upon that contribute to the delays in the approval of survey returns | <ul style="list-style-type: none"> ▪ Implement the proposed streamlined integrated verification process |
| | <ul style="list-style-type: none"> ❖ Old system of survey is still being used in the approval of survey | <ul style="list-style-type: none"> ▪ | <ul style="list-style-type: none"> ▪ do |
| Survey Approval | <ul style="list-style-type: none"> ▪ | <ul style="list-style-type: none"> ▪ | <ul style="list-style-type: none"> ▪ |
| Validation and Correction of Surveys | <ul style="list-style-type: none"> ▪ poor technical skills of staff in the use of modern equipments | <ul style="list-style-type: none"> ▪ | <ul style="list-style-type: none"> ▪ provide relevant trainings on the operation of modern equipments ▪ implementers must write training manuals |
| | | <ul style="list-style-type: none"> ▪ erroneous survey causes re-survey | <ul style="list-style-type: none"> ▪ rectify survey errors immediately |
| | <ul style="list-style-type: none"> ▪ GPS and OPM technologies not available in all barangays | <ul style="list-style-type: none"> ▪ GPS and OPM fast track field validation | <ul style="list-style-type: none"> ▪ project planning to schedule availability of GPS & OPM technologies |
| | <ul style="list-style-type: none"> ▪ insufficiency in the supervision of survey verification | <ul style="list-style-type: none"> ▪ Poor monitoring of survey works contribute to the errors/ defects on survey output | <ul style="list-style-type: none"> ▪ direct supervision by GE ▪ clear job descriptions, reporting and performance targets |
| | <ul style="list-style-type: none"> ▪ validation, correction and adjudication done at the same time due to time constraint | <ul style="list-style-type: none"> ▪ A lead time should be provided in the conduct of survey validation and correction prior the adjudication | <ul style="list-style-type: none"> ▪ Systematic Adjudication can proceed right after survey correction (minimum of 1 month in the validation of survey prior adjudication) |
| Densification of Project Controls | <ul style="list-style-type: none"> ▪ Limited NAMRIA personnel to establish the processing of the 1st & 2nd control points and the processing & evaluating GPS field Data | <ul style="list-style-type: none"> ▪ Limited staff complement in the implementation of survey works delays operation | <ul style="list-style-type: none"> ▪ For the NAMRIA to give priority in the processing of the densification in the 1st & 2nd order of control points as mandated under EO – 280 dated 2001 ▪ For NAMRIA to train and assign additional personnel in the processing & evaluation of GPS field data submitted by the different |

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| | <ul style="list-style-type: none"> ▪ Limited knowledge of LAMP & DENR survey personnel to establish & process 3rd & 4th order control points ▪ Limited skills & knowledge of survey contractor personnel to establish & process project control using GPS | <ul style="list-style-type: none"> ▪ | <p>regions</p> <ul style="list-style-type: none"> ▪ Provide trainings to concerned personnel on the establishment, processing & adjustment of GPS field data; provisions of additional GPS equipments & Software ▪ Contractors must provide trainings to their own personnel before sending to the field or for the contractor to hire knowledgeable & skilled technical personnel |
| | <ul style="list-style-type: none"> ▪ Lack of survey marks maintenance | <ul style="list-style-type: none"> ▪ Some of the control points are disturbed or uprooted | <ul style="list-style-type: none"> ▪ Formulate IEC materials regarding the importance of survey marks and implement stiffer sanctions to the violators |

Attachment 2
**COMMENTS ON THE DELETION OF THE NUMERICAL TECHNICAL
DESCRIPTION (TD) (REFER TO EXISTING LAMP REPORTS LISTED)**

The deletion of the TD from the title is required because it is slow, subject to error and perceived as having legal status as it forms part of the title (thus amendment of error is difficult, and involves a judicial process). Further, the users of the title (land owners, banks, lenders, etc) comment that the TD is difficult to understand, and some employ resources to convert the TD to a sketch to assist interpretation. Generally, it is agreed by most stakeholders that the TD is cumbersome and awkward to use and interpret, and therefore the issue is what form should the spatial representation take and how can it be shown easily on the title.

Existing research indicates that the TD is not prescribed in legislation as a numerical descriptor; rather authority for the form of the TD is the responsibility of the Director of Lands (Extract from *PD1529"Property Registration Decree"*, Sec. 35 *Cadastral Survey preparatory to filing of petition*).

(a) When in the opinion of the President of the Philippines, public interest so requires that title to any unregistered lands be settled and adjudicated, he may to this end direct and order the Director of Lands to cause to be made a cadastral survey of the lands involved and the plans and technical description thereof prepared in due form).

The form of the TD is contained in the DAO98-12 Survey Manual (section389).

The inclusion of the current form of the TD on the title is the responsibility of the LRA. To allow the efficient progress of LAMP 2, the current form of the TD may change to a simpler form such as a diagram or sketch generated from the lot survey returns. If this is implemented, there will be no need to generate the current form of the TD and therefore the LRA will need to consider what TD format to adopt.

The Torrens title system is a means of unambiguously identifying (and guaranteeing the validity of) interests which attach to the subject land. The system does not guarantee the dimensions, it only requires sufficient description to identify the land; e.g. reference to an approved survey plan or document.

The existing procedure for cadastral surveys is for the technical description to be derived from the lot calculation sheets submitted as part of the survey returns. The survey returns do not include a survey plan with dimensions, bearings and area, only a cadastral map showing lot numbers and lot boundaries but no dimensions. In the case of isolated surveys a dimensioned survey plan is provided.

Therefore, the issue is how to reference on the title to a dimensioned survey document, rather than including a TD on the title. For an isolated survey, reference could be to the approved (dimensioned) survey plan; but no equivalent document exists for cadastral surveys. An alternative could be a sketch on the title which shows the lot extent (to scale) and adjoining lots to assist in locating the lot. Within the Land Law Study (LAMP July, 2002) it is stated that a feature of the Torrens System adopted in the Philippines, is the TD (or metes and bounds description) on the certificate of title. Under the Torrens System the land in the certificate of title is normally defined by a plan on public record and no TD is necessary as the land is described by reference to the plan and the title may sometimes show a diagram based on the plan.

Experience has shown that TDs are not readily understood by lay people and that they are tedious to produce and prone to error.

In discussion with the National Adviser (survey), several options have been developed:

Option 1

- (a) Maintain in the title data, the following;
 - Legal lot number
 - Area of the lot
 - Graphical sketch of the lot (includes dimensions and bearings, plus abutting lots)
 - Name of land owner/s
 - Project number or survey number (or approved survey plan number)
 - Location of the lot in terms of barangay, municipality/city and province.
- (b) The lot technical description is no longer included as part of the land title data.

Option 2

Adopt the cadastral survey record card system.

A cadastral record card maybe issued to the rightful landowner right after the approval of the survey or cadastral project. The card while not part of the title may be used as the official technical data reference for the lot and area contained in the title in the possession of the land owner. It contains:

- a) Lot number with sketch
- b) Cadastral/project survey number
- c) Area of the lot to nearest square meter
- d) Unique parcel identifier (if final CIM is already prepared)
- e) Name of owner
- f) Address of owner
- g) Location of the lot (barangay/municipality/province)
- h) Cadastral map sheet coordinate
- i) Bearings and distances of the lot
- j) Land use category
- k) Other pertinent data as may be useful to both the landowner and DENR for reference information.

The cadastral Record Card could be issued prior to the issuance of titles or even before titling of the lot commences and fully certified as a correct copy from the approved cadastral records. A duplicate copy is maintained in the DENR (or as data in a computer database).

Option 3

Adopt option 1 (a) and (b), but (c) becomes a certified Xerox copy (for the land owner) of the approved lot technical data that is part of the approved survey records or the DENR.

Option 4 (For isolated surveys only)

Reduce the size of the approved isolated survey plan to land title paper size. DENR issues a certified correct Xerox copy of the approved plan to the land owner for his/her reference.

The weakness in all these options is the lack of consistency. Ideally, the title should refer to an approved survey plan. Given that the purpose of the existing TD is to accurately identify the location and dimensions of the lot, then the approved plan will provide a solution. It does not form part of the register, and is therefore for information purposes, and is not part of the title; i.e. errors are easily corrected, and the complication of the existing TD is removed.

The inclusion of a sketch on the title would produce the same result. For cadastral surveys the current process is for the cartographer/draftsman to prepare a numeric TD from the survey returns (lot calculation book). If this process were changed such that the task was the preparation of a sketch from the survey observations/coordinates (to avoid error and to check the closure of each lot, described as part of a modified TD preparation procedure in section 9.7 of the Field Operations Manual), then a sketch could be available for photocopying onto the title (this copy would be certified correct), rather than a numeric TD which has to be re-typed onto the title...introducing the chance of error. A sketch is more user-friendly and understandable to the user and is easily copied without error. GEs undertaking contract cadastral surveys for PIO 1 are already providing survey data in digital form, such that lot sketches could be provided automatically.

Given that isolated surveys require a dimensioned survey plan, a photo copy of the plan (or relevant lot) onto the title could be easily done, or simply a reference to the approved survey plan would suffice; e.g. "being lot xx on survey plan yyy".

Therefore, in both the case of an isolated survey and a cadastral survey there would be an approved plan or document which shows the absolute and relative position, all relevant dimensions, areas and abutments to the lot.

The requirements of the users are met, and if the appropriate standards of survey and drafting, as determined by the Director of Lands are also met, then the numeric TD can be deleted and the newly described TD substituted.

References:

- Memo Prepared for the removal of the numerical technical description from title
- Previous Experiences with Cadastral Mapping and Sketching
- Extract from "Final Report on National Strategy on Land Records Management" (D22)
- Extract from "First Status Report on Land Document Registration" (C11)
- Extract from "Future Directions for Land Document Registration" (D21)
- Technical Description (extract from Section 9.7, Field Operations Manual)

Memo Prepared for the removal of the numerical technical description from title.

A feature of the Torrens system in the Philippines which distinguishes it from Torrens Title systems elsewhere, particularly modern Torrens systems, is the inclusion of a numerical technical description (otherwise known as a metes and bounds description) in the certificate of title. Under the Torrens system the land in a certificate of title is normally defined by a plan on public record and no technical description is necessary. The title may sometimes show a diagram based on the plan.

The use of a numerical technical description on the titles introduces a significant opportunity for error, especially as the long technical description must be retyped onto a new certificate of title. An error in any of the bearings or distances completely alters the extent of land covered by the certificate of title and is considered to be a significant issue for the overall title system. The technical description is complicated, tedious and costly to produce, prone to error and not readily understood by the public. The practice is more in keeping with an outdated deeds registration system than a modern title registration system, where the emphasis should be on simplicity and efficiency. Furthermore, if a technical description is wrongly described (a not infrequent occurrence), then the title that bears the technical description must be amended, at the request of the owner, by a court. This adds further time and expense to the conveyancing process.

The difficulty in understanding the technical description was confirmed by several interviewees within the ROD's and the banks. In most cases the technical description requires transcription into diagrammatic form by a geodetic engineer in order to be understood. This adds unnecessary time and expense to the conveyancing process. The branch of the Land Bank in Leyte has technical staff to verify the accuracy of the technical description. The bank staff interviewed reported a large number of technical descriptions that did not close, and revealed that they place greater reliance on the plans held by the Department of Environment and Natural Resources (DENR) than on the technical description. A retired Registrar of Deeds has commented that if the technical description does not close banks will not accept the title as collateral for a mortgage.

It is not PD 1529 that prescribes the format of the technical description; it is the Director of Lands who determines the format of the technical description (Section 35(a)). That format is contained in DENR Administrative Order No 98-12, published in the Official Gazette on 27 July 1998, which specifies the requirements for the technical description of surveys in Section 389.

Further support to the argument for modification or removal of the numerical technical description is given by the Cadastral Act (Act 2259). Section 16 therein provides:

“After the entry of the final decree of registration of any lot, the designation of the lot by the cadastral number, or block and lot number, as the case may be, together with the name of the municipality, township, or settlement and province in which the lot is situated, shall be sufficient description of said lot for all purposes....”

The Torrens title system is a means of unambiguously identifying (and guaranteeing the validity of) interests which attach to the subject land. The system does not guarantee the dimensions; it only requires sufficient description to identify the land; e.g. reference to an approved survey plan or document held in a secure records system.

A graphical/numerical description of a land parcel is a sufficient technical description for administrative and ordinary or cadastral land registration proceedings, and for the title that subsequently issues. Graphical methods are the most effective and easy to comprehend; they communicate quickly and cheaply most of the relevant information. Further, in a Torrens system it is not essential that the full technical description of the parcel appear on the title itself. A reference to another document kept elsewhere in the land registry, such as a plan of survey, is sufficient.

Alternatively a 'title diagram' based on the technical description could be prepared in the ROD using a simple plan format and filed in the Registry. A person wishing to view the title would be required to acquire a copy of the plan separately.

Ideally, the title should refer to an approved survey plan. Given that the purpose of the existing numerical technical description is to accurately identify the location and dimensions of the lot, then the approved plan will provide a solution, and the complication of the existing numerical technical description is removed. The inclusion of a sketch on the title would produce the same result.

Accordingly, it is submitted that a further Administrative Order from DENR is all that is required if the strategy is to be implemented, and the technical description be permitted to be in a different format, or dispensed with when a plan of survey is held by the ROD. The administrative order could also reinforce the provisions of Section 16 of the Cadastral Act (Act 2259).

It is acknowledged that the technical description has been used for many years, and that there is a reluctance to change. However, the use of the technical description is one of the greatest causes of delay and cost to the conveyancing process, and its removal should be given urgent consideration.

To expedite the consideration of a lasting solution to this issue, it is recommended that a joint DENR and Department of Justice working party be convened to formulate options to replace the current numeric technical description with a simpler spatial reference.

References:

- First status report on land document registration (LAMP, December 2002)
- Future directions for land document registration land records management (LAMP, May 2003)
- Final report on national strategy for land records management (LAMP, June 2003)

Attachment 3
Activities for the period March 31 to May 28 2004 International Cadastral
Adviser

| Dates | Activity |
|-----------------------------|--|
| Week 1 31March-9April | Input to the Draft Survey Regulations Input to the Lessons and Methodology report |
| Week2 12April-16 April | Assist writing for survey component of the Field Operations Manual (PIO1 Leyte) |
| Week3 19 April-23 April | Assist in defining survey competencies, develop cost model, review costs and processes (Leyte) |
| Week 4 26 April-30 April | Inputs to the Field Operation and Administrative Manuals, Lessons and Methodology report, arrange acceleration of the survey approval process workshop (Leyte) |
| Week 5 3 May- 7 May | Define field tests for OPM and GPS, review field verification activities (At Leyte) |
| Week 6 10 May-14 May | Prepare workshop material, define competencies, assess survey validation process (at Leyte) |
| Week 7 17May-21 May | Assist an survey process evaluation W'shp and write-up Prepare training matrices for survey (at Leyte) |
| Week 8 24May-28 May | Comments on the Technical Description, assist preparing Draft Survey Regulations, and write Exit Report |

(12.5 Summary of costs – 20 May 2004)

| Titling Activities (average per lot) | Costs Conventional Survey | Costs SNS by Orthophoto | Costs GPS |
|--|--------------------------------------|------------------------------------|----------------------------|
| Geodetic Control | P145 | P145 | P145 |
| CIM | P19 | P19 | P19 |
| Database | P17 | P17 | P17 |
| CRS | P1717 | P1717 | P1717 |
| SNS and Political Boundaries Research Mobilisation Initial Pulong-Pulong Reconnaissance Sketching SNS Monumenting Forest Boundaries Political bdry. Marking Gov't Lands Distribution of SNS Ident CARP | P602 | P602 | P602 |
| Traditional Lot Survey Solution, including: Project control Lot survey Preparation/Office work Final Pulong-Pulong Compilation/Editing Submit Returns Mobilisation Correction survey | P936 | | P211 |
| GPS Solution (excludes equipment costs) | | | P283 |
| Orthophoto/Satellite Solution, including (mapping control) | | P234 | |
| Additional Survey Inputs Field validation (Other cost to be determined: inspection, supervision and approval of surveys) | P28 | P6 | P28 |
| Title Issuance Adjudication CENRO PENRO RED (Other cost to be determined: acceptance of application conduct of final investigation processing of application) | P253 P124 P15 | P190 P124 P15 | P190 P124 P15 |
| Registration | P309 | P309 | P309 |
| Delivery of Title | P915 | P915 | P915 |
| Records Management (Costs to be determined) | | | |
| TOTAL | P5,080 US\$90.5 | P4,293 US\$76.5 | P4,575 US\$81.5 |

ATTACHMENT 3

Feature Comparison Matrix

12.4 Summary of methodology for Phase II

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|---------------------------------|--|--|---|--|---|
| CIM by Hand-Drawn Method | <ul style="list-style-type: none"> Commence with the hand-drawn method. As expertise develops and equipment becomes available, introduce the use of technology The compilation of CIM starting from the preparation of CIM Base Layout, Parcel Tracing, Plotting and designation of Parcel Identifier (PI), Legend Information up to Lot Indexing is done purely by manual drafting, <p>This is the most basic way of CIM compilation cause in all instances it does not require high/advance technology equipment to aid in the preparation. Cartographer who is compiling must have the basic knowledge and experience in cadastral mapping.</p> | <p>Brgy. Lukay</p> <p>P 2,341.70 Cost per CIM or \$ 42.60 U.S Dollars</p> <p>P 19.85 per Lot</p> | <p>1 CIM Sheet = @ 3days/persons preparation with an average lots of 118 per CIM.</p> <p>2 days lot indexing</p> | <ul style="list-style-type: none"> Sustainable cause does not require high/advance technology equipment. Replicable to any parts of the region cause can be implemented with a lesser budget. No field operation. | <ul style="list-style-type: none"> Highly Dependent on Cadastral Data. |
| CIM/GIS Process | <ul style="list-style-type: none"> The process of compilation is done entirely inside Map Info. CIM Base Layout including legend down to the textual information that is required within a CIM. | <p>Brgy. Mudburon</p> <p>P 2,121.96 Cost per CIM or \$ 35.58 U.S Dollars</p> <p>P 18 per Lot</p> | <p>1 CIM Sheet= @ 2days/persons preparation with an average lot of 118 per CIM.</p> <p>1 day lot indexing</p> | <ul style="list-style-type: none"> Time Efficient Labor-saving <ul style="list-style-type: none"> High percent accuracy performance. | <ul style="list-style-type: none"> High Cost of Equipment. Require Intensive Technical Trainings. |
| CIM by Orthophoto | <p>The method of CIM preparation utilizes advanced technology i.e. Map Info. Software and the operator is highly skilled.</p> <ul style="list-style-type: none"> The CIM preparation is done with the use of an orthophoto. The CIM Base layout including legend down to the textual information in formation that is required within a CIM is done either manual or | <p>Brgy. Patong</p> <p>P 41,591.19 Cost per CIM Or \$ 756.20 U.S Dollars</p> <p>P 258 per Lot</p> | <p>1 CIM Sheet = @ 1day/persons preparation at 10% out of 161 no. of lots.</p> | <ul style="list-style-type: none"> Excellent guide to land use delineation. Validate actual ground condition Efficient in field activity. | <ul style="list-style-type: none"> High Cost of Procurement of Orthophoto |

PART B – Orthopho Mapping

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|--------------------------------------|--|---|---|---|--|
| | <p>automation.</p> <p>This method of preparation utilizes also advance technology i.e. Orthophoto Images & Map Info. Cartographer who is compiling should have photo interpretation skill.</p> | | | | |
| CRS/CO | <p>Preferred methodology Community Mobilization for Adjudication through CO and LGU Partnership</p> <p>The flowchart is set out in this report. The methodology is documented in the Field Operations Manual</p> | <ul style="list-style-type: none"> • Cost of CRS member per team @ 13,300 x 4 months / 3 barangays – P17,333 • Community mobilization and capability building for LGU/community expense – P50,000 <p>Indicative Total Cost: P67,000 per</p> | <ul style="list-style-type: none"> • Same time frame as technical component for community mobilization for titling – not less than 3 months; • Additional time frame for post-adjudication – at least 6 months involving 1 personnel for municipality and several barangays | <ul style="list-style-type: none"> • Cost sharing with LGU and community • Vulnerable sectors' concerns addressed/aids in process of empowering poor – entry point for PO organizing/strengthening • Systematization of benchmarking; assumes cost for benchmarking which was otherwise contracted out • Increased stakeholder participation • Improved chances of sustainability through organizational and institutional strengthening thru analysis, problem solving and community mobilizations techniques | <ul style="list-style-type: none"> • Close coordination with DAR needed • Elite capture • Two – three months social preparation with CO processes – integration, core group formation, social investigation, planning with affected sectors and capability building • Needs good facilitators to do social preparation for titling within allotted time • Many social issues and vulnerable groups – high mortgage rate, tenancy, concentration of land |
| Political Boundary Definition | <p>OPTIONS:</p> | | | | |
| 1) Surveyed and | <p>a. Strong consultation and linkage with local officials.</p> | <p>Recon: 40 pt / mo.</p> | <p>P3,126 pesos/Pol. Boundary pts.</p> | <p>a. Strong negotiations and appropriate</p> | <p>a. Intensive consultations and negotiations is</p> |

PART B – Orthopho Mapping

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|---|---|--|---|--|--|
| unsurveyed areas. | <p>b. Use of GPS and total station for survey measurements.</p> <p>c. Complete documentation of outcomes in agreements and monument descriptions.</p> <p>d. Pursue strong negotiations to avoid boundary disputes and long dispute settlement tasks.</p> <p>RECOMMENDATION:</p> | <p>Mon: 20/mo.</p> <p>Observ: 40/mo.</p> <p>Effective Ave/mo. = 40 for one team only</p> | <p>Recon at: P435/pt.</p> <p>Construction of Monument: P1,035/pt.</p> <p>Observation and Measurements: 66/mo. at P1,146/pt.</p> <p>Materials and hauling: P610/pt.</p> <p>Total: P3,126/pt. plus 40% processing and lagtime costs TOTAL: P4,376/pt.</p> | <p>consultations with local officials and natural leaders / local elders give out workable agreements and avoid disputes.</p> <p>b. Political Boundary points become part of the local surveying control references so that the use of the GPs and Total stations in the Political Boundary Surveys give out the correct accuracy requirements for the lot surveying referencing and other minor engineering controlled surveys.</p> <p>c. Complete documentation of Political Boundary establishment including the signed agreements ensures permanency of boundary definition and not subject to changes by different local political leaders.</p> | <p>time consuming and may cause delays in operations</p> |
| 2) Validation of approved surveys. | <p>OPTIONS:</p> <p>a. orthophoto</p> | | | | |

PART B – Orthopho Mapping

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|--|--|---|--|--|--|
| | <p>b. Compass and tape for areas not covered by orthophoto and for wooded or covered areas.</p> <p>c. Use of GPs.</p> <p>RECOMMENDATION:</p> | <p>1 team operating at 5 lots per day or 110 lots/mo.</p> <p>1 team of 3 members with 5 lots per day or 110 lots/mo.</p> | <p>Head: P10,000/mo. 2 Asrt: 16,418 at P8,709 each/mo. P26,418/mo. or P240/lot</p> <p>P26,127/mo. Unit cost = P237.52 plus TEV 50% P118.70 = P356.22/lot</p> | <p>b1. Measures line directions and distances between corner points with good and acceptable accuracies.</p> <p>b2. Local experience is very significant in this method.</p> <p>b3. Low cost of equipment.</p> <p>c1. Provides for independent position check and relatively fast process.</p> | <p>b1. Relatively slow and time consuming.</p> <p>b2. Requires extensive clearing activities in wooded areas.</p> <p>b3. Outmoded and old technology</p> <p>c1. Requires higher technical training in the operation and processing of GPs data.</p> <p>c2. Equipment is expensive.</p> |
| 3) Subdivision correction surveys of Surveyed Areas | <p>a. GPS method for open spaces (First preference)</p> | <p>20 pt. corners/day maybe observed for contiguous lots with a team of 3 members.</p> <p>Operation is sporadic and could be just one lot being</p> | <p>P8,709x3 = P26,127/mo.</p> <p>Unit cost: P1,086 plus 50% TEV = P542</p> <p>Total Unit Cost: P1,628/lot</p> | <p>a1. Fast process of boundary measurements.</p> <p>a2. Provides more accurate position definition of corner</p> | <p>a1. Expensive equipment</p> <p>a2. Requires highly trained technical operators and processors of data for GPS.</p> |

PART B – Orthopho Mapping

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|--|--|---|----------------------------|---|---|
| | b. Total station for wood covered areas. (second preference) | corrected or subdivided per day. 15 corners to be measured per day with a team of 1 GE = P12,000/mo. 3 Assistants P26,127 (at P8,709/mo.) P38,127/mo. or 1,733/day plus 50% TEV = P866.50 TOTAL:P2,639.50/lot (maximum) | | points. a3. Lower cost for contiguous lots. b1. High accuracy corner point and boundary line survey. b2. Low cost, Fast process of surveying. | a3. Not applicable in covered areas. a4. High cost for isolated/single lots. b1. High cost of equipment. |
| 4) Approval of Cadastral Surveys. | a. Streamlined approval process with strong SNS and Field Verification plus a Field office interphase with Office Survey Verification and the preparation of survey returns. | | | a. Errors in field processes are avoided. b. Gross production of erroneous field data is avoided. c. Quality control is assured. d. Approval of cadastral surveys is facilitated | a. Cost of operation is relatively higher. b. Some contractors do not prepare their computations and cadastral map preparations in the field office. c. Needs more field operator components from the PIO office to work in verification and inspection side by side with the contractors' teams. |
| 5) Project | Total Stations with GPS support | Recon. Team: | 255.40 pesos control point | a. More accurate position | a. Expensive equipment |

PART B – Orthopho Mapping

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|---|--|--|----------------------|--|---------------------------------|
| Controls of Cad. Surveys | NOTE: GPS observations shall be made at workable BLLMs and BBM points distributed at not more than 2 km density. Connection of Transition points in between of the entire project control loops may be done by Total Stations. | Pesos/ 1 = 8709 <u>1 = 8709</u> P 17,418 at 10 pts/day Controls Monumenting Team: 1 = 8709 <u>1 = 8709</u> P17,418 at 10 pts/day Control Survey Team: 1 GE = 12,000 <u>4 = 34,836</u> P 86,890 at 10 pts./day P3,949/day or P394.90/control pt. plus 50% TEV = P197.40 TOTAL: P592.30 / control pt. | | measurements and check of the control points. b. Faster way of doing control work. c. Cost efficient compared to the old way of establishing project controls. | |
| 6) Lot definition in Unsurveyed areas. | OPTIONS: (a) orthophoto (b) If orthophoto is not available and the land is less than 50% covered by timber, use GPS | Lot Survey Team plus 4 Members: P12,000 Team Head P34,836 at P8,709 each for 4 members Sum P46,836 for mo. 10 lots/day or 110/mo. = P425.78 | P158.34/lot | Using total station traverses obtain steady and correct directions and linear distance promptly. | |

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|--|---|--|---|---|--|
| | (c) Adopt the traversing with total stations. RECOMMENDATION: | Sketching Team: 1 Sketch man 1 Assistant 8709 <u>8709</u> P17,418 5 lots/day or 110 lots/mo. Monumenting Team: 2 Men at P17,416/mo. at 5 lots/day or 110 lots/mo. Plus Cost of Monument = P40 each x 3 = P120/lot | P425.78/lot P158.34/lot P158.34/lot <u>P120/lot</u> P862.46 plus 50% P431.23 Total: P1,293.69 NOTE: Excluding costs for controls and political boundary and preparation of survey returns | | |
| 7) Mobilizing Survey Contractor | Orientation and training on the LAMP Process, Standards and Requirements is fundamental | | | a. Survey contract projects are implemented with trained staff to accomplish LAMP standard outputs. b. Activity coordination with adjudicators and Field verifiers is enhanced. c. Contractors get to understand the range of requirements to facilitate the preparation and submittal of survey returns. | The intensive training requires participation of survey supervisors, unit heads and key operators resulting in work stoppages. |

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|---|--|----------------------|----------------------|--|---|
| | | | | d. Process for approval of surveys is facilitated. | |
| 8) Survey Process check with Inspections of Activity | Field verification and inspection during cadastral surveying operation | | | a. Facilitate the execution of cadastral project. b. Provide quality check to the survey process and outcomes. c. Provide confidence in the survey and contribute to early approval of surveys. d. Ensures correct surveys and saves government future expenses for validation, correction or even resurveys. | More LAMP staff is assigned to the field. |
| Adjudication | <ul style="list-style-type: none"> • Systematic processes should be adopted • Whole of municipality approach • Base camp in the community • Live-in base camps in remote locations • All field processes integrated at the base camp level • CENRO and PENRO records, processing and approval processes undertaken in the field and in the base camp • Extensive use of contract staff to permit expansion • Contract adjudicators to perform the functions of Deputy Public Land Inspectors with appropriate deputisation given | | | Activity is in the community Transparent Widespread publicity Increased capacity to object processes | <ul style="list-style-type: none"> • Mass land titling programme or sketching into SNS can be frustrated by non-participating landowners. • Need the concept of the qualified title for boundaries that are not conclusively identified as a result of nonparticipation by one owner • Capacity of land users to participate |

PART B – Orthopho Mapping

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|-----------------------|--|---|---|--|--|
| | <ul style="list-style-type: none"> • Full integration in the field with DAR tenancy formalization processes • DAR CARP processes to follow mapping and titling • CRS programme to support • Interview location – on the land parcel • Interview by one adjudicator and one barangay representative • One adjudicator to have exclusive responsibility for a barangay • Merged interview and ocular inspection process • Evidence required to support an application – place more reliance on corroborative evidence in affidavits if notarised deeds are not available | | | | |
| Titling option | <p>Agricultural land - Free Patent under the existing legal framework – until legislation can be amended as suggested</p> <p>Homestead Patent to be available as an option</p> <p>– accept corroborative evidence in the form of affidavits by disinterested persons; support from the community; absence of disputes</p> | \$ US 120 per patent 2003 | 2-6 months | Flexible procedure Fast Can rely on corroborative evidence from the community if documents not available | Restrictions on transfer and mortgage in the first 5 years not appropriate |
| | <p>Residential land – initially apply both judicial titling and Miscellaneous Sales Patents at the choice of the community</p> <p>Short-term legislative change – apply free patents to residential land</p> <p>Longer tem – permit the issue of a</p> | <p>Incomplete pilots</p> <p>Incomplete date for miscellaneous sales</p> | <p>2 years for title issue in judicial</p> <p>Miscellaneous sales – Incomplete date</p> | <p>Faster than judicial</p> | <p>Slow, tedious</p> <p>- Expensive - Ignores existing accrued</p> |

PART B – Orthopho Mapping

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|---|--|--|--|---|---|
| | grant of any lad to a qualified user with 10 years of undisputed possession etc | | | | rights |
| Title registration | <p>Patents to be registered by ROD without investigation –in recognition of the administrative rather than judicial role of ROD</p> <p>Fees- eliminate the cadastral fee and interest; impose a flat fee</p> | | | | |
| Records Management | <p>LRA and DENR plan approval processes be merged</p> <p>CIM sheets to be used in ROD processes</p> <p>CIM to be stored in the ROD and be integrated into all registration functions of the ROD.</p> <p>Database/ digital CIM to be developed as a basis of integrated land information system</p> | | | | |
| Post-Adjudication Support for Community Organizing and Development (Post-adjudication phase) | <ul style="list-style-type: none"> • Cost of hiring focal person for titling and post-adjudication assistance to barangay – LGU counterpart • Cost of 1 CRS per municipality x 9 person months/average of 25 barangays – P4,788 • CO expenses - Share of training cost – P5,000/barangay • Contribution to cost of BDP workshop – P2,000/barangay for 2 days | <ul style="list-style-type: none"> • Addition of post-adjudication period of at least 6 months for 1 CO Facilitator | <ul style="list-style-type: none"> • Institutional strengthening of BC for Barangay Development and continuing action on land tenure issues • Organizational strengthening • Leveraging of LGU resources for external support implementation of BDP/organizational plans • Development planning facilitates access to external resources for local development | <ul style="list-style-type: none"> • Cost sharing limitations of LGU • Short time frame for CO • Requires able and committed CO facilitators | <i>Post-Adjudication Support for Community Organizing and Development (Post-adjudication phase)</i> |
| Convergence for Land Tenure | <ul style="list-style-type: none"> • Designation of LAMP personnel to support LGU activation of local development mechanisms | <ul style="list-style-type: none"> • Extends from titling to post-adjudication period | <ul style="list-style-type: none"> • Maximizes CO strategy • Leverages resources of LGU, LAMP for | <ul style="list-style-type: none"> • Limited LGU resources or personnel | Convergence for Land Tenure Improvement and Local Development |

| Activity | Methodology recommended | Cost analysis | Time Analysis | Advantages Strengths | Disadvantages Weaknesses |
|--|--|---|--|--|---|
| Improvement and Local Development | <ul style="list-style-type: none"> • Contribution to cost of workshops and training – P15,000 | | <p>development assistance from other programs and agencies</p> <ul style="list-style-type: none"> • Systematizes coordination for local development and poverty reduction • Institutionalization of poverty reduction and planning mechanisms | | |
| Community-Based Monitoring and Evaluation (Community level) | <ul style="list-style-type: none"> • Should entail no additional cost • Counterpart cost for evaluation workshops x 3, etc. – P1,000 | <ul style="list-style-type: none"> • Adjudication and post-adjudication phases | <ul style="list-style-type: none"> • Strengthens participatory processes in project implementation • Quick action on field processes by community implementers - Improved quality of output • Monitoring results feeds into project's M and E | <ul style="list-style-type: none"> ▪ Technical assistance needed on preparation of forms by community | Community-Based Monitoring and Evaluation (Community level) |

ATTACHMENT 4

Information systems requirements



LAND ADMINISTRATION AND MANAGEMENT PROJECT (LAMP)

Project Implementation Office 2 – Quezon City

2nd Floor, LRA Building, East Avenue, cor. NIA Road, Diliman
Quezon City
Tel. No. 4264247/925-3129/9253166 (fax)

**WORKSHOP ON ORGANIZING THE REQUIREMENTS
FOR THE LONG-TERM OSS INFORMATION SYSTEMS**

23 April 2004
Friday, 8:30AM – 4:30AM
EMB Training Room

GENERAL PROGRAM

The analysts and other key persons for developing databases of the project had their first meeting for the discussion of the long-term OSS information systems. The Project Implementation Office's databases in Leyte and in Quezon City are visibly and constructively different, though they have some similar fields. Mr. Barry Dick, the Land Title Records Adviser of PIO2 and the initiator of this workshop, observed that this is going to be a constraint in the future LAMP II.

In order to provide guidance to the analysts and programmers in building a consolidated, more effective and user-friendly database that caters to the needs of the clients, this workshop aims to come up with best approach on developing each of the PIO's databases and the preparation of the Terms of Reference for the database Technical Advisers.

PROGRAM SCHEDULE (See attached program of activities)

HIGHLIGHTS

I. Opening Notes (Workshop started at 9:20AM)

- A. Opening prayer led by Mr. Kevin Serrona.
- B. Introduction of participants, stating their name, designation and office.
- C. Mr. Serrona gave a brief summary of what will be discussed.

II. Mr. Barry Dick's Presentation

- A. Discussed the program for the workshop.
- B. Rationale of this workshop:
 - 1. The incorporation of the two PIOs in the near future (LAMP II)

2. How to integrate the activities of the two prototypes
3. To get the internal and external requirements needed for the OSS
- C. The database is a prototype within a prototype as quoted by Mr. Dick
- D. Gave a background of the workshop including the review of the current environment and processes of the OSS database.
 1. The database developers must consider what the user needs.
 - a. It should be something clear and easy to handle.
 - b. The developers must also know what the management and the users exactly wanted.
 - c. They also have to review the business operation needs to know what works and what doesn't.
 2. Document the whole process and have the original design of the database done agreed by the creators and the users.
 3. Nothing should be changed in the final database without going to the whole process again.

III. The Two Prototypes IT Support

- A. PIO1 (Presented by Ms. Juliet Asuar, Deputy Prototype Manager)
 1. Their Land Records Database is the consolidation of the informations in the ROD and CENRO.
 - a. They installed their database to the ROD and CENRO so that clients don't necessarily have to go to the OSS to get informations in their lots.
 2. They had incorporated some of their fields to gender-related issues.
 3. The applications normally done in those land-related agencies are also done in the OSS.
 4. They also have developed an Employee Employment System, but it still needs some improvement.
 5. Hardware and software problems
 - a. They have different versions of the operating system used in the land transactions. Most of them are using Windows 98 and some are Windows ME and XP. This is going to be one of the stumbling blocks in developing an integrated OSS Systems.
 - b. Their server's operating system is in Windows 2000 Professional. It has a limited capacity that caters to only 10 workstations.
 6. They also were having problems in the networking in their Base Camp because of the lack of telephone lines available in their area.
 7. Future plans
 - a. Implement a strategic plan that will keep PIO1 with technology advances.
 - b. Focusing on the requirements needed to support LAMP's growth.
- B. PIO2 (Presented by Engr. Henry Pacis, Deputy Prototype Manager)
 1. Stated the areas that requires support
 - a. Daily Operations
 - i. Provide fee advice for different OSS transactions
 - ii. Document the following:
 - Customer information
 - Arising issues in the process

- Management reports of activities
- b. Cross Index
 - i. OSS staff extensive and continuous training on the database
 - ii. Searching of records by key elements
 - iii. Linkage to spatial data on the CIM
- c. Linkage Between Agencies
 - i. PIO2's having a linkage problem with the other agencies because of the unproduced router.
- d. Graphical Information System
 - i. Accurate and computerized replacement for the CIM
 - ii. Linking the Cross Index

IV. Workshop I: Requirements to Support the OSS

- A. What do we expect to have in the future OSS?
 - 1. An OSS procedure that caters to both urban and rural situations
 - 2. After the integrated system has been completed, PMO should take charge it.
 - 3. It should be in a single operation that includes everything.
- B. Mr. Kevin Serrona facilitated the discussion of the *OSS Long-Term Requirements*. He classified it into four categories, namely: Technical, Manpower, Logistics and Institutional Support Requirements. *(See attached output)*
- C. Mr. Barry Dick suggested having a stand-alone OSS that could create revenues by itself. The OSS should be able to set fees for different transactions.
- D. Mr. Serrona also had assist in the discussion on the more detailed *Existing and Future OSS Requirements*. *(See attached output)*

V. Presentation on PIO1 & PIO2's Database Structure

- A. PIO1's database structure was presented by Ms. Hazel Hibanada, PIO1's System Analyst.
 - 1. She showed the actual database that is being used in PIO1's OSS.
 - 2. ROD and CENRO has their own separate tables in the database.
 - 3. Their tables are linked using the alpha-numeric field "Whatever".
 - 4. It also has five residential address fields that serve as their various address reference.
 - 5. Their database has a lot of tables compared to PIO2's system.
 - 6. Every change in the database needs a corresponding workshop.
 - 7. They cannot make any sudden changes in the database because other agencies are also using the system.
 - 8. The ROD and CENRO's access in their database is restricted.
- B. PIO2's database structure was discussed by Mr. Erwin Yamsuan, PIO2's System Analyst.
 - 1. Mr. Yamsuan showed the different tables and fields in the Cross Index, discussing each field's format, size and indexing.
 - 2. Since most of the participants are already familiar with the PIO2's database, elaboration on it is not necessarily needed. Instead, a table of comparison was written on the whiteboard by Mr. Serrona for a more clear and distinct comparison.

VI. Workshop 2: Investigate the Consolidation the 2 Databases into New Tables

- A. Workshop 2 was being done along with the discussion of the PIOs database structures. The facilitator was not able elaborate on this because of the time constraint.

VII. TORs for the Key TA Positions

- A. The participants were given metacards and marker pens for their proposition on what to put on the TER of the following Technical Advisers:
 1. International Database Adviser
 2. Local Database Adviser
 3. National Management Adviser
 4. National Process Engineer Adviser
 5. International GIS Adviser
 6. Local GIS Adviser
 - *See attached for the results (Suggested TOR for the Key TA Position)*

VIII. Next Steps

- A. Fully develop the TORs of the key TAs
- B. Consolidate and develop a single database
- C. The technical people of the three LAMP offices (PMO, PIO1 and PIO2) should meet more often to have consultation meeting to know the best way to consolidate the database tables.

WORKSHOP ON ORGANIZING THE REQUIREMENTS FOR THE LONG-TERM OSS INFORMATION SYSTEMS

23 April 2004
Friday, 8:30AM – 4:30AM
EMB Training Room

OSS Long-Term Requirements

| Technical Requirements | Manpower Requirements | Logistics Requirements | Institutional Support Requirements |
|--|--|---|---|
| 1. User Requirements <ul style="list-style-type: none"> • Internal • External | 1. Trained and Reform-oriented Staff <ul style="list-style-type: none"> • Engineers / Surveyors • IT • GIS • IEC Specialists • Cartographers • Adjudicators (Legal People, but not necessarily lawyers) • Community Development Specialists (Admin) | 1. Office Space | 1. Personnel <ul style="list-style-type: none"> • DENR • BIR • ROD / LRA • DAR • LGU |
| 2. Hardware & Software | 2. Technical Advisers | 2. Utilities <ul style="list-style-type: none"> • Electricity • Water | 2. Monetary Support <ul style="list-style-type: none"> • PIO2 – 1.5M • PIO1 – none |
| 1. Trainings <ul style="list-style-type: none"> • Continuous capability building • CIM | 3. Managers / Planners | 3. Communications | 3. Issuances from agencies (strengthens relationships with agencies) |
| 2. Manuals | 4. Process Documentor | 4. Vehicles | 4. Logistics |

| Technical Requirements | Manpower Requirements | Logistics Requirements | Institutional Support Requirements |
|--|---|--|--|
| | <ul style="list-style-type: none"> • M & E – facilitate issues | | |
| 3. TA Inputs | | 5. Operational Funds | 5. Co-management structure <ul style="list-style-type: none"> • PIO2 – LGU – Agencies – Committees • PIO1 – Mobile OSS |
| 4. Information <ul style="list-style-type: none"> • Land Records Database | | 6. Multimedia <ul style="list-style-type: none"> • Information Kits • Advertisements | 6. Information Arm (CRS) |
| | | 7. Latest Equipments <ul style="list-style-type: none"> • Survey | |

WORKSHOP ON ORGANIZING THE REQUIREMENTS FOR THE LONG-TERM OSS INFORMATION SYSTEMS

23 April 2004

Friday, 8:30AM – 4:30AM

EMB Training Room

Existing and Future OSS System Requirements

| PIO1 / PIO2 Existing OSS System | Future OSS System |
|--|---|
| 1. Technical <ul style="list-style-type: none"> • Multiple operating system • No virus protection • Multiple manuals • Multiple database system • Limited internal network • None external network • Separate development systems | 1. Technical <ul style="list-style-type: none"> • Single operating system • Virus protected • Consolidated manuals (caters to both urban and rural situations) • Integrated database system • Internal and external network • Centralized development systems |
| 2. Hardware & Software <ul style="list-style-type: none"> • No server • No server software • Low capacity computers | 2. Hardware & Software <ul style="list-style-type: none"> • Adequate number of hardware and software • Utility • Maintenance |

Key Features of the Database Structures of the PIOs

| PIO1 | PIO2 |
|--|---|
| 1. MS Access-based | 1. MS Access-based |
| 2. Captures information for the agencies | 2. Only used for locating the key to records held in other agencies databases. |
| 3. Uses the “Whatever” field as the link between tables | 3. Uses the “SPI” field as the link between tables |
| 4. Uses sub tables for repeating data, although not for multiple residential addresses | 4. Uses sub tables for repeated data. |
| 5. Database installed in ROD & CENRO | 5. Installed at the Barangay level as Barangay Integrated Land Information System BILIS |
| 6. Ownership identified for CRS purposes | 6. Ownership identified for CRS purposes |
| 7. Geocoding of GIS not yet started. | 7. Geocoding of data with cross index completed for Holy Spirit |
| 8. Sex-disaggregated | 8. Sex-disaggregated |

**WORKSHOP ON ORGANIZING THE REQUIREMENTS
FOR THE LONG-TERM OSS INFORMATION SYSTEMS**

23 April 2004
Friday, 8:30AM – 4:30AM
EMB Training Room

Suggested TOR for the Key TA Position

| International & Local Database Adviser | National Management Adviser | National Process Engineer Adviser | International & Local GIS Adviser |
|--|--|---|---|
| <ul style="list-style-type: none"> TA who can train IT staff on data warehousing and building e-commerce database websites. | <ul style="list-style-type: none"> Should be able to monitor the manual of operations. Once implemented should be strictly followed, putting into consideration the public service it will bring to the end user. Deviations / non-adherence later because the start of failure of a project. | <ul style="list-style-type: none"> Assist in streamlining processes in OSS with the agreement of partner agencies. | <ul style="list-style-type: none"> Ensure that CAD information is authoritative, accurate, and complete and meets the needs of the participating agencies. |
| <ul style="list-style-type: none"> The network adviser should know how to link the database of the OSS and create a single database which can be accessed by all OSS. | <ul style="list-style-type: none"> Organizational development adviser | <ul style="list-style-type: none"> Develop effective processes for OSS services delivery. | <ul style="list-style-type: none"> Review, recommend and implement policies and procedures related to the digital cadastre, to establish practical, effective processes and frameworks that will ensure the high quality |

| International & Local Database Adviser | National Management Adviser | National Process Engineer Adviser | International & Local GIS Adviser |
|---|--|--|--|
| | | | maintenance and availability of cadastral information. |
| <ul style="list-style-type: none"> • Assistance for modification and improvement of PIO's databases / linkages. | <ul style="list-style-type: none"> • OSS management structure | | <ul style="list-style-type: none"> • Plan and estimate the resource requirements and costs associated with the GIS program. |
| <ul style="list-style-type: none"> • Evaluate existing standards and make recommendations on a national standard. (Local Adviser) | <ul style="list-style-type: none"> • Sustainability program for OSS | | <ul style="list-style-type: none"> • Facilitate the identification and development of initiatives to improve processes and practices. |
| <ul style="list-style-type: none"> • Develop a single database for all OSS. | | | <ul style="list-style-type: none"> • Access to remote databases like oracle spatial. |
| <ul style="list-style-type: none"> • Evaluate the methods for linking systems, including small stand-alone versus central mainframe. | | | <ul style="list-style-type: none"> • PRS 92 – each models • Data models • Digital capture / vector raster • Map projections • MapInfo / spatialware |
| <ul style="list-style-type: none"> • Someone who can provide emergency funds for the project. | | | <ul style="list-style-type: none"> • Overall concept of GIS for the OSS. |

PART B – Orthopho Mapping

| International & Local Database Adviser | National Management Adviser | National Process Engineer Adviser | International & Local GIS Adviser |
|---|------------------------------------|--|---|
| | | | <ul style="list-style-type: none"> • Appropriate and cheaper GIS system. |
| | | | <ul style="list-style-type: none"> • Determine the best method for holding spatial and textual data system requirements. |
| | | | <ul style="list-style-type: none"> • Develop and update GIS operational plan and manual. |
| | | | <ul style="list-style-type: none"> • Develop things to enhance the capability of the staff. |
| | | | <ul style="list-style-type: none"> • Identify / test appropriate GIS software for LAMP / OSS purposes. |
| | | | <ul style="list-style-type: none"> • Enhancement of advance GIS. |
| | | | <ul style="list-style-type: none"> • Finalization of CIM layout. |
| | | | <ul style="list-style-type: none"> • Review of standards and know how will they fit into international standards |

| International & Local Database Adviser | National Management Adviser | National Process Engineer Adviser | International & Local GIS Adviser |
|---|------------------------------------|--|--|
| | | | <ul style="list-style-type: none">• Using query for validation and QA. |

ATTACHMENT 5

Competency standards for CIM

**PHILIPPINES AUSTRALIA LAND
ADMINISTRATION AND MANAGEMENT
PROJECT**

**DRAFT COMPETENCY STANDARDS FOR
CADASTRAL INDEX MAPPING AND
CARTOGRAPHY**

Date prepared

April 2004

Standards preparation team comprising:

Document Preparation and QA check

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Name of Project: **Philippines-Australia Land Administration and Management Project (PA LAMP)**

Name of Document: Draft competency standards for

Author(s) of Document HR Committee, PA LAMP

Original and Electronic Copy held by Executive Director of LAMP
Team Leader of PA LAMP
HR Unit

Related and/or Previous Documents PA LAMP Second Draft Design Document (LAMP Extension)
December 2003

Requirements for the Competency Based Approach to Training in the Land Administration and Management Project (LAMP)

A Guide to Competency Based Assessment and Development of Assessor Guides

Operating manuals

Training guide to operating manuals

AN INTRODUCTORY NOTE ON COMPETENCY STANDARDS

Why competency standards?

Emerging technologies in the last two decades has resulted in the evolution of borderless economies. The world, as we know it, is shrinking, and the global community has taken its place. Now, more than ever, competent human resources are required to ensure growth and competitiveness. And for a country whose competitive advantage is said to be its human resources, these developments require education and training strategies and systems that are not only responsive but also ensure outputs or products that are of a quality recognized and accepted within the global community.

The competency or standards based approach to education and training is one such system. It ensures that the education and training programs delivered are based on the standards of work performance for each worker as defined by employers within a sector. It is this system upon which this draft Competency Standards for Human Resource Practitioners is founded.

What exactly are competencies or competency standards?

*The Australian National Training Authority or ANTA defines competency as the “**specifications of knowledge, skills and attitudes and the application of these to the standard of performance required in the workplace**”. The concept of competence, therefore, focuses on what is to be expected of an employee in the workplace (i.e. what he or she has to do and the standard to which such has to be done) rather than on the learning or the performance process. It embodies the ability of an individual to transfer and apply skills and knowledge to new situations and environments. It is a broad concept that includes all aspects of work performance and not only narrow task skills. All employers in all enterprises by industry groups define the competencies and prepare the standards to the “standard” required of the sector.*

Progress towards a Philippines national qualifications framework

As in any other education and training delivery system, people are given “awards” or “qualifications” that recognize the package of competencies they have achieved. This “package of competencies” comes from a basket of endorsed competency standards which meet an enterprise, sector or industry need. This “basket of competency standards” then forms the National Qualifications Framework. In essence, the NQF is a way or system of structuring national qualifications. It is designed to provide

- nationally recognized, consistent standards and qualifications; and
- recognition and credit for all learning of knowledge and skills.

In 2002 there is still no “national” qualifications framework operating in the Philippines. There is however a Technical and Vocational Education and Training Framework (TVET) and a proposal to articulate this into the higher education system to form a national qualifications framework.

The TVET framework in 2002 proceeds only to a National Certificate IV level although there is a proposal to have a level V (Diploma) and Level VI (Advanced Diploma) active within the TVET framework and that these two qualifications would be at par with Diplomas and Advanced Diplomas being issued by CHED. In reviewing these standards, it will be noticed that the qualification level proposed for the (insert name of standards) units of competency is (insert proposed qualification level).

It is not the purpose here to argue the case for a national qualifications framework. This is being undertaken in other forums. These standards when finalized and developed into curricula and course materials will have a life and recognition of their own. If and when a national qualifications framework is created then this HR qualification that is already being delivered, awarded and practiced will be placed on the national register of standards and course wares. The basic premise of the standards based approach to education and

PART B – Orthopho Mapping

training is for the relevant sector to prepare the standards to the ‘standard’ required of the sector. These standards then drive the downstream products and processes of curriculum, courseware development, registration and accreditation of providers, delivery and awards of qualifications. In the future it would be expected that those sectors which have their examination and licensing system governed by the Professional Regulatory Commission may choose to review the value of having critical aspects of the education and training and licensing of future and current employees being controlled by a body other than the sector for and by itself.

Readers and users of these standards should refer to the web sites of Australia, New Zealand, the United Kingdom, United States and other countries undertaking reforms to education and training to view the qualifications frameworks and the sector led standards development in education and training as well as the awards and licensing systems inherent in these. Secondary school certificates are also incorporated into the national framework as many students are able to begin post high school studies whilst still at school.

The TESDA site of the Philippines should also be viewed. A number of web sites and references are listed at the back of these draft standards for further reading.

How a national qualifications framework ‘works’

The National Qualifications Framework is a three-pronged quality system:

- where national standards are registered.
- which is used by [accredited education and training providers](#) as basis for their programs.
- includes a [moderation system](#) to ensure national consistency.

Framework qualifications in countries adopting the standards approach are quality assured and nationally recognized. Frameworks are usually administered by a Qualifications Authority (such as TESDA and CHED). Every learner gaining credits on the Framework receives a Certificate of Competency (COC). When sufficient competencies have been gained the national qualification may be awarded. Because the worker or learner has proven their competency to the standard required (set) by the sector(s) then there is little need for further examination by another authority.

In the Philippines in early 2003 there exists a TVET Framework and a higher education “system” comprising Diplomas as Bachelor degrees, Masterals and Doctorates. There is no recognized system for registered and approved education and training institutions to recognize qualifications provided by other providers. Other countries using national frameworks have been able to achieve a high level of recognition amongst education and training providers at different levels. Users of these standards are urged to research for themselves how other countries have moved towards fully integrated systems which recognize qualifications awarded by other quality assured and registered or approved providers.

The framework and system in the Philippines in 2003 is displayed in the table below.

** There is no recognized formal arrangement for moving from the TVET sector (with say the proposed Level 5 Diploma) into the higher education sector.*

| Secondary Education | Technical and Vocational Education and Training (TVET) | Higher Education |
|----------------------------|---|-------------------------|
| | | Diploma (Doctorate) |
| | | Diploma (Masters) |
| | Diploma Level 5 (Proposed) | Diploma (Bachelors) |
| | National Certificate 4 | |
| | National Certificate 3 | |

| | | |
|------------------------|------------------------|--|
| | National Certificate 2 | |
| | National Certificate 1 | |
| High School Graduation | | |

- **National Certificates and Diplomas**

All competency certificates or credits for national standards lead to National Certificates, National Diplomas or other national qualifications.

- **Standards**

Each standard developed by a sector may be registered on the Framework. Standards describe what a learner needs to know or what they must be able to achieve or a what a worker (without the qualification) needs to demonstrate that he or she can perform that competency to the standard required (this is RPL or Recognition of Prior Learning)

Unit standards are developed by experts in each sector or across sectors in their fields and set the benchmark for what needs to be done and to what standard. Because the standards are nationally agreed, learners' achievements can be recognized in a number of contexts. Their knowledge and skills will be transferable between qualifications and providers.

Standards specify learning outcomes. Having qualifications based on learning outcomes is what makes Framework qualifications different from other qualifications systems (which are often focused more on outputs such as courses, or inputs such as curricula or teaching hours). Outcomes models have been endorsed by international bodies involved with funding education systems (for example, the World Bank, Asian Development Bank and the OECD) and are being implemented by countries such as the US, Australia, the UK and others.

Each unit standard has a defined credit value and sits at a specified level on the Framework. Credits may be accumulated from different learning institutions or workplaces towards a single qualification. All organizations accredited to assess against standards recognize Framework credits awarded by others.

- **Standard setters**

The Qualifications Framework is built on a process of consensus. Industry sectors by groupings develop standards and national qualifications for specific industries and professions, hence readers will see reference to the functional analysis approach to developing standards. Standards are drafted by expert groups (engineers for engineering standards, geographers for geography standards and so on). The draft standards are then placed on a web site or circulated to stakeholders for comment and contribution. Once standards are agreed to and registered, they are subject to review by stakeholders and experts on a regular basis. This allows for standards to be refined and updated over time even whilst in use by the concerned sectors.

- **Accredited or Registered Education and Training Providers**

Education and training providers - - i.e. schools, training centers, colleges, universities, government agencies, project and private training establishments - - develop learning programs that can be assessed against national standards. Providers can only be accredited to the national framework if they fulfill quality requirements to prove they have the instructors, tutors, resources and equipment to run their programs. Workplace training centers can also become accredited to deliver programs and assess against national standards as they have the equipment on site to conduct relevant training.

A training provider must be registered and accredited by the national authority to award credits for unit standards.

- **Assessment**

Assessment can be done by the representative of an [accredited provider](#) (a school, private or industry training establishment, government training establishment or a tertiary institution) or by a registered assessor.

A wide range of evidence may be used to compare a candidate's performance against a unit standard as part of the assessment process. As well as traditional tests, projects etc, an assessor can use evidence of prior achievements or evidence from the candidate's workplace to test performance against a standard and award the relevant qualification.

- **Recognition of Prior learning**

An important principle of a qualifications framework is that skills, knowledge and understanding gained outside formal education or training will be recognized.

- **Moderation**

A system called [moderation](#) ensures that all accredited providers and workplace assessors are making consistent and reliable judgments about students' assessed work.

[Best Practice Moderation](#) provides a set of principles to ensure that the moderation systems providers and standards setters are required to participate in are run in an effective and positive manner.

- **Applications of the standards**

The principal application of these standards is to use it to prepare professional and technical qualifications (and human resources with these qualifications) for the sector. All other applications are linked to this and include:

- Preparing job descriptions and person specifications
- Using standards as recruitment instruments
- Preparing short and long term training program curricula and course wares
- Packaging competencies achieved in short term training to gain new qualifications
- Preparing work plans for unit teams and individuals
- Enabling assessment of officer competencies against standards
- Preparing procedure manuals
- Publicizing the fact that the sector is working to professional standards benchmarked to international standards
- Locating the standards within the national qualifications framework (under development)

If using these draft standards...

For any of the applications listed above please keep in mind that the same task may be performed by another group in another sector elsewhere. Coordination and information sharing may be useful and efficient. The standards are generic and do not constitute trade or professional secrets. How well any sector or organization applies the standards will constitute trade or professional advantage.

If reviewing these draft standards for technology changes or structural changes to the sector...

Please keep in mind that **your reviewing group needs to see the function as it would be performed across the sectors and in various organizations**. One of the main foundations of the standards setting system is that they are common across sectors making for huge efficiencies in avoiding the duplication of efforts in preparing course wares. Specific organizations or sectors need only to identify the specific standards belonging to their sector and either search for these (if existing) or write them, submit for endorsement and insertion on the national framework and prepare related course materials.

Copyright

There is no copyright on these standards. Interested parties may use them for their own purposes and adopt or amend as needed. We would however appreciate feedback on the drafts and any suggestions for improvements. Please forward these to:

The Executive Director

Land Administration and Management Project
Human Resources Management Unit
Department of Environment and Natural Resources
2nd Floor, DENR Main Bldg., Visayas Avenue, Quezon City

e-mail

palamp@mindgate.net

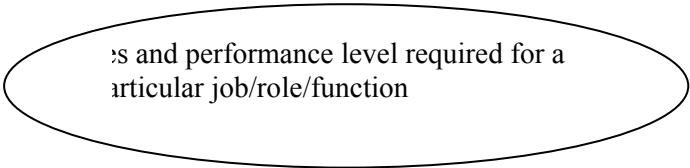
web site

<http://www.phil-lamp.org/>

INTEGRATED OR STAND ALONE KEY OR GENERIC WORK COMPETENCIES WITHIN THE STANDARDS

In June 2002, Key Competencies are an included feature of the adopted competency standards for the Philippines. The following information on Key Competencies has been included for the Reviewer's reference as most countries adopting the competency approach have included something similar in the development, endorsement and application of competency standards. Different sectors developing standards have either found ways to integrate key competencies into the mainstream standards or have been content to leave them as independent units of competency. What is important is that analysis groups determine the appropriate level for each key competency in relation to the function.

Key Competencies are...



Key competencies are generic competencies that are seen to be *essential for effective performance in a particular job/role*. Key competencies should be embedded or integrated into learning and should be part of the holistic assessment process. Those being assessed are expected to achieve the key competencies at one of the specified levels of achievement. These are listed in the following table modeled on the Australian Key Competencies but has a number of optional competencies that may be considered appropriate for the Philippine work culture. Analyst groups may find some of the competencies they derive through the workshop process may in fact be Key Competencies. This is fine.

Also, the table is a useful tool for trainers and assessors to identify and confirm the level against which they are training and assessing the key competencies.

Readers and reviewers of the draft standards should realize that many skills and groups of skills that they are quite familiar with are contained somewhere within the Key Competencies. For example, negotiating would be a skills within communication as is networking, presentation, report writing etc. One might be tempted to place facilitation skills within communication but as these are draft standards for HR Practitioners we would expect to find facilitation as an element within the unit of competency for delivering a training course or acting as a resource person.

KEY COMPETENCIES (AUSTRALIA AND PHILIPPINES)

| Key Competency | Performance Level 1 | Performance Level 2 | Performance Level 3 |
|--|--------------------------------------|---|---|
| Collecting, analyzing and organizing ideas and information <i>The capacity to find, sift and sort information and present it in a useful way. For example, filing invoices to a set procedure or developing a mailing list of potential clients</i> | Access and record - single source | Access, select and record - more than one source | Access, evaluate and organize - range of sources |
| Communicating ideas and information <i>The capacity to communicate with others using spoken, written, graphic and other non verbal means of expression. For example, writing</i> | Simple - familiar setting | Complex - particular context | Complex - variety of contexts |

| Key Competency | Performance Level 1 | Performance Level 2 | Performance Level 3 |
|--|--|--|--|
| <i>a letter for a job application, presenting a report,</i> | | | |
| <p>Planning and organizing activities</p> <p><i>The capacity to plan and organize work activities, including making good use of time and resources, arranging priorities and monitoring own performance. For example writing a daily log of activities to be done and achieved</i></p> | Under supervision | With guidance | Independently initiate and evaluate complex activities |
| <p>Working with others and in teams</p> <p><i>The capacity to work as a member of a team to achieve a shared goal. For example, helping with photocopy and collating work.</i></p> | Familiar activities | Help formulate and achieve goals | Collaborate in complex activities |
| <p>Using mathematical ideas and techniques</p> <p><i>The capacity to use mathematical ideas by numbers and space and techniques such as estimation and approximation. For example estimating the amount of cement bags in a bricklaying task</i></p> | Simple tasks | Select appropriate complex tasks | Evaluate and adapt as appropriate for task |
| <p>Solving problems</p> <p><i>The capacity to identify when a problem exists and to achieve a solution. For example, handling a complaint from a customer or overcoming personal conflict at work.</i></p> | Routine - minimal supervision Exploratory - close supervision | Routine - independently Exploratory - with guidance | Complex problems, implement systematic approach, explain process |
| <p>Using technology</p> <p><i>The capacity to operate and equipment and materials and to explore and adapt them. For example, trouble shooting a photocopier or programming a VCR</i></p> | Reproduce or present basic product or service | Construct, organize or operate products or services | Design or tailor products or services |
| Optional/Additional Key Competencies (to be researched). | | | |
| For the Philippines, these may include: | | | |
| Applying work ethics and values | | | |
| Adhering to Occupational Health and Safety procedures | | | |
| Adhering to environmental concerns | | | |

Table adapted from Mayer Committee. 1992. Key Competencies. Report to the Australian Education Council and Ministers for Vocational Education and Training. p44

Readers should be able to see the advantages and economies gained by sectors recognizing the fact that what they have regarded as competencies specific to their sector may in fact exist across sectors. Curricula and course ware need only to be prepared once and made available on a central register.

Recommended web sites for further reading and sourcing materials

1. Australian National Training Authority (ANTA) and links (www.anta.gov.au)
2. New Zealand Qualifications Authority (NZQA) and links (www.nzqa.govt.nz)
3. Asian and Pacific Skills Development Programme (ILO/APSDEP)
4. International Labor Organization (ILO)
5. National Skills Standards Board (USA) (www.nsb.org)
6. Technical Education and Skills Development Authority (TESDA). www.tesda.org
7. TAFE NSW. www.tafensw.edu.au
8. Education Newsletter Australia. www.edna.edu.au/
9. National Office of Overseas Skills Recognition (NOOSR Australia)
10. Flexible Learning website (www.flexiblelearning.au.innovations/)
11. Scottish Qualification Authority
12. Qualifications and Curriculum Authority (UK)

References

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7. TESDA. 1999. Implementing Guidelines for TESDA Occupation Qualification and Certification System. TESDA Skills Standards and Certification Office. TAGUIG. Philippines (now superseded by PTQF)

INTRODUCTORY NOTE ON THE COMPETENCY STANDARDS FOR CADASTRAL INDEX MAPPING AND CARTOGRAPHY

History of Preparation/Revisions to Draft Standards

Date of Revision

Revision Details

A note about the format of the Standards

The format of the Standard follows closely that adopted by the Regional Model for Competency Standards (RMCS) to which the Philippines subscribes and was developed by the International Labor Organization for its regional members. The method of development of the draft standards has been through the organization and conduct of Functional Analysis Workshops which is a job analysis approach that has efficiencies when cross sector and across sector standards are being developed as well as analysis undertaken within the individual organization. Variations of this approach may be seen being used by other countries.

The Standard for ?????? at the above date comprises ???? Units of Competency. These are displayed in one of the tables below.

*Each Unit has been analyzed into its component **Elements** and a set of **Performance Criteria** attached to each of these. The Element is a component of a Unit whilst Performance Criteria are evaluative statements in an Element which specify what is to be done in the work environment and the required level of performance for this. Reviewers of the Standards should consider this definition.*

Each Unit is then taken in turn and analyzed in terms of its **Range of variables**. A number of countries using this format for Standards have included this aspect to cover the possible ways or conditions in which the work might be performed. The Range statement sets the parameters for application of the competency and usually tries to capture the types of work, resources, services and so on that would come into play when the competency was being used. This might become important when different technologies may be in use to perform the same unit (or element) such as “**maintain personnel records of all employees**”. The Range Statement may mention either or both manual and computer methods of storing and manipulating the records and this will be important in training design and assessment of learners or workers on the job.

Following that, for the Function under analysis, an **Evidence Guide for Competency-Based Assessment including Recognition of Prior Learning has been prepared comprising:**

- Critical aspects of evidence to be considered
- Resource implications for assessment
- Method of assessment
- Context for assessment
- Underpinning knowledge, skills and attitudes (KSAs). This latter group of KSAs have been identified using the Australian “**Key Competencies**” with a performance level of 1, 2 or 3 being identified for each one. Reviewers of the Draft Standards may see that Key Competencies of one level of performance or another are inherent in almost any function and are generic (with application requirements) across industries and sectors.

Competency Standards for the Function of: Cadastral Index Mapping and Cartography

Statement of Key Purpose of the Function (to be completed)

Competency Standard: This competency standard defines the minimum required knowledge, skills and attitude a person must possess to qualify as a

..... shall be issued when the prescribed units of competencies have been achieved.

Holder of these qualifications shall be able to perform the range of functions of

Terms used in the technology defined as a part of the standard

OPM Orthophoto map

Qualifications: If defined/available

- 1.
- 2
- 3
- 4

Units of Competency within the Function

| Code allocated | Title of Unit of Competency | Salary Grade level and organisational responsibility (executive, managerial, supervisory, technical, or support) |
|-----------------------|--|---|
| CIM0001 | Collect all relevant land records | Salary Grade (SG) 6-8 |
| CIM0002 | Scan all maps into computer | SG 12-16 |
| CIM0003 | Encode all relevant information into the database | SG 12 |
| CIM0004 | Digitize scanned maps using mouse cursor | SG 12/16 |
| CIM0005 | Over-lay digital copies of orthophoto maps with digitized parcels | SG 12/16 |
| CIM0006 | Link database with digitized map | SG 12/16 |
| CIM 0007 | Plot parcel including all cadastral information (manual procedure) | SG12/16 |
| CIM0008 | Prepare CIM base sheet/ layout (manual procedure) | SG 8/16 |
| CIM0009 | Label/ assign all parcel information (manual procedure) | SG 12/16 |
| CIM00010 | Prepare cross-index (manual procedure) | SG 8/16 |

Competency Standards for:

Unit Code: CIM0001. COLLECT ALL RELEVANT LAND RECORDS

Unit Descriptor This unit deals with the competency requirements for...

Elements and Performance Criteria within Unit of Competency

| Elements | Performance Criteria |
|--|---|
| 1. Identify all agencies involved in land matter activities | <ul style="list-style-type: none">▪ List of all participating agencies |
| 2. Request permission for the access of records | <ul style="list-style-type: none">▪ Written communication from LAMP manager |
| 3. Copy/ photocopy records needed for the project | <ul style="list-style-type: none">▪ Clearly visible and complete |
| 4. Determine all collected records if it is sufficient and consistent and complete according to the needs of the project | <ul style="list-style-type: none">▪ Records requirements for database must be specified |

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Competency Standards for:

Unit Code: CIM0002. SCAN ALL MAPS INTO COMPUTER

Unit Descriptor This unit deals with the competency requirements for...

Elements and Performance Criteria within Unit of Competency

| Element | Performance Criteria |
|---|--|
| Check the condition of maps | Map features to be clearly visible Must be true to scale Always select original to a copy Must be a suitable dimension for the scanner Must be reasonable flat and no creases If possible, color background of copies should be white Grid lines must not be distorted |
| Assign at least 4 control to be used in heads-up digitizing | Control points must be clearly marked prior to scanning Coordinates for the control points must be available Where possible, control points must be located at map corners Additional control points can be selected if required |
| Scan the map using available software and hardware | Select appropriate resolution Image captured and stored File reformatting from PCX to TIFF |
| Enhance the scanned map using available software | Image should have no black dots, smudges, or noise speckles Image archived unchecked Image conversion (raster to vector) |
| | |

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Competency Standards for:

**Unit Code: CIM0003. ENCODE ALL RELEVANT INFORMATION INTO
THE
 DATABASE**

Unit Descriptor This unit deals with the competency requirements for...

Elements and Performance Criteria within Unit of Competency

| Element | Performance Criteria |
|---------------------------------|---|
| Check all relevant land records | Land records identified containing necessary information Omissions identified and recorded |
| Encode data | Data entered under agency listing |
| Run cross check for accuracy | Irrelevant land records filtered/ deleted |
| Update land records | New data entered into the cross indexed database Run cross check for accuracy |
| Produce tabulated reports | Data formatted according to user requirements |

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Competency Standards for:

**Unit Code: CIM0004. DIGITIZE SCANNED MAPS USING MOUSE
CURSOR**

Unit Descriptor This unit deals with the competency requirements for...

Elements and Performance Criteria within Unit of Competency

| Element | Performance Criteria |
|---|--|
| Register scanned maps/ image using available software | Control points identified Coordinates of control points converted into decimal degree Image registered with control points |
| Create new tables | Field names entered should match the database |
| Screen-based digitizing the parcels of the scanned maps | All map features vectorized from screen image. Parcels captured seamlessly. |
| Identify and plot control points | Four control points be identified Coordinates of the control points should be in PRS'92 coordinates. Where possible, control points must be located at the lot corners |
| Drag the digitized maps/plans with respect to the plotted control point | Digitized parcels aligned to control points |
| | |
| | |

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Competency Standards for:

Unit Code: CIM0005. OVER-LAY DIGITAL COPIES OF ORTHOPHOTO MAPS WITH DIGITIZED PARCELS

Unit Descriptor This unit deals with the competency requirements for...

Elements and Performance Criteria within Unit of Competency

| Element | Performance Criteria |
|---|---|
| Register Orthophoto maps using available software | Control points identified Coordinates of control points converted into decimal degree Image registered with control points |
| Overlay the map layers to the Orthophoto maps | Digital files conform with the orthophoto maps Overlaid files saved in a workspace for easy access Map lay-out ready for printing |
| | |
| | |

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Competency Standards for:

Unit Code: CIM0006. LINK DATABASE WITH DIGITIZED MAP

Unit Descriptor This unit deals with the competency requirements for...

Elements and Performance Criteria within Unit of Competency

| Element | Performance Criteria |
|--|---|
| Prepare the cross index of the database and the UPI of the digitized parcels | Database information accurate and complete. All digitized parcels have corresponding UPI. UPI's are indexed. |
| Geocoding | Database exported using dbf extension file UPI of the digitized map matched the cross-index database. Linked parcels saved in a different file name |
| | |
| | |

Competency Standards for:

Unit Code: CIM0007. PLOT PARCEL INCLUDING ALL CADASTRAL INFORMATION (MANUAL PROCEDURE)

Unit Descriptor This unit deals with the competency requirements for...

Elements and Performance Criteria within Unit of Competency

| Elements | Performance Criteria |
|---|---|
| 1. Identify scale to be used | <ul style="list-style-type: none"> ▪ Urban areas scale should be 1:500 or 1:1000 ▪ Rural areas scale should be 1:2000 or 1: 4000 depending on number and size of parcels contained in the CIM sheet |
| 2. Reduce or enlarge survey plans into standard scale | <ul style="list-style-type: none"> ▪ Must meet standard scale ▪ All parcels and physical features to be clearly visible ▪ Must be in symmetry to the CIM base dimension |
| 3. Adjust coordinates of survey plans | <ul style="list-style-type: none"> ▪ Plans/maps adjusted to PRS (?) 92 |
| 4. Trace parcels for all physical features | <ul style="list-style-type: none"> ▪ All parcels to be accounted for ▪ All information written legibly ▪ Clear and neat |

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Competency Standards for:

Unit Code: CIM0008. PREPARE CIM BASE LAYOUT (Manual Procedure)

Unit Descriptor This unit deals with the competency requirements for...

Elements and Performance Criteria within Unit of Competency

| Elements | Performance Criteria |
|--|--|
| 1. Prepare the CIM graticule from the available map software | <ul style="list-style-type: none">▪ Appropriate scale selected |
| 2. Label the CIM number and grid coordinates | <ul style="list-style-type: none">▪ Computation to be true and accurate |
| 3. Prepare legend for physical features | <ul style="list-style-type: none">▪ Map information to be identified and shown in the legend |
| 3. Prepare the adjoining CIM sheets number | <ul style="list-style-type: none">▪ Adjoining CIM number to be indicated on the bottom right side of the map |

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Competency Standards for:

Unit Code: CIM0009. LABEL/ASSIGN ALL PARCEL INFORMATION

Unit Descriptor This unit deals with the competency requirements for...

Elements and Performance Criteria within Unit of Competency

| Element | Performance Criteria |
|---|--|
| Assign parcel identifier (PI) in Z pattern, lot number, CIM number, and UPI | Digital file must be adjusted to PRS 92 The reference must be accurate and complete |
| Identify its physical features | Scanned map must be clearly visible for the needed information in labeling |
| | |
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| | |

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Competency Standards for:

Unit Code: CIM0010. PREPARE CROSS-INDEX (Manual Procedure)

Unit Descriptor This unit deals with the competency requirements for...

Elements and Performance Criteria within Unit of Competency

| Element | Performance Criteria |
|--|--|
| List down all the information of the parcels | All parcel information must be accounted |
| Tabulate parcel in numerical order using PI | Parcel listed numerically Parcel number must not |
| Indicate title information | All parcel information must be clearly and correctly written Name claimant, Lot area, location, title number, parcel identifier and remarks must be indicated |
| Cross check with database | Irrelevant/ erroneous information correctly deleted |

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RANGE OF VARIABLES

For each unit of competency in the standard, the 'Range' describes the various contexts and conditions for performance of the unit as well as listing the main items of equipment and other resources required.

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EVIDENCE GUIDE FOR COMPETENCY BASED ASSESSMENT AND IDENTIFICATION OF KEY COMPETENCIES AND LEVELS

| | |
|---|---|
| 1. Critical aspects of evidence to be considered | Quality output including accuracy, sufficiency and completeness of information. Knowledge on hardware and software. Accuracy and consistency of database. Critical analysis of all land records. |
| 2. Resource implications for assessment | Photocopier, vehicle, hardware and relevant mapping software, scanner, plotter, orthophoto maps, satellite images, drafting table, drawing instruments, surveying equipments, operations manual, training manual, sets of land records, maps and plans, inventory forms and consumables |
| 3. Method of assessment | On the job by observation of work in progress and or submission of completed work |
| 4. Context for assessment | Worksite and in other agencies and organizations |
| 5. Underpinning knowledge, skills & attitudes or Key Competencies used in performance of the function | |
| Key competency | Level Basic, Intermediate or Advanced |
| • Collecting, analyzing and organizing ideas and information using a range of sources | Level Advanced |
| • Communicating ideas and information using a variety of media and methods | Level Intermediate to advanced |
| • Planning and organizing activities | Level Advanced |
| • Working with others and in teams to collaborate complex activities | Level Advanced |
| • Using mathematical ideas and techniques to evaluate and adapt as appropriate for task | Level Intermediate to advanced |
| • Solving problems with minimal close supervision | Level Intermediate |
| • Using technology to construct, organize, or operate products or services | Level Intermediate |
| Other Key or Generic Competency - Values and ethics | Level Advanced |
| Other Key or Generic Competency - Occupational health and safety | Level Basic |
| Other Key or Generic Competency - Environmental concerns | Level Basic |

ATTACHMENT 6

CIM Manual

Philippines-Australia Land Administration & Management Project

Republic of the Philippines

PHILIPPINES-AUSTRALIA

LAND ADMINISTRATION

&

MANAGEMENT PROJECT

(PA-LAMP)

PROCEDURE MANUAL

for

URBAN and RURAL

CADASTRAL INDEX MAP PRODUCTION

Registered Copy

**DOCUMENT VERIFICATION
DOCUMENT APPROVAL**

| | |
|-----------------------|--|
| TITLE: | Procedure Manual for Urban and Rural CIM Production and Office Validation |
| GENERAL DESCRIPTION: | Procedure Manual to support the CIM production for validation and management of land records for PA-LAMP for the Philippines Land Administration and Management Project (LAM Project). |
| REFERENCED DOCUMENTS: | |

| | | | | | |
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| SIGN OFFS | ORIGINATOR | NAME | POSITION | SIGNED | DATE |
| | APPROVED | NAME | POSITION | SIGNED | DATE |
| | APPROVED | NAME | POSITION | SIGNED | DATE |

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Procedure Manual for Urban and Rural CIM Production

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1 INTRODUCTION AND OVERVIEW

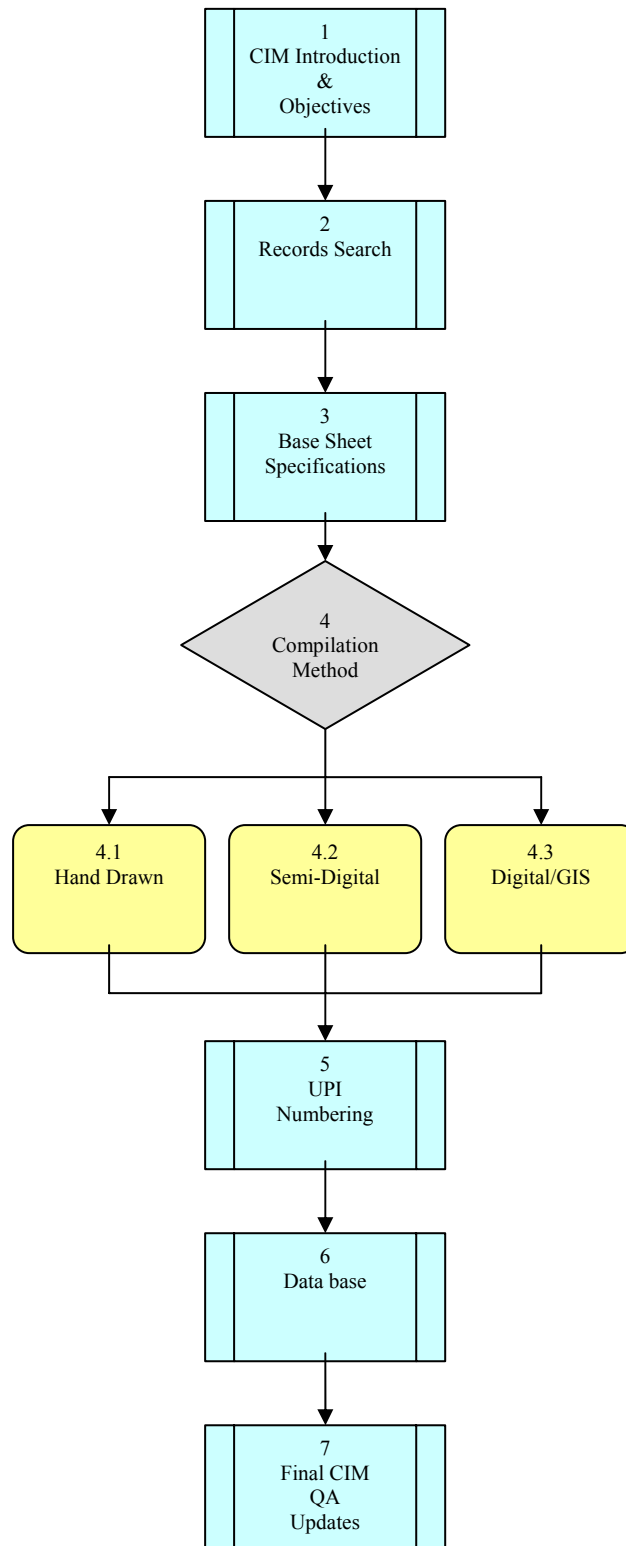
The Cadastral Index Map (CIM) series is the national standard spatial index for the Philippines depicting land parcels as they exist on the ground and projected therein in the Philippines Reference System (PRS-92). It is a graphical representation that can be produced by manual or computer assisted techniques and is capable of being spatially presented in GIS systems.

The CIM will provide a vital management tool for; the improvement and protection of rights to land, eliminate fake titles, and the introduction of an equitable system of land registration and valuation. It should be noted that whilst the CIM is used to manage and control the land records process, it does not replace the existing land records such as Certificate of Title or survey plans.

1.1 Objective of the manual

This manual has been developed to facilitate staff training and to provide procedural guidance for the preparation of standardised CIM's. The manual will be quality controlled and maintained on a regular basis with the current version being made available to all registered employees.

1.2 Production Flowchart



2 RECORDS SEARCH

As previously stated, the CIM will be used as a tool for the management of information pertaining to all land parcels records held by the various agencies. This will allow cross checking of information to ensure the parcel hasn't been issued duplicate or fraudulent titles. It will also allow for the access of information and the updating of existing information in the one location by the various agencies when a transaction occurs on a parcel of land, ie in the One Stop Shop (OSS).

The CIM will provide the mechanism through the CrossIndex database for the validation and maintenance of vital land records. Therefore before commencing the compilation of a CIM, an agency records search must be conducted.

This process will:

- Ensure all land parcels are accounted for;
- Ensure that all existing records from all agencies are included in the process;
- Aid reconstitution of damaged or missing records;
- Identify conflicts or anomalies for future investigation;
- Provide a mechanism for maintenance of the records system.

2.1 Transaction File Notification to ROD, DENR, LRA BIR, and LGU

Prior to commencement of the records search, all agencies, from where records will be required will be provided with an explanation of the CIM requirements.

The Project Manager will provide each agency with a letter and diagram setting out the barangay to be searched.

From the beginning of the records search, each agency will need to maintain a file of all transactions occurring during the search period, so that any changes that occur can be identified and included in the final CIM. This file should be maintained and any further actions on the parcel should be noted so that the CIM and the Cross Index can be updated within the OSS.

The Project CIM Manager/Supervisor will be required to regularly check that the transaction file is being maintained by all agencies, and to include all new transactions in the CIM work process.

2.2 Storage of Plans and Records

Copies of survey plans and titles obtained from LRA, DENR, CENRO, LMB, Assessor's Office and ROD need to be stored by barangay in the appropriate storage cabinet and numbered folders.

A separate folder should be maintained for the survey plans and records, for each CIM.

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Safe and adequate storage should be provided for all records to ensure the records are not lost or damaged.

It is suggested that all plans and maps be stored either vertically or horizontally in plan storage cabinets and not folded or rolled. All survey records and lot data computation sheets collected in the rural situation should be kept in a safe storage unit.

2.3 Data Sources

The records of ROD, LRA, DENR, LMB, BIR, and the Assessor's Office (LGU) will need to be searched. Listed below are the major items that are required.

| Data Sources | Survey Plan Copy | Survey Plan No. | TCT Copy | TCT No. | Provisional Title | Owner's Name | Lot Area | Decree No. | Tax Declaration No./PVPIN | Tax Identification No. |
|--------------|------------------|-----------------|----------|---------|-------------------|--------------|----------|------------|---------------------------|------------------------|
| LRA | X | X | | | | | X | X | | |
| DENR | X | X | | | | | X | | | |
| LMB | X | X | | | | | X | | | |
| ASSESSOR | | X | | X | | X | X | | X | |
| ROD | | X | X | X | X | X | X | | | |
| OWNER'S COPY | | X | X | X | X | X | X | | X | |
| BIR | | | | X | | X | | | | X |

2.3.1 Assessor's Office Tax Map Records

The Tax Maps are to be ordered from the Assessor's Office. After the maps have been retrieved, the CIM Manager/Supervisors' file should be amended to indicate which maps have been retrieved. All maps should then be stored correctly for future use.

2.3.2 Search DENR, LRA and CENRO Records

The search should be on a barangay basis, these should be either scanned or a white print made. The following information should be obtained:

- *Subdivision survey plans with Technical Descriptions (azimuth and distance annotation) either as a textual table or on an annotated plan drawing;*
- *Subdivision survey plans without Technical Descriptions, which may have individual lot description, either as textual table or annotated plan drawing;*
- *Consolidated plans of complex subdivision;*
- *Old survey plans from Land Management Bureau (LMB) that are not available from DENR;*

- *Plans of original surveys of old areas, which may have no other survey (eg Payatas and Piedad estates);*
- *Application No., Patent No., Contested/uncontested, (CENRO);*
- *Decree No. (LRA);*
- *All approved survey plans.*

2.3.3 Search of ROD Records

The search of ROD for the Certificate of Title (TCT) can be accessed as follows:

- *Tax Maps (from the assessors office) show the TCT number of the original lot before subdivision;*
- *TCT's are stored in ROD by the book number and page within the book (not by barangay or district) this is found on the top right-hand corner of the TCT;*
- *The front page of TCT contains reference to the previous TCT that it was created from. Where a TCT has been cancelled it will have the new TCT number created endorsed on the back of the TCT;*
- *Provisional Titles over land with incomplete reconstituted titles;*
- *TCT show, survey plan number, lot number, owner, area and textual technical description;*
- *All the above should be available from the BOO records database (urban situations).*

Note: See Procedures Manual for Office Validation

2.3.4 Survey Plans

It is imperative that all plans that have been retrieved from the various agencies be used where they cancel an older survey. It is suggested that each survey plan be placed and attached to the plan that it superseded.

If this is adhered to then there should be no plans that are missed out when compiling the CIM.

In urban areas, all survey plans are recorded in the survey plan database. The following information is found in the SPIS:

- Survey plan number
- Number of sheets of the survey plan
- Number of copies of the survey plan
- Total number of days the plan was approved
- Name of claimant
- Name of surveyor/geodetic engineer
- Name of the division chief that approved the survey plan

- Name of the Director (NENR) or administrator (LRA) of where the survey plan was approved
- The annotation/notes on the bottom left of the plan
- Mother lot (lot numbers, block numbers and survey plan number of the lot consolidated/subdivided)
- TCT number, date registered and OCT number of the mother lot
- CIM number where the parcel is projected

In urban areas, all survey plans are scanned for visual reference and are stored in a separate folder within the computer server. In PIO1, all cadastral maps are scanned and stored.

2.3.5 Survey Control

Survey control is one of the most important requirements in the production of CIM. Without good control it is impossible to place the CIM on its absolute position upon the earth.

Control is required to establish position of all data that is held within any CIM, this can be done by a number of methods and is crucial in all aspects of CIM production from manual methods to the various automated methods.

Survey control may be available in many forms, ie existing traverses connected to PRS92, GPS established stations, or rectified orthophoto maps. All these may be used for control in the constraint and construction of CIM production.

Where existing surveys traverses appear on PRS92, these should be plotted in the CIM and any connections made to cadastral corners also plotted. From these connections the survey plans can then be oriented and scaled to fit the control as plotted.

In certain instances GPS maybe used to obtain control for the CIM orientation and population. In these circumstances identified cadastral corners are selected and position captured by GPS. These will be used to orientate and scale individual subdivisions.

Both aerial photography and satellite imagery can be rectified, ie in displacement, distortion and scale, thus producing a true-scaled image map of the earths surface. Each image map has the same projection, coverage and numbering convention as the CIM system. The image maps can therefore be used as control and provide a means to locate the planimetric information on the CIM .

2.4 Data entry for Cross-Index Database

Where possible all data from the various agencies needs to be collected, collated and entered into the cross-index database. It is essential that the data entry is verified, ie once all the data is entered for a particular day, or period of time, that data should be printed or matching routines run, so that the integrity of the data within the database is maintained. Remember that incorrect data will produce incorrect results when reports are made for the various field or office activities. Also incorrect data can make identification of duplicate or fraudulent title difficult, which is one of the main areas of concern.

3 CIM BASE SHEET SPECIFICATIONS

The following specifications remain constant regardless of the CIM compilation methodology utilised.

3.1 Scale

The base cadastral map within the Philippines is 1:4000 and depending on the location (rural or urban) and density of parcels, the scale can be varied as follows:

- *1:4000, the map sheet will be 1' (one minute) of arc of latitude and longitude.*
- *1:2000, the map sheet will be 30" (thirty seconds) of arc of latitude and longitude.*
- *1:1000, the map sheet will be 15" (fifteen seconds) of arc of latitude and longitude.*
- *1:500, the map sheet will be 7.5" (seven and a half seconds) of arc of latitude and longitude.*

In rural areas the scale of 1:4000 will be predominantly used whereas in urban areas 1:1000 and 1:500 are used where the area is too densely populated to allow the base scale to depict the lots and their annotations clearly.

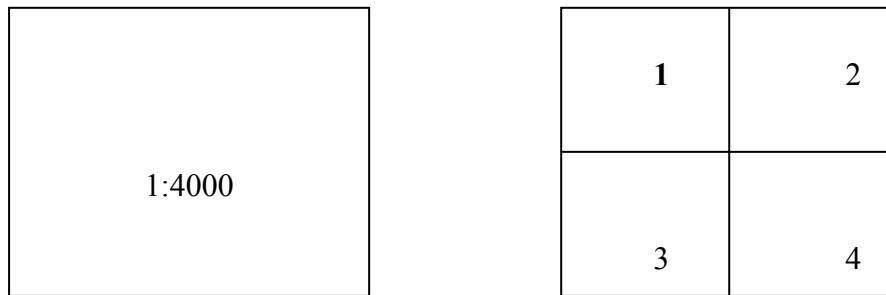
3.2 Numbering

Basically the CIM will be numbered by the geographical coordinates of the bottom left corner of the base 1:4000 map sheet and then broken down into 1:2000, 1:1000 and 1:500 sheet numbers.

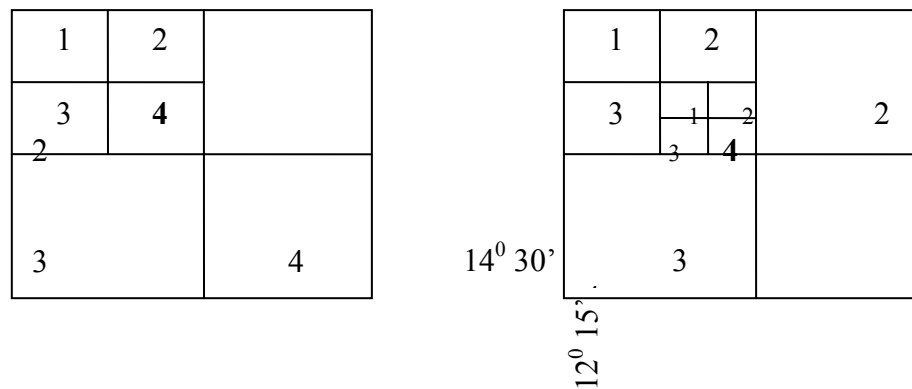
All CIM will have a unique number, in this manner a CIM location and scale can be identified by the CIM number.

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A standard 1:4000 map sheet can be broken down into 4 x 1:2000 map sheets.



The 1:2000 map sheets can be broken down into 4 x 1:1000 map sheets. These can be further broken down into 4 x 1:500 map sheets.



The bottom left corner of the 1:4000 map sheet is defined by Latitude eg 14°30' and Longitude of 121°15'.

The CIM numbering can now be the degrees and minutes of that sheet corner. Considering that the Philippines longitude extends for only 5° the digit for 100 degrees longitude can be eliminated, leaving 4 significant numbers that can define the corner of the 1:4000 CIM, ie 14302115.

To enable the 1:2000 sheet numbering ie sheet 1 in this case an extra digit is required, 143021151 indicates this sheet. To enable the 1:1000 map sheet to be shown an extra digit is added ie 1430211514. To enable the 1:500 map sheet to be shown an extra digit is shown ie 14302115144.

Using the example shown above, if only the 1:4000 sheet is referred to then the CIM number would be 14302115000, if the 1:2000 sheet is referred to the CIM number would be 14302115100. If the 1:1000 sheet were referred to the CIM number would be 14302115140. If the 1:500 sheet were referred to the CIM number would be 14302115144.

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This then becomes a unique CIM numbering system and by this number any sheet can be located geographically with ease.

The CIM sheets will be between 676 and 704 mm wide (depending on geographical location) and 581 mm high. The CIM will be divided into grid intervals and this will be dependent on the scale of the CIM. See the "PALAMP CIM SHEET CORNERS" software which will give correct graticule sizes.

3.4 Grid

- *1:4000 CIM will have a grid interval of 500 metres, ie 12.5 cm at map scale;*
- *1:2000 CIM will have a grid interval of 200 metres ie 10cm at map scale;*
- *1:1000 CIM will have a grid interval of 100 metres ie 10cm at map scale;*
- *1:500 CIM will have a grid interval of 50 metres ie 10cm at map scale;*
- *The grid starting position will be determined by PTM coordinates of the bottom left corner of the graticule. For instance if the coordinates of the graticule are North 1622133.713 and East 399465.524 then at the various scale the first grid in both North and East are:*
 - *1:4000, 366.287m towards the top of the CIM for North and 34.476m to the right for East;*
 - *1:2000, 66.287m towards the top of the CIM for North and 134.476m to the right for East;*
 - *1:1000, 66.287m towards the top of the CIM for North and 34.476m to the right for East;*
 - *1:500, 16.287m towards the top of the CIM for North and 34.476m to the right for East;*

The Latitude and Longitude will only appear on the graticule. Grid coordinates will not appear on the graticule.

3.5 Drafting Specification Standard

Production of the CIM will be according to the drafting specification standard set out below:

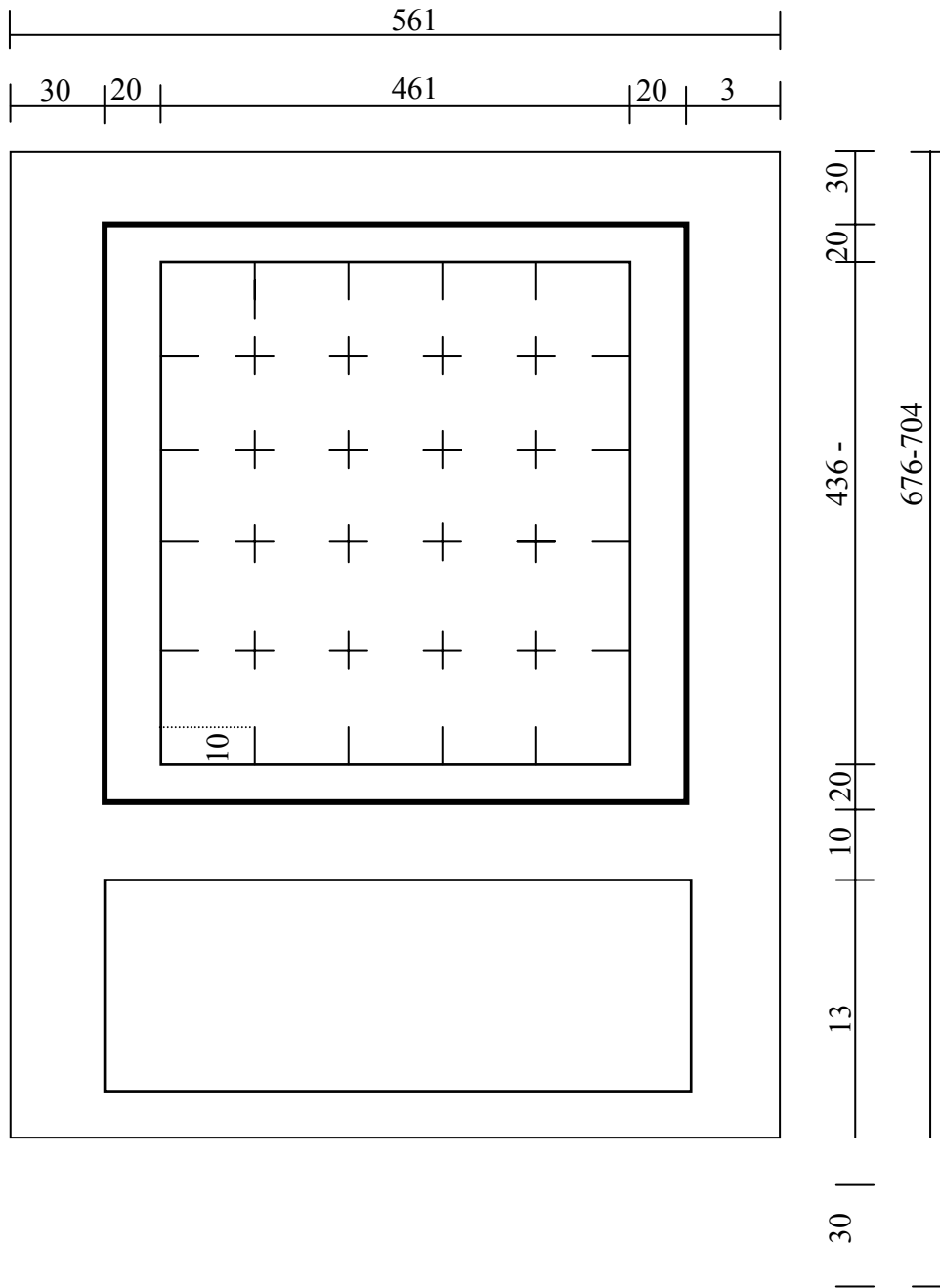
3.5.1 Drafting Film

The drafting film to be used for the CIM sheet shall be made of durable material being quality drafting film of a type and standard as below:

- *Type: single matt;*
- *Thickness: 0.03mm.*

3.5.2 Sheet Dimensions






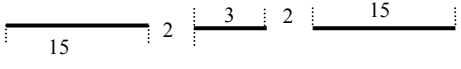
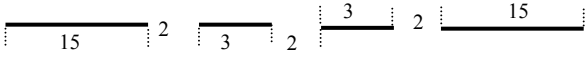
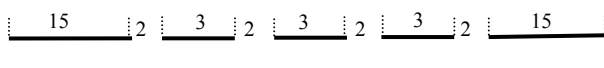
Dimensions are in millimetres



3.5.3 Standard of Detail & Line Work

All detail on CIM must be in waterproof ink of a type recommended by the manufacturer of the drafting material. All detail lines, numbers, letters, symbols and decimal points must be legible and not defaced. Erasures must be made by a method that does not damage the surface of the drafting material.

The following table shows the standard of detail to be assigned for the cadastral maps:

| Items | Symbol | Pen Number | | | Stencil Size |
|---|--|------------|-----|-----|--------------|
| | | 0.2 | 0.3 | 0.5 | |
| Outer Edge of Cadastral Index Map Frame |  | | | ✓ | |
| Inner Edge of Cadastral Index Map Frame |  | ✓ | | | |
| Grid Line |  | ✓ | | | |
| Coordinates Values | 1 622 000, 399 000, 14° | ✓ | | | |
| Boundary Line |  | ✓ | | | |
| Preliminary Land Parcel Number |  | ✓ | | | CL80 |
| Final Land Parcel Number | 1 | | ✓ | | |
| Name of adjacent Road, River or Lake | Emerald Ave | ✓ | | | |
| Barangay Boundary (mm) |  | | | ✓ | |
| Municipality/District Boundary (mm) |  | | | ✓ | |
| Province Boundary (mm) |  | | | ✓ | |

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The following table shows the standard of detail to be assigned for the CIM:

| Item | Preliminary Cadastral Index Map | Final Cadastral Index Map |
|---|--|----------------------------------|
| 1. Boundary Line | Yes | Yes |
| 2. Survey Plan Number | Yes | No |
| 3. Lot and Block Number | Yes | No |
| 4. Parcel Number Identifier | Yes | Yes |
| 5. Name of adjacent road, river or lake | Yes | Yes |
| 6. Barangay Boundary | Yes | Yes |
| 7. Municipality/City Boundary | Yes | Yes |
| 8. Province Boundary | Yes | Yes |
| 9. Region Boundary | Yes | Yes |
| 10. Titled (PIO 1) | Yes | No |
| 11. Not Titled (PIO 1) | Yes | No |
| 12. Land Classification | Yes | No |
| 13. Land Use | Yes | No |

Note: The preliminary and final CIM, when using a orthophoto map will consist of the orthophoto map and the overlay sheet.

By the use of the software “PA-LAMP CIM Sheet Corners” the CIM sheet corners in both Geographic and Grid, plus the CIM sheet number and size will automatically be produced.

A sheet template can be modified in either MapInfo or AutoCAD. A grid in PTM can then be produced. The sheet corner coordinates in both systems, and the CIM sheet number can be added, along with the legend information.

The legend on a Final CIM will contain:

- *CIM Map Sheet Number at both top and bottom of the legend box;*
- *Map Scale;*
- *Scale Bar;*
- *North Point;*
- *Projection;*
- *Datum;*
- *Index to Adjoining CIM diagram;*
- *Barangay boundaries;*

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- *Municipality/City boundaries;*
- *Regional boundaries;*
- *Provincial boundaries;*
- *Certification ie. Officers, Signatures and Dates;*
- *Administrative Areas Diagram (optional).*

The Legend for a Preliminary CIM will contain:

- *All the above as in the Final CIM and;*
- *Land Use codes;*
- *Land Classification codes;*
- *Preliminary CIM lot numbers (UPI).*

Note: These processes may need to be performed using manual drafting if the AutoCAD and/or MapInfo process has not been developed.

The CIM supervisor should carry out Quality Assurance checks on the completed CIM base.

3.5.4 Edge Matching with Adjoining Map

Edge matching is required between adjoining sheets. The match is achieved using the graticule to align the adjoining sheets and then tracing through the boundary of the lots that cross the sheet edge.

A quality control check on the edge matching should be carried out prior to inking or plotting.

If the adjoining map is being compiled simultaneously, work in cooperation with the other person to achieve acceptable edge matching.

If the data is being collated within a computer environment the above is not required due to the software enabling a seamless map to be made.

Note: Do not close the polygon as this may cause confusion in assigning PI to the CIM.

4 CIM COMPILATION PROCEDURES

The CIM is ready to be compiled when the records of the DENR, LRA, LMB, ROD, CENRO, DAR, National Irrigation Authority (NIA), Public Works and Highways (DPWH) and Tax Maps have been searched and copies of plans available. Not all of these agencies maybe involved, it is dependent on whether the CIM is rural or urban.

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All NIA plans for canals ie man made constructed waterways and DPWH plans should be collected for these may also depict changes in the cadastre that are not indicated on the original survey plans. These should be plotted and investigated where they overlap the cadastre that has already been captured.

Note that all plans should be approved by either DENR or LRA. Unapproved information however, may be held within a separate layer.

If available the orthophoto map can be used as control for the base map.

The CIM Supervisor should direct the cartographer to begin the CIM compilation. The Supervisor will note CIM number, start date and cartographer name in Supervisor's CIM Production Control Register. At the completion of every stage of the CIM production the CIM Control Register is required to be completed. It is preferable that only one cartographer work on one CIM.

4.1 Manual Drafting

Hand or manual drafting is the most basic way of the producing a CIM. In the first instances this is how the CIM will be produced until supplemented by the introduction of technology and training.

The drafting equipment mentioned in the list below is the standard equipment to be used for construction of a CIM.

| No | Basic Equipment Needed |
|-----|---|
| 1. | Technical pencil 0.5 (2H) |
| 2. | Eraser (ink and pencil) |
| 3. | Technical pen 0.2, 0.3 & 0.5 |
| 4. | Waterproof ink |
| 5. | Set square 45° & 60°/30° |
| 6. | Scale ruler (1:500, 1:1000, 1:2000 & 1:4000) |
| 7. | Scriber |
| 8. | Leroy lettering set (CL 290, 240, 175, 140, 100, 80 & 60) |
| 9. | Plastic or metal drafting ruler 1 metre |
| 10. | Minimum of 2 Weights (lead encased in leather either pellet or solid) |

The steps that need following are:

- *Undertake records search*
- *Prepare base sheet as per specifications (the map graticule and grid can be produced using AutoCAD or MapInfo if these methods are available)*
- *Plot all available survey control*
- *If orthophoto maps are available, they can be used as control to position the survey plans and or cadastral maps.*
- *Plot the mother lots of survey plans*

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- *By referring to the Assessor's records, survey plans within the mother lot can be identified.*
- *Each of the survey plans are then traced within the mother lot.*
- *In cases wherein there are gaps on the CIM, the tax map of the Assessor's record can be used to fill the gaps.*
- *Add lot and block numbers*
- *Assign parcel identifiers*
- *Update the cross-index database*
- *Apply quality assurance procedures to the processes*

Note: the use of photocopier to scale the survey plans is not advisable as the result may be distorted. It is therefore advisable to plot the parcel using the technical description when rescaling is required.

4.2 Semi-Digitised

If there is survey control, AutoCAD, MapInfo and a digitising table/scanner available, then semi-digital or digital method of CIM production can be employed. The semi-digital is a hybrid procedure that involves digitising the sheet lifework and manually adding all numbers and names. The steps that need following are:

- *Undertake records search*
- *Prepare base sheet as per specifications. The map graticule and grid can be produced using AutoCAD or MapInfo.*
- *Plot all available survey control*
- *If orthophoto maps are available, they can be used as control to position the survey plans.*
- *Plot the external boundaries of the first major subdivisions using the technical descriptions found on the plans, into AutoCAD or MapInfo using the control supplied. If BLLM connections are used, use only one connection and then plot the other boundaries from their common points. This will alleviate any overlaps or gaps that are produced by the calculated connections;*
- *Digitise the minor subdivisions or surveyed parcels using the external plotted boundaries from above as control, ie AutoCAD only, this is done by using the calibration method.*
- *Plot out sheets*
- *Add lot and block numbers by manual method*
- *Assign PI numbers*
- *Update the cross-index database*
- *Apply quality assurance procedures to the processes*

4.3 Digitised/GIS

If there is survey control, CAD/GIS software and a digitising table/scanner available, then semi-digital or digital method of CIM production can be employed.

Note that CAD software uses a plane grid system while GIS software can either use a plane or spherical system. A requirement is that all CIM be on the PRS92 and if a seamless map is required then it is better to use a spherical method than a plane method. This has other advantages and that is it can be used as the base for a GIS. The steps that need following are:

- *Undertake records search*
- *Prepare base sheet as per specifications. The map graticule and grid can be produced using CAD/GIS software.*
- *Import all available survey control*
- *Scan all relevant plans and cadastral maps*
- *Import scanned survey images into CAD/GIS software and register images.*
- *Heads-up (on screen) digitising from register images or cogo entry of external boundaries of the mother lot using the technical descriptions found on the plans, into CAD/GIS using the control supplied. If control points or location monuments are used, use only one connection and then plot the other boundaries from their common points. This will alleviate any overlaps or gaps that are produced by the calculated connections;*
- *Digitise internal subdivision lots or surveyed parcels using the mother lot boundaries as control.*
- *Label all parcels with PI and CIM numbers and barangay location*
- *Update the cross-index database*
- *Apply quality assurance procedures to the processes*

4.3.1 Orthophoto Maps

An Orthophoto is an image in the form of photograph having the geometric properties of a map, wherein the image displacement caused by source image projection; camera tilt and relief of terrain are removed.

As the CIM production techniques become more advanced, the potential use and benefits of Orthophoto maps will be become evident. If orthophoto maps are available, the digital image can be registered and set as an additional layer in the GIS software where heads-up digitising can be done.

Orthophotos can also assist the processes of:

- For office planning and validation
- Survey verification and validation
- Adjustment to PRS92 coordinates

5 LOT NUMBERING

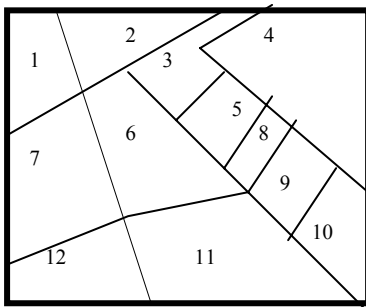
Every parcel of land will be shown on the CIM and given a Parcel Identifier (PI). The PI is a unique number that is not repeated within the CIM where that parcel occurs. Where subdivisions have occurred but are unregistered, they are shown on a different layer until registered. A Cross Index Database (CrossIndex) will maintain an up to date reference of each parcel of land on any CIM, with respect to all the relevant information held by other participating agencies dealing with that parcel.

5.1 Assigning of PI Numbers

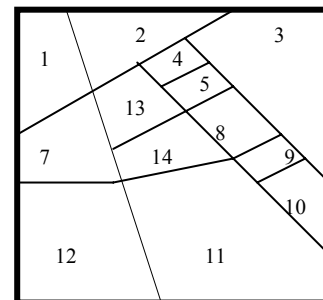
Lots will be numbered starting from 1 consecutively from the top left of the CIM to the right and then in the reverse direction (ie. a Z pattern). PI numbering will not be duplicated within any one CIM.

The last or highest PI can be obtained from the database by using a simple query, but if required the last number used could be indicated by pencil in the bottom right hand corner of the CIM.

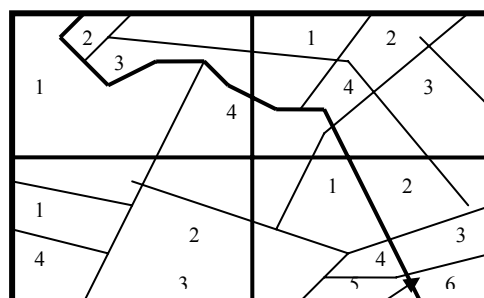
CIM Lot Numbering Convention



CIM Lot



CIM Lot Numbering Convention Across CIM Edge



Barangay or Municipal Boundary

5.2 Rules for assigning PI's

- *Each lot is annotated only once;*
- *Each CIM starts with the PI Number 1;*
- *If a lot crosses the graticule into more than one CIM sheet, place the PI on the larger portion of the lot in only ONE of the CIM sheets;*
- *Parcels are numbered across the entire CIM. Do not stop at barangay or other administrative boundaries;*
- *During CIM updating, any lot that is altered by either subdivision or consolidation will have the originally assigned PI retired, (not deleted) and new PI assigned following on from last PI assigned on that CIM. The previous last number assigned to the CIM can be determined from the CrossIndex. The original PI should not be removed from the database but will remain for historical purposes for a search for previous transactions.*

6 CROSSINDEX DATABASE

Once the PI's have been added to the CIM, they will need to be entered into the CrossIndex database so that all the records pertaining to that lot are cross referenced.

In urban situations, use the survey plan, block and lot number as the reference to find the corresponding record in the CrossIndex database, add the CIM number and PI number ie UPI to the database.

In rural situations, use the survey plan (cadastral map) and parcel number as the reference to find the corresponding record in the CrossIndex database, add the CIM number and PI number ie UPI to the database.

Any parcels that cannot be found in the CrossIndex database should be flagged for further office investigation or field checks. This is done by the software by adding to a table for checking ie one that indicates what is required to be followed up to ensure that the database and all records are referenced and verified.

A check should be made in the database by running the report "Duplicate Titles" (this should be automated and done in the background on every piece of data entered). A search will be done in the CrossIndex database for any lots that have more than one title; or more than one owner, these should be flagged for further investigation.

Any parcels that occur in the CrossIndex more than once such as repeated TCT's and survey plan lot numbers should be marked for further office investigation or field checks. This may be due to duplicate entries or incorrect data having been entered.

6.1 Updaters / Transactions Occurring During CIM Compilation

At the commencement of the searching process, copies of the barangay boundaries should have been given to the DENR, LRA ROD, NIA and DPWH, with a request that copies of all new survey plans and titles that are approved flagged and copies forwarded. This will enable the CIM to be updated, and include all new transactions before handing the CIM over to the OSS.

7 QUALITY ASSURANCE

Checks should be undertaken to ensure the completeness, reliability and quality of the CIM. These checks should be on a regular basis, ie when particular achievements have been reached during the compilation of the CIM. The QA should be done by a supervising or experienced operator.

At the completion of every stage of the CIM production the CIM Control Register is required to be completed, this will require a blue/white print of the CIM at every stage, see **Appendix 1**. **Appendix 2** shows the check sheets to be used and what is required at each QA check.

The approach will be by highlighting the checked data on the blue/white print. Any information which is found in error will be highlighted in a different colour. On

completion of the QA, the person who performed the QA will sign the copy of the CIM and date it. The CIM Register will then be updated. This sheet will accompany the CIM until it is handed over to Office & Field Validation, and the handover to ROD.

If there are any corrections to be made from the QA process, the updating will be checked, ie all the corrections attended to will be rechecked.

The items that are required to be checked are:

- Completeness and accuracy of searching;
- Check that the grid, legend, graticule and CIM number is correct;
- Checks of control used, reference plans and indexes used;
- Plot checks for accuracy over parts of the CIM;
- Completeness and accuracy of lot numbering;
- Quality of drawing and lettering;
- Completion of edge joins, legends;
- Use of AutoCAD files and digital outputs.

7.1 CIM Production Control

The Manager and Supervising Cartographer will be responsible for managing the production flow process. This will include:

- Planning the CIM workflow programs consistent with resources, budgets and required output plans;
- Planning, reviewing and requesting additional control;
- Ordering, logging receipt and storage of orthophoto maps;
- Assigning staff to record searching in a timely manner;
- Monitoring records collection rates and quality assurance;
- Assigning staff to CIM compilation so that the CIM can be completed in a timely manner;
- Monitoring compilation rates and assuring quality;
- Planning, coordinating and implementing the hand over of the CIM into the OSS and or the office and field validation (urban).

SHEET PREPARATION CHECK

This particular QA checks the CIM after the sheet preparation stage. It is suggested that the CIM sheet corner calculations is redone unless a copy of the original has been printed and attached to the CIM folder. Listed below are the items to be checked:

- Is the search complete and have all the plans been identified?
- Have all the survey plans been collated and the latest plans identified?
- Is the CIM number correct?
- Is the grid plotted correctly?
- Are the grid values correct?
- Are the graticule values correct?
- Is the legend correct?
- Is the lettering and drafting neat?
- Has the CIM Register (database) been filled out?

Comments:

Date:

PARCEL PLOTTING CHECK

This particular QA checks the CIM after the plotting of parcels and inserting of their lot numbers. Listed below are the items to be checked:

- Have all the plans been plotted correctly?
- Have all the Road Lots been identified?
- Are the adjoining sheets matched?
- Are all the plan lot numbers correct?
- Are all the road lot numbers correct?
- Is the lettering and drafting neat?
- Has the CIM Register (database) been filled out?

Comments:

Date: _____

UPI CHECK

This particular QA checks the CIM after the allotting of the UPI. Listed below are the items to be checked:

- Is the numbering consecutive?
- Have all lots been numbered?
- Is the numbering correct at the sheet edges?
- Are there any lots numbered on other CIM?
- Are all the road lot numbers correct?
- Is the lettering and drafting neat?
- Is the UPI noted on the bottom right hand corner of the CIM in pencil?
- Has the CIM Register (database) been filled out?

Comments:

Date: _____

PRELIMINARY CIM COMPLETED

This particular QA check is performed when the preliminary CIM is completed. Listed below are the items to be checked:

- Are all street and roads named correct?
- Are all the creek and other water features naming correct?
- Is the CIM suitable for either forwarding to Office Validation or for the final CIM preparation?
- Is the lettering and drafting neat?
- Has the CIM Register (database) been filled out?

Comments:

Date: _____

UPDATE AFTER OFFICE VALIDATION

This particular QA checks the CIM after any updating has occurred after Office Validation. Listed below are the items to be checked:

- Have the new lots been drawn correctly?
- Have all lots been numbered correctly?
- Have the new UPI started from the last used UPI?
- Are all the road lot numbers correct?
- Is the lettering and drafting neat?
- Is the UPI noted on the bottom right hand corner of the CIM in pencil?
- Has the CIM Register (database) been filled out?

Comments:

Date: _____

UPDATE AFTER FIELD VALIDATION

This particular QA checks the CIM after any updating has occurred after Office Validation. Listed below are the items to be checked:

- Have the new lots been drawn correctly?
- Have all lots been numbered correctly?
- Have the new UPI started from the last used UPI?
- Are all the road lot numbers correct?
- Is the lettering and drafting neat?
- Is the UPI noted on the bottom right hand corner of the CIM in pencil?
- Has the CIM Register (database) been filled out?

Comments:

Date:

FINAL CIM COMPLETED

This particular QA checks the CIM after the completion of the final CIM. Listed below are the items to be checked:

- Is the CIM number correct?
- Is the grid plotted correctly?
- Are the grid values correct?
- Are the graticule values correct?
- The legend correct?
- Have all the plans been plotted correctly?
- Have all the Road Lots been identified?
- Are the adjoining sheets matched?
- Are all the plan lot numbers correct?
- Are all the road lot numbers correct?
- Is the numbering consecutive?
- Have all lots been numbered?
- Is the numbering correct at the sheet edges?
- Are there any lots numbered on other CIM?
- Are all the road lot numbers correct?
- Are all street and roads named correct?
- Are all the creek and other water features naming correct?
- Is the CIM suitable for either forwarding to Office Validation or for the final CIM preparation?
- Is the lettering and drafting neat?
- Has the CIM Register (database) been filled out?
- Is the CIM suitable for forwarding to ROD?

Comments:

Date:

Appendix 2 CIM CONTROL REGISTER

The CIM Control Register should be completed after each phase of CIM compilation:

frmCIMRegister

LAT LONG SHEET
DDMMDDMMSSS

CIM CONTROL REGISTER

CIM Number Cartographer Method Source

Sheet Preperation Started Completed QA Name Date

Parcel Drafting Started Completed QA Name Date

UPI Started Completed QA Name Date Last UPI

Preliminary CIM Completed Completed QA Name Date

Final CIM Preparation Started Completed QA Name Date

Handover to Office Validation Date

Update CIM after Office Validation Started Completed QA Name Date Last UPI

Handover to Field Validation Date

Update CIM after Field Validation Started Completed QA Name Date Last UPI

Final CIM Completed Date

Handover to ROD Date

Find Record Save Record Exit

Record: 1 of 1

1.0 Summary of Unit Costs (As at 27 May 2004)

| Titling Activities (average per lot) | Costs/lot Conventional Survey | Costs/lot Orthophoto* | Costs/lot GPS |
|--|----------------------------------|----------------------------------|-------------------------------|
| Geodetic Control | P145 | P24 | P80 |
| CIM | P19 | P19 | P19 |
| Database | P17 | P17 | P17 |
| CRS | P376 | P376 | P376 |
| Orthophoto Map Production from Aerial Photos or Satellite (incl. map control) | 0 | P234 | 0 |
| SNS and Political Boundaries Research Mobilisation Initial Pulong-Pulong Reconnaissance Sketching SNS Monumenting Forest Boundaries Political bdry. Marking Gov't Lands Distribution of SNS Ident CARP | P602 | P602 | P602 |
| Lot Survey , including: Project control Lot survey Preparation/Office work Final Pulong-Pulong Compilation/Editing Submit Returns Mobilisation Correction survey | P936 | 0 | P283 |
| Additional Survey Inputs Field validation Field verification | P28 P77 | P6 P30 | P28 P44 |
| Title Issuance Adjudication CENRO PENRO RED (Other cost to be determined: acceptance of application conduct of final investigation processing of application) | P253 P124 P15 | P190 P124 P15 | P190 P124 P15 |
| Registration | P309 | P309 | P309 |
| Delivery of Title | P915 | P915 | P915 |
| Records Management (Costs to be determined) | | | |
| TOTAL | P3,816 US\$67 | P2,861 US\$50.5 | P3002 US\$53 |

*OPM costs assume all lot corners are readily identifiable (0-25% canopy)

Footnotes: The participation rate in the title process is assumed to be 100%
 Lot surveys by GPS are using Differential Code
 Field verification costs have been estimated at 5% of lot survey, SNS and monumentation costs
 Office overheads are a percentage of Base Camp costs and survey management costs
 (Estimated at 10% per total lot cost, e.g. P380, P286 and P300 to be confirmed)

2.0 Costing Analysis

1. As of December 2002, from a total of 1,496 municipalities, there were 827 with approved cadastral survey, 321 in-progress, 280 partially surveyed, 65 unsurveyed and 3 are abandoned. The municipalities and cities with approved cadastral surveys covers 4,487,311 lots with a total area of 17,848,035 hectares, roughly 60% of the total area of the country.
2. In consideration of an approximate total of 17.3 million parcels, 4.5 million having approved surveys and approximately the same number having partial surveys, an estimation of 10 million parcels requiring identification, validation and or titling over the next 15-20 years of LAMP will be adopted for analysis purposes.
3. Of the 10 million parcels, it is assumed that 50% of these will have some form of cadastral survey content with only 50% of the remaining targeted parcels being suitable for titling by orthophoto methodology (ie. 25% of the total).
4. For the piloted Brgy's, the number of lots successfully processed was used for calculation purposes.
5. Figures provided were exclusive of fixed asset, management and most recurrent operational overheads.
6. Cost for orthophoto maps are based solely on NAMRIA quotations and may not reflect commercial reality.
7. Average number of lots per CIM = 118.

Deduction (based on sample canopy cover of Leyte project area only), for 10 Million Land Parcels:

| | | |
|--------------|-------------------------------|-----------------|
| Conventional | 100% @ US\$67 | = \$670 million |
| Orthophoto | 75% @ US\$67 + 25% @ US\$50.5 | = \$629 million |
| GPS | 75% @ US\$67 + 25% @ US\$53 | = \$635 million |

The mix of small open rice land areas surrounded by coco/banana crops throughout rural Leyte, combined with the existence of previous cadastral surveys, dramatically reduces to viability of using the orthophoto graphical approach. Whilst the internal rice paddy levies are easily identifiable, the lot corners adjoining or contained within the coco/banana areas are difficult to accurately identify by OPM techniques. Similarly, the use of GPS is consistent with the use of imagery in that it is only suitable for areas of < 50% canopy coverage.

Whilst it is noted that the monument placement and SNS procedures provide the land holders with an acceptable comfort level, it is known that monuments have a very short survival rate in rural Philippines. This raises the possibility of having to use a combination of techniques over this type of terrain in order to ensure that sufficient accuracy is obtained to enable acceptable reestablishment tolerances; an option that should be avoided if at all possible, from a practical and operational perspective.

PART C – Cost Analysis

As orthophotos represent a significant project overhead and require long term planning, site selection becomes a critical activity in procurement process. It is therefore recommended that the provinces of the Philippines should be examined to determine those locations that have extensive areas of open to < 50% canopy cover. A review of archival landsat imagery may assist in providing initial site locations that are suitable for the graphical approach. Additionally, those areas should be examined for evidence of previous survey activity.

Ensure the highest possible participation rates are achieved so as to minimise the unit costs.

Comparison of Survey Costs Excluding Lot Surveys

| Titling Activities (average per lot) | Costs Conventional | Costs Orthophoto |
|---|-----------------------|---------------------|
| Orthophoto Map Production | 0 | P234 |
| Additional Survey Inputs Field validation and verification | P28 + P77 = P105 | P6 + P30 = P36 |
| Adjudication | P253 | P190 |
| TOTAL | P358 | P460 |

CIM production at POI 1 is the result of many inputs including field results. It is therefore reasonable to assume that orthophotos facilitate office and field planning, survey verification/validation and adjudication process rather than CIM drafting.

From information contained in (12.5 Summary of costs), it can be seen that up to 80% efficiency savings can be realized by using orthophotos for field validation/verification of past/new surveys and 25% efficiency savings on adjudication (as shown in the table above).

With the additional benefits derived from orthophotos such as PRS92 checks, GIS, Database, OSS operation and support to the LGU's for asset management, planning and tax collection (if P100 per parcel benefit can be accrued), then the orthophotos would pay for themselves even if they are not used for graphical cadastral definition.

The tables on the following pages, show the analysis of costs for Cadastral Survey by contract for 12 Modules let by DENR under LAMP in 2003/2004. The columns show the expected costs, as calculated by DENR, and the actual costs.

SURVEY COSTS – ESTIMATES VERSES ACTUAL SURVEY CONTRACTS in 2003/4 (12 MODULES)

| Activity per lot | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | |
|-------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | E | A | E | A | E | A | E | A | E | A | E | A |
| Research | 13.86 | 21.28 | 13.59 | 20.00 | 7.62 | 12.59 | 7.67 | 14.93 | 8.72 | 11.86 | 8.73 | 11.67 |
| Mobilisation | | 63.83 | | 60.00 | | | | 44.78 | | | | |
| Initial Pulong-Pulong | | 21.28 | | 20.00 | | | | 14.93 | | | | |
| Reconnaissance | 40.10 | 63.83 | 33.28 | 60.00 | 23.75 | 79.32 | 17.07 | 44.78 | 19.40 | 68.64 | 23.32 | 70.67 |
| Sketching SNS | 517.66 | 170.21 | 473.88 | 100.00 | 341.70 | 68.89 | 278.83 | 104.48 | 303.93 | 64.75 | 334.90 | 65.83 |
| Monumenting | 69.70 | 159.57 | 71.00 | 120.00 | 75.16 | 79.32 | 75.56 | 89.55 | 75.90 | 67.80 | 75.51 | 70.67 |
| Sub-Total | 641.32 | 500.00 | 591.75 | 380.00 | 448.24 | 240.12 | 379.13 | 313.43 | 407.95 | 213.05 | 442.47 | 218.83 |
| Forest Boundaries | | 63.83 | | 60.00 | | | | 44.78 | | | | |
| Political bdry. | 12.64 | 148.94 | 0.00 | 120.00 | 10.43 | 207.91 | 6.99 | 74.63 | 3.97 | 183.81 | 0.00 | 188.33 |
| Marking Gov't Lands | | 63.83 | | 60.00 | | | | 44.78 | | | | |
| Distribution of SNS | | 74.47 | | 60.00 | | | | 59.70 | | | | |
| Ident CARP | | 63.83 | | 50.00 | | | | 44.78 | | | | |
| Sub-Total | 12.64 | 414.89 | 0.00 | 350.00 | 10.43 | 207.91 | 6.99 | 268.66 | 3.97 | 183.81 | 0.00 | 188.33 |
| Project control | 18.91 | 148.94 | 18.55 | 100.00 | 10.40 | 323.04 | 10.47 | 59.70 | 11.90 | 275.66 | 11.92 | 315.00 |
| Sub-Total | 18.91 | 148.94 | 18.55 | 100.00 | 10.40 | 323.04 | 10.47 | 59.70 | 11.90 | 275.66 | 11.92 | 315.00 |
| Lot survey | 1013.72 | 446.81 | 927.99 | 410.00 | 669.15 | 566.67 | 546.02 | 313.43 | 595.18 | 361.02 | 655.82 | 495.00 |
| Preparation/Office work | 209.79 | 255.32 | 196.93 | 200.00 | 143.17 | 74.37 | 151.55 | 149.25 | 163.55 | 109.63 | 155.00 | 120.00 |
| Final Pulong-Pulong | | 85.11 | | 60.00 | | | | 59.70 | | | | |
| Compilation/Editing | | 63.83 | | 60.00 | | | | 59.70 | | | | |
| Submit Returns | | 21.28 | | 20.00 | | 22.96 | | 14.93 | | 19.83 | | 18.78 |
| Mobilisation | | 63.83 | | 60.00 | | | | 44.78 | | | | |
| Correction survey | 67.58 | | 66.28 | | 52.04 | | 52.36 | | 51.02 | | 51.10 | |
| Sub-Total | 1291.10 | 936.17 | 1191.20 | 810.00 | 864.36 | 664.00 | 749.92 | 641.79 | 809.74 | 490.47 | 861.92 | 633.78 |
| Total | 1963.96 | 2000.00 | 1801.50 | 1640.00 | 1333.43 | 1435.07 | 1146.51 | 1283.58 | 1233.56 | 1163.00 | 1316.31 | 1355.95 |

PART C – Cost Analysis

| Activity per lot | Modules | | | | | | | | | | | |
|-------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------|
| | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | |
| | E | A | E | A | E | A | E | A | E | A | E | A |
| Research | 9.57 | 16.51 | 11.46 | | 10.37 | 20.00 | 7.07 | | 26.38 | 112.55 | 9.79 | 24.94 |
| Mobilisation | | | | | | 60.00 | | | | | | |
| Initial Pulong-Pulong | | | | | | 20.00 | | | | | | |
| Reconnaissance | 34.07 | 114.13 | 17.85 | | 27.68 | 60.00 | 40.88 | 11.01 | 97.57 | 112.55 | 25.87 | 46.82 |
| Sketching SNS | 428.89 | 107.89 | 285.39 | | 376.87 | 120.00 | 839.39 | 357.88 | 1516.30 | 191.88 | 585.78 | 44.13 |
| Monumenting | 75.98 | 114.13 | 75.51 | | 75.30 | 100.00 | 292.87 | 199.24 | 300.83 | 369.00 | 195.10 | 56.18 |
| Sub-Total | 548.52 | 352.66 | 390.21 | 348.88 | 490.22 | 380.00 | 1180.20 | 568.14 | 1941.09 | 785.98 | 816.55 | 172.07 |
| Forest Boundaries | | | | | | 60.00 | | | | | | |
| Political bdry. | 0.00 | 305.50 | 10.45 | | 9.45 | 120.00 | 5.30 | 155.08 | 45.04 | 191.88 | 18.83 | 125.21 |
| Marking Gov't Lands | | | | | | 60.00 | | | | | | |
| Distribution of SNS | | | | | | 60.00 | | | | | | |
| Ident CARP | | | | | | 60.00 | | | | | | |
| Sub-Total | 0.00 | 305.50 | 10.45 | 0.00 | 9.45 | 360.00 | 5.30 | 155.08 | 45.04 | 191.88 | 18.83 | 125.21 |
| Project control | 15.67 | 510.09 | 12.51 | 256.18 | 14.15 | 150.00 | 10.52 | 15.29 | 94.32 | 191.88 | 35.01 | 187.82 |
| Sub_Total | 15.67 | 510.09 | 12.51 | 256.18 | 14.15 | 150.00 | 10.52 | 15.29 | 94.32 | 191.88 | 35.01 | 187.82 |
| Lot survey | 839.89 | 641.28 | 558.88 | 315.51 | 738.01 | 420.00 | 444.62 | 418.45 | 1076.50 | 442.80 | 414.36 | 344.36 |
| Preparation/Office work | 170.02 | 136.15 | 158.47 | 153.71 | 153.60 | 200.00 | 317.95 | 235.84 | 317.27 | 140.22 | 232.75 | 71.69 |
| Final Pulong-Pulong | | | | | | 60.00 | | | | | | |
| Compilation/Editing | | | | | | 60.00 | | | | | | |
| Submit Returns | | 28.31 | | 108.65 | | 20.00 | | 107.20 | | 535.06 | | 17.70 |
| Mobilisation | | | | | | 60.00 | | | | | | |
| Correction survey | 55.99 | | 55.89 | | 50.55 | | | | | | | |
| Sub-Total | 1065.90 | 805.74 | 773.24 | 577.87 | 942.16 | 820.00 | 762.57 | 761.48 | 1393.77 | 1118.08 | 647.11 | 433.75 |
| Total | 1630.09 | 1974.00 | 1186.41 | 1182.92 | 1455.98 | 1710.00 | 1958.59 | 1500.00 | 3474.21 | 2287.82 | 1517.50 | 918.85 |

PART C – Cost Analysis

| Activity per lot | Average Total | | AverageTotal | |
|-------------------------|---------------|---------|--------------|--------|
| | Cost | | % | |
| | E | A | E | A |
| Research | | | | |
| Mobilisation | | | | |
| Initial Pulong-Pulong | | | | |
| Reconnaissance | | | | |
| Sketching SNS | | | | |
| Monumenting | | | | |
| Sub-Total | 730.66 | 372.76 | 40.83 | 24.24 |
| Forest Boundaries | | | | |
| Political bdry. | | | | |
| Marking Gov't Lands | | | | |
| Distribution of SNS | | | | |
| Ident CARP | | | | |
| Sub-Total | 11.05 | 229.27 | 0.62 | 14.91 |
| Project control | | | | |
| Sub_Total | 23.21 | 211.13 | 1.30 | 13.73 |
| Lot survey | | | | |
| Preparation/Office work | | | | |
| Final Pulong-Pulong | | | | |
| Compilation/Editing | | | | |
| Submit Returns | | | | |
| Mobilisation | | | | |
| Correction survey | | | | |
| Sub-Total | 1024.60 | 724.43 | 57.26 | 47.11 |
| Total | 1789.50 | 1537.60 | 100.00 | 100.00 |

ATTACHMENT 1

| Corner/Lot | GPS Point | GPS Coordinates | | Cadastral Coordinates | | Coordinate Difference | | Remarks |
|---------------------------------|-----------|-----------------|-------------|-----------------------|------------|-----------------------|---------|-----------------------------------|
| | | Easting | Northing | Easting | Northing | ΔE | ΔN | |
| 8/Lot 938; 4/Lot 939 | A-1 | 480411.5342 | 1247270.817 | 480423.32 | 1247286.94 | -11.786 | -16.123 | Offset 4m |
| 1/Lot 942 and 943; 3/Lot 1740 | A-10 | 480021.6461 | 1247219.893 | 480020.7 | 1247220.73 | 0.946 | -0.837 | PS Monument |
| 5/Lot 943; 4/Lot 1740 | A-11 | 480031.1319 | 1247182.119 | 480035.87 | 1247172.09 | -4.738 | 10.029 | Malugani Tree 6m Offset |
| 4/Lot 943 and 941 | A-12 | 480131.9053 | 1247200.625 | 480134.79 | 1247190.03 | -2.885 | 10.595 | PS Monument |
| 6/Lot 942; 2/Lot 943 | A-13 | 480128.1733 | 1247263.432 | 480128.71 | 1247263.45 | -0.537 | -0.018 | PS Monument |
| | A-14 | 480099.1789 | 1247347.497 | | | | | Offset 20m |
| | A-15 | 480240.7836 | 1247320.067 | | | | | TagomTagom Tree 3m Offset |
| | A-2 | 480423.7116 | 1247206.300 | | | | | No monument |
| | A-3 | 480395.4857 | 1247128.381 | | | | | Offset 20m |
| | A-4 | 480326.811 | 1247126.115 | | | | | |
| | A-4a | 480314.437 | 1247121.720 | | | | | |
| | A-5 | 480347.2557 | 1247326.137 | | | | | Bigo Tree 3m Offset |
| | A-6 | 480250.1677 | 1247171.423 | | | | | |
| 3/ Lot 941 | A-7 | 480203.0169 | 1247185.998 | 480198.72 | 1247191.87 | 4.297 | -5.872 | Adgan Tree 4m Offset |
| | A-8 | 480313.8599 | 1247100.309 | | | | | Narra Tree 15m Offset |
| 1/Lot 576 and 577 | B-1 | 481555.3099 | 1247686.097 | 481560.67 | 1247686.18 | -5.360 | -0.083 | PS Monument |
| 5/Lot 974 | B-10 | 481417.8334 | 1247509.312 | 481417.5 | 1247508.67 | 0.333 | 0.642 | Rice Paddy |
| 6/Lot 974 | B-11 | 481333.2724 | 1247530.306 | 481333.78 | 1247529.74 | -0.508 | 0.566 | Rice Paddy |
| 2/Lot 973 | B-12 | 481317.0106 | 1247534.372 | 481316.61 | 1247543.89 | 0.401 | -9.518 | PS Monument disturb |
| 3/Lot 973 | B-13 | 481312.5145 | 1247564.831 | 481314.67 | 1247572.97 | -2.155 | -8.139 | PS Monument disturb |
| 4/Lot 973 | B-14 | 481246.7949 | 1247599.716 | 481246.43 | 1247604.2 | 0.365 | -4.484 | Rice Paddy |
| 6/Lot 973 | B-15 | 481302.393 | 1247697.027 | 481300.53 | 1247706.04 | 1.863 | -9.013 | Dead coconut tree along the creek |
| 4/Lot 576 and 968; 3/Lot 574 | B-16 | 481438.7014 | 1247796.819 | 481438.28 | 1247799.24 | 0.421 | -2.421 | PS Monument |
| 3/Lot 968; 4/Lot 574 | B-17 | 481406.604 | 1247816.378 | 481406.46 | 1247819.79 | 0.144 | -3.412 | PS Monument |
| 2/Lot 968; 5/Lot 574; 7/Lot 573 | B-18 | 481415.2671 | 1247844.632 | 481414.87 | 1247845.18 | 0.397 | -0.548 | Rice Paddy |
| 5/Lot 576; 2/Lot 574 | B-19 | 481492.8202 | 1247768.355 | 481504.64 | 1247764.88 | -11.820 | 3.475 | Rice Paddy |
| 10/Lot 577; 2/Lot 576 | B-2 | 481494.8705 | 1247684.345 | 481476.16 | 1247690.6 | 18.711 | -6.255 | Between 2 coconut trees |

PART C – Cost Analysis

| | | | | | | | | | |
|----------------------------------|--------|-------------|-------------|-----------|------------|--------|--------|--|--|
| | | | | | | | | | No monument/7m from concrete road due west/3.20m from the coconut tree due north |
| 6/Lot 576; 1/Lot 574 | B-20 | 481562.5826 | 1247762.773 | 481563.45 | 1247764.02 | -0.867 | -1.248 | | |
| 6/ Lot 574 and 573 | B-21 | 481569.314 | 1247834.167 | 481568.6 | 1247833.89 | 0.714 | 0.277 | | No monument |
| 5/Lot 573; 4/Lot 572 | B-22 | 481566.1293 | 1247885.830 | 481569.76 | 1247887.27 | -3.631 | -1.440 | | PS Monument |
| 1/Lot 573 and 968; 8/Lot 572 | B-23 | 481477.8511 | 1247930.379 | 481477.52 | 1247929.42 | 0.331 | 0.959 | | PS Monument |
| 15/Lot 968; 9/Lot 572 | B-24 | 481473.9475 | 1247934.100 | 481474.72 | 1247935.57 | -0.772 | -1.470 | | Rice Paddy |
| 14/Lot 968; 10/Lot 572 | B-25 | 481508.4197 | 1248021.207 | 481508.57 | 1248020.78 | -0.150 | 0.427 | | PS Monument disturb |
| 13/Lot 968 | B-26 | 481500.329 | 1248025.222 | 481481.32 | 1248031.48 | 19.009 | -6.258 | | Coconut Tree (not a corner) |
| 12/Lot 968; 5/Lot 965 | B-27 | 481454.2442 | 1248043.232 | 481454.79 | 1248043.19 | -0.546 | 0.042 | | PS Monument |
| | B-28 | 481471.98 | 1248034.081 | | | | | | Rice Paddy |
| | B-29 | 481366.782 | 1247834.153 | | | | | | Rice Paddy |
| 9/Lot 577; 3/Lot 576; 5/Lot 968 | B-3 | 481427.0447 | 1247707.992 | 481422.14 | 1247714.14 | 4.905 | -6.148 | | PS Monument |
| 10/Lot 968; 7/Lot 965 | B-30 | 481352.758 | 1247835.967 | 481357.58 | 1247831.97 | -4.822 | 3.997 | | Coconut Tree |
| 9/Lot 968 | B-31 | 481319.0175 | 1247804.682 | 481314.29 | 1247789.69 | 4.728 | 14.992 | | Along Caburutan Creek |
| 8/Lot 577; 6/Lot 968 | B-4 | 481385.6267 | 1247718.969 | 481385.33 | 1247718.84 | 0.297 | 0.129 | | PS Monument |
| 7/Lot 973, 968 and 577 | B-5 | 481371.91 | 1247659.347 | 481372.16 | 1247658.79 | -0.250 | 0.557 | | PS Monument |
| 2/Lot 974; 8/Lot 973; 6/Lot 577 | B-6 | 481394.231 | 1247647.574 | 481394.92 | 1247648.46 | -0.689 | -0.887 | | PS Monument |
| | B-7 | 481458.6481 | 1247629.125 | | | | | | Rice Paddy |
| 4/Lot 577 and 974 | B-8 | 481444.4001 | 1247587.832 | 481443.6 | 1247587.65 | 0.800 | 0.182 | | Rice Paddy |
| 2/Lot 577 | B-9 | 481560.0892 | 1247558.206 | 481557.59 | 1247558.21 | 2.499 | -0.004 | | Pulangi Tree 2m offset due north |
| 1/Lot 1740 and 1742 | BBM-15 | 479813.9271 | 1247119.082 | 479812.89 | 1247118.99 | 1.037 | 0.092 | | Political Boundary |
| 2/Lot 965 and 3902 | C-1 | 481446.701 | 1248182.681 | 481444.21 | 1248182.79 | 2.491 | -0.109 | | No Monument |
| 3/Lot 641 | C-10 | 481579.4708 | 1248287.688 | 481585.01 | 1248286.9 | -5.539 | 0.788 | | PS Monument |
| 1/Lot 565 and 564 | C-11 | 481594.9536 | 1248364.222 | 481595.01 | 1248363.78 | -0.056 | 0.442 | | PS Monument |
| 2/Lot 564; 11/Lot 641; 4/Lot 565 | C-12 | 481570.9049 | 1248362.504 | 481571.51 | 1248359.46 | -0.605 | 3.044 | | PS Monument |
| 3/Lot 565 and 566; 12/Lot 641 | C-13 | 481575.2785 | 1248341.992 | 481575.83 | 1248343.71 | -0.552 | -1.718 | | PS Monument |
| 2/Lot 565; 4/Lot 566 | C-14 | 481596.7309 | 1248345.489 | 481596.22 | 1248345.58 | 0.511 | -0.091 | | PS Monument |
| 5/Lot 566; 1/Lot 641 | C-15 | 481598.0315 | 1248328.467 | 481597.24 | 1248328.39 | 0.791 | 0.077 | | PS Monument |
| 13/Lot 641; 2/Lot 566 | C-16 | 481576.7259 | 1248325.117 | 481572.4 | 1248325.78 | 4.326 | -0.663 | | PS Monument |
| 5/Lot 3902;6/Lot 640; 9/Lot 641 | C-17 | 481424.557 | 1248256.120 | 481425.44 | 1248257.67 | -0.883 | -1.550 | | Rice Paddy |
| 5/Lot 640; 10/Lot 641; 3/Lot 564 | C-18 | 481411.9274 | 1248325.999 | 481414.33 | 1248323.64 | -2.403 | 2.359 | | PS Monument |

PART C – Cost Analysis

| | | | | | | | | |
|----------------------------------|-------|-------------|-------------|-----------|------------|--------|--------|---|
| 2/Lot 640; 1/Lot 638 | C-19 | 481382.836 | 1248408.490 | 481380.51 | 1248410.84 | 2.326 | -2.350 | No Monument/1.69 m due west from the coconut tree |
| | C-19A | 481307.8797 | 1248397.962 | | | | | PS Monument |
| 3/Lot 965 | C-2 | 481430.8559 | 1248107.250 | 481432.73 | 1248108.7 | -1.874 | -1.450 | Pointed by tenant of Mendiola |
| | C-20 | 481289.8404 | 1248329.366 | | | | | Pointed by tenant of Mendiola |
| 1/Lot 640;2/Lot 638 | C-21 | 481319.9615 | 1248283.162 | 481317.2 | 1248282.41 | 2.761 | 0.752 | Pointed by tenant of Mendiola |
| 2/Lot 641 | C-22 | 481597.6321 | 1248287.917 | 481597.08 | 1248287.66 | 0.552 | 0.257 | PS Monument |
| 5/Lot 639 | C-3 | 481334.51 | 1247977.885 | 481334.27 | 1247976.67 | 0.240 | 1.215 | No Monument/2m due southwest from the coconut tree |
| 6/Lot 639 | C-4 | 481255.6589 | 1247955.671 | 481248.57 | 1247957.38 | 7.089 | -1.709 | No Monument/2.32m due southwest from the coconut tree |
| 1/Lot 639 | C-5 | 481269.7615 | 1248056.513 | 481269.47 | 1248055.60 | 0.292 | 0.913 | PS Monument beside the coconut tree |
| 7/Lot 640; 4/Lot 3902 | C-6 | 481349.8001 | 1248247.427 | 481345.86 | 1248217.65 | 3.940 | 29.777 | No Monument/2m due south from the coconut tree |
| 1/Lot 3902; 8/Lot 641 | C-7 | 481469.9909 | 1248259.795 | 481469.80 | 1248260.22 | 0.191 | -0.425 | Rice Paddy |
| 8/Lot 641 | C-8 | 481483.0251 | 1248240.336 | 481486.39 | 1248236.89 | -3.365 | 3.446 | Curve |
| 6/Lot 641 | C-9 | 481495.7749 | 1248236.374 | 481495.62 | 1248235.42 | 0.155 | 0.954 | PS Monument disturb |
| 1/Lot 1350 | E-1 | 481586.0214 | 1247907.244 | 481587.86 | 1247905.55 | -1.839 | 1.694 | |
| 7/Lot 1350; 8/Lot 1347 | E-10 | 481622.2762 | 1248108.254 | 481622.93 | 1248106.85 | -0.654 | 1.404 | |
| 1/Lot 1347 and 1371; 16/Lot 1370 | E-11 | 481752.1737 | 1248065.189 | 481753.17 | 1248063.73 | -0.996 | 1.459 | X on coconut tree |
| 2/Lot 1347; 5/Lot 1371 | E-12 | 481797.9274 | 1248078.667 | 481799.31 | 1248081.62 | -1.383 | -2.953 | X on Biri Tree |
| 3/Lot 1347; 4/Lot 1371 | E-13 | 481808.1895 | 1248095.949 | 481809.17 | 1248093.74 | -0.981 | 2.209 | Offset 2m due west |
| 6/Lot 1347 | E-14 | 481847.6048 | 1247969.752 | 481850.83 | 1247972.14 | -3.225 | -2.388 | PS Monument/5m offset due east |
| 9/Lot 3907 | E-15 | 481879.913 | 1248043.416 | 481879.56 | 1248040.80 | 0.353 | 2.616 | Along the creek |
| 10/Lot 3907 | E-16 | 481950.8374 | 1248067.364 | 481955.30 | 1248066.38 | -4.463 | 0.984 | X on coconut tree |
| | E-17 | 482070.9794 | 1248100.898 | | | | | X on Potat Tree |
| 11/Lot 3907 | E-18 | 482065.6329 | 1248116.763 | 482066.18 | 1248114.56 | -0.547 | 2.203 | Rice Paddy |
| 4/Lot 1339 | E-19 | 482034.8145 | 1248145.001 | 482034.99 | 1248143.60 | -0.176 | 1.401 | Rice Paddy |
| 7/Lot 1350; 8/Lot 1347 | E-2 | 481738.7079 | 1247942.403 | 481737.47 | 1247942.71 | 1.238 | -0.307 | |
| | E-20 | 481992.1461 | 1248152.834 | | | | | PS Monument |
| | E-21 | 481991.4197 | 1248123.357 | | | | | PS Monument |

PART C – Cost Analysis

| | | | | | | | | | |
|-------------------------------------|------|-------------|-------------|-----------|------------|---------|--------|--|---|
| | E-22 | 481959.3567 | 1248120.490 | | | | | | Rice Paddy |
| | E-23 | 481965.426 | 1248095.400 | | | | | | PS Monument |
| 9/Lot 3905 | E-24 | 481873.1466 | 1248067.380 | 481874.62 | 1248067.24 | -1.473 | 0.140 | | PS Monument |
| 1/Lot 3905 | E-25 | 481804.2727 | 1248189.823 | 481809.17 | 1248192.35 | -4.897 | -2.527 | | Along the creek |
| 16/Lot 1338; 7/Lot 3907 | E-26 | 481876.1544 | 1247955.748 | 481889.61 | 1247957.89 | -13.456 | -2.142 | | Along the creek |
| 11/Lot 1338 | E-27 | 481973.6118 | 1247731.122 | 481962.88 | 1247730.41 | 10.732 | 0.712 | | X on Biri Tree |
| 6/Lot 1338 | E-28 | 482099.9997 | 1247880.551 | 482098.64 | 1247882.36 | 1.360 | -1.809 | | Rice Paddy |
| 5/Lot 1338 | E-29 | 482117.8201 | 1247875.614 | 482117.04 | 1247876.84 | 0.780 | -1.226 | | Rice Paddy |
| 6/Lot 1350; 3/Lot 1347 | E-3 | 481702.8151 | 1247976.825 | 481697.04 | 1247981.88 | 5.775 | -5.055 | | PS No. 369 Concrete Monument |
| 4/Lot 1338 | E-30 | 482163.0278 | 1247885.957 | 482162.40 | 1247886.06 | 0.628 | -0.103 | | PS Monument |
| 3/Lot 1338 | E-31 | 482159.4005 | 1247923.849 | 482156.51 | 1247925.13 | 2.890 | -1.281 | | Rice Paddy |
| 2/Lot 1338 | E-32 | 482148.4196 | 1248006.998 | 482147.66 | 1248007.11 | 0.760 | -0.112 | | PS Monument |
| 1/Lot 1338 | E-33 | 482092.9998 | 1248010.224 | 482089.60 | 1248009.33 | 3.400 | 0.894 | | Rice Paddy |
| | E-34 | 482033.7174 | 1247988.904 | | | | | | X on Langka Tree 1.5m due north form the coconut tree |
| 2/Lot 3908; 4/Lot 3909 | E-35 | 482004.7511 | 1247984.802 | 482002.94 | 1247984.61 | 1.811 | 0.192 | | PS Monument disturb |
| 9/Lot 1338 | E-36 | 482001.8456 | 1247765.105 | 482008.50 | 1247768.40 | -6.654 | -3.295 | | Rice Paddy |
| 8/Lot 1338 | E-37 | 482038.7252 | 1247809.129 | 482038.40 | 1247810.26 | 0.325 | -1.131 | | Rice Paddy |
| 7/lot 1338 | E-38 | 482071.6508 | 1247852.338 | 482070.63 | 1247852.85 | 1.021 | -0.512 | | Rice Paddy |
| 3/Lot 1371 | E-39 | 481750.5414 | 1248191.700 | 481754.28 | 1248187.34 | -3.739 | 4.360 | | No Monument/ along the creek |
| 6/Lot 1350; 3/Lot 1347 | E-4 | 481700.6956 | 1247978.838 | 481697.04 | 1247981.88 | 3.656 | -3.042 | | |
| 13/Lot 1370 | E-40 | 481665.3546 | 1248168.051 | 481674.20 | 1248173.67 | -8.845 | -5.620 | | 4m offset due north form Cayamoto Tree |
| 5/Lot 1350; 10/Lot 1347 | E-5 | 481686.5961 | 1248003.921 | 481684.00 | 1248009.37 | 2.596 | -5.449 | | |
| | E-6 | 481679.7811 | 1248047.732 | | | | | | |
| 4/Lot 1350;17/Lot 1370; 11/Lot 1347 | E-7 | 481689.1453 | 1248059.584 | 481680.22 | 1248061.11 | 8.925 | -1.526 | | |
| 3/Lot 1350; 1/Lot 1370 | E-8 | 481621.2513 | 1248086.684 | 481623.13 | 1248085.66 | -1.879 | 1.024 | | |
| 2/Lot 1350 | E-9 | 481600.9914 | 1248090.975 | 481604.01 | 1248091.94 | -3.019 | -0.965 | | |
| 5/Lot 1454; 2/Lot 1456 | F-1 | 482064.0173 | 1246526.343 | 482060.91 | 1246526.49 | 3.107 | -0.147 | | PS Monument |
| 3/Lot 1454 | F-10 | 482138.6813 | 1246574.238 | 482141.04 | 1246566.69 | -2.359 | 7.548 | | X on coconut tree |
| 4/Lot 1454 | F-11 | 482124.3974 | 1246525.201 | 482125.52 | 1246527.70 | -1.123 | -2.499 | | No Monument |

PART C – Cost Analysis

| | | | | | | | | |
|------------------------|--------|-------------|-------------|-----------|------------|--------|---------|---|
| 3/Lot 1456 | F-2 | 482018.9718 | 1246529.957 | 482020.37 | 1246529.90 | -1.398 | 0.057 | Offset 2.10m southeast from Dapdap Tree |
| 4/Lot 1456 | F-3 | 482017.3798 | 1246609.539 | 482016.71 | 1246609.08 | 0.670 | 0.459 | X on coconut tree |
| 5/Lot 1456 | F-4 | 482013.7181 | 1246687.769 | 482013.65 | 1246686.45 | 0.068 | 1.319 | Rice Paddy |
| 6/Lot 1456 | F-5 | 482035.8002 | 1246708.164 | 482037.93 | 1246708.33 | -2.130 | -0.166 | Rice Paddy |
| 7/Lot 1456 | F-6 | 482053.664 | 1246725.134 | 482052.50 | 1246725.47 | 1.164 | -0.336 | Rice Paddy |
| 1/Lot 1456; 6/Lot 1454 | F-7 | 482071.2082 | 1246624.440 | 482069.62 | 1246622.79 | 1.588 | 1.650 | PS Monument |
| 1/Lot 1454 | F-8 | 482103.704 | 1246604.096 | 482091.33 | 1246621.01 | 12.374 | -16.914 | X on coconut tree |
| 2/Lot 1454 | F-9 | 482137.9549 | 1246583.854 | 482139.16 | 1246587.23 | -1.205 | -3.376 | Offset 3m due north from the edge of the road |
| | LYT-45 | 481259.6611 | 1249042.943 | | | | | |

PART C – Cost Analysis

| Corner/Lot | GPS Point | GPS Coordinates | | Cadastral Coordinates | | Coordinate Difference | | Remarks |
|-------------------------------------|-----------|-----------------|-------------|-----------------------|------------|-----------------------|--------|---|
| | | Easting | Northing | Easting | Northing | ΔE | ΔN | |
| 3/ Lot 1137 | A-1 | 483256.0429 | 1246246.905 | 483277.94 | 1246252.17 | -21.898 | -5.268 | 2.5m Due North from Creek |
| 4/ Lot 3843 | A-10 | 483533.1836 | 1246417.26 | 483533.25 | 1246416.78 | -0.067 | 0.477 | Rice Paddy |
| 1/ Lot 3843 | A-11 | 483528.5636 | 1246377.361 | 483526.61 | 1246360.53 | 1.953 | 16.827 | PS Monument |
| 1/Lot 3845; 3/Lot 3844; 6/Lot 1137 | A-12 | 483211.7143 | 1246488.671 | 483214.02 | 1246488.69 | -2.307 | -0.022 | PS Monument |
| 1/Lot 3846; 2/Lot 3845; 5/Lot 1137 | A-13 | 483196.2159 | 1246528.719 | 483204.65 | 1246533.41 | -8.435 | -4.694 | Coconut Tree |
| 3/Lot 3846; 3/ Lot 3847; 2/Lot 3848 | A-14 | 483256.6828 | 1246599.999 | 483261.23 | 1246599.06 | -4.548 | 0.936 | PS Monument |
| | A-15 | 483238.9618 | 1246622.837 | ? | ? | | | Coconut Tree |
| | A-16 | 483212.3792 | 1246649.11 | ? | ? | | | Coconut Tree |
| 4/Lot 3848 and Lot 1137 | A-17 | 483125.5175 | 1246599.315 | 483127.39 | 1246594.1 | -1.873 | 5.212 | Tan-ag Tree |
| 5/Lot 3848; 3/Lot 1141 | A-18 | 483135.3638 | 1246589.059 | 483144.93 | 1246582.36 | -9.567 | 6.696 | X on Caimito Tree |
| 3/Lot 1561 and Lot 1139 | A-19 | 483098.031 | 1246641.358 | 483092.82 | 1246641.19 | 5.210 | 0.164 | 5m North West of Caimito Tree |
| | A-2 | 483243.639 | 1246304.382 | 483242.32 | 1246276.08 | 1.318 | 28.298 | Concrete Monument |
| 4/Lot 1139; 2/ Lot 1138 | A-20 | 483081.4978 | 1246699.28 | 483075.36 | 1246698.97 | 6.137 | 0.307 | X on Caimito Tree |
| 4/Lot 1138 | A-21 | 483085.8514 | 1246750.445 | 483082.76 | 1246749.03 | 3.090 | 1.412 | X on Coconut Tree |
| 1/Lot 1138 and Lot 1139; 3/Lot 3847 | A-22 | 483256.0752 | 1246691.035 | 483248.02 | 1246687.84 | 8.054 | 3.192 | No Monument |
| 5/Lot 3847 | A-23 | 483332.7813 | 1246713.602 | 483370.59 | 1246713.55 | -37.810 | 0.049 | X on Langka Tree |
| 6/Lot 3847; 4/Lot 3846 | A-24 | 483370.6692 | 1246598.998 | 483375.34 | 1246596.05 | -4.672 | 2.945 | PS Monument |
| 4/Lot 3845 and Lot 3844 | A-25 | 483358.3559 | 1246443.414 | 483357.55 | 1246442.07 | 0.805 | 1.341 | PS Monument |
| 1/Lot 3844; 8/Lot 1137 | A-26 | 483318.3299 | 1246383.76 | 483317.4 | 1246381.46 | 0.929 | 2.297 | Cocnrete Post |
| 11/ Lot 1137 | A-3 | 483144.0717 | 1246327.509 | 483148.01 | 1246332.75 | -3.939 | -5.244 | No Monument 2m due West to coconut Tree |
| 7/Lot 1137; 2/Lot 3844 | A-4 | 483197.8904 | 1246442.457 | 483199.12 | 1246443.24 | -1.231 | -0.786 | No Monument |
| 1/Lot 1137 | A-5 | 483186.6744 | 1246441.742 | 483186.2 | 1246440.06 | 0.473 | 1.679 | Langka Tree |
| 2/Lot 1137 | A-6 | 483116.4761 | 1246471.718 | 483112.25 | 1246473.08 | 4.225 | -1.365 | Creek |
| 4/Lot 3848 and Lot 1137 | A-7 | 483147.7171 | 1246563.782 | 483155.69 | 1246563.69 | -7.977 | 0.093 | 8m due North from coconut tree |
| 5/Lot 1137; 2/Lot 3846; 3/Lot 3848 | A-8 | 483209.2083 | 1246586.279 | 483214.19 | 1246586.33 | -4.983 | -0.054 | PS Monument |
| 2/Lot 3843 | A-8a | 483344.1108 | 1246404.872 | 483345.08 | 1246404.14 | -0.970 | 0.729 | Coconut Tree |

PART C – Cost Analysis

| | | | | | | | | |
|--------------------------------------|--------|-------------|-------------|-----------|------------|---------|--------|--------------|
| 3/Lot 3843 | A-9 | 483365.0506 | 1246431.433 | 483364.66 | 1246430.24 | 0.390 | 1.190 | Coconut Tree |
| | B-1 | 482829.7386 | 1247541.372 | ? | ? | | | PS Monument |
| | B-10 | 482924.7873 | 1247638.758 | ? | ? | | | PS Monument |
| | B-11 | 482935.763 | 1247593.963 | ? | ? | | | PS Monument |
| 4/Lot 4039; 8/Lot 1422; 13/Lot 1329 | B-12 | 482962.5424 | 1247607.223 | 482965.97 | 1247602.35 | -3.429 | 4.870 | PS Monument |
| 1/Lot 1421 and Lot 1422; 12/Lot 1329 | B-13 | 482946.886 | 1247638.357 | 482942.71 | 1247642.15 | 4.175 | -3.796 | Rice Paddy |
| 2/Lot 1421; 11/Lot 1329 | B-14 | 482898.4891 | 1247730.968 | 482898.31 | 1247730.98 | 0.178 | -0.015 | Rice Paddy |
| 10/Lot 1329 | B-15 | 482854.8279 | 1247787.223 | 482849.84 | 1247777.8 | 4.987 | 9.420 | Rice Paddy |
| 8/Lot 1329 | B-16 | 482817.2653 | 1247759.068 | 482809.87 | 1247755.29 | 7.394 | 3.775 | Rice Paddy |
| 3/Lot 1422 | B-17 | 483094.2505 | 1247699.219 | 483096.45 | 1247698.82 | -2.200 | 0.396 | |
| 4/Lot 1422; 1/Lot 1626 | B-18 | 483201.937 | 1247554.005 | 483203.66 | 1247555.07 | -1.724 | -1.068 | Rice Paddy |
| 4/Lot 1626; 5/Lot 1422 | B-19 | 483145.0378 | 1247472.874 | 483157.01 | 1247467.48 | -11.973 | 5.391 | Rice Paddy |
| | B-2 | 482825.8047 | 1247546.932 | ? | ? | | | PS Monument |
| 6/Lot 1422 | B-20 | 483031.4529 | 1247558.038 | 483031.79 | 1247557.55 | -0.338 | 0.485 | Rice Paddy |
| 7/Lot 1422; 5/Lot 4039 | B-21 | 482992.2167 | 1247558.727 | 482991.6 | 1247558.5 | 0.616 | 0.224 | PS Monument |
| | B-3 | 482791.8164 | 1247518.932 | ? | ? | | | PS Monument |
| 1/Lot 1329 | B-4 | 482777.1937 | 1247533.806 | 482776.43 | 1247531.1 | 0.763 | 2.703 | Rice Paddy |
| 2/Lot 1329 | B-5 | 482766.794 | 1247600.399 | 482766.47 | 1247599.86 | 0.323 | 0.536 | Rice Paddy |
| | B-6 | 482690.9204 | 1247662.366 | ? | ? | | | PS Monument |
| 5/Lot 1329; 4/Lot 4037 | B-7 | 482770.9884 | 1247747.192 | 482770.16 | 1247746.83 | 0.827 | 0.359 | Rice Paddy |
| 6/Lot 1329; 3/Lot 4037 | B-8 | 482853.6237 | 1247607.436 | 482853.73 | 1247607.51 | -0.107 | -0.077 | PS Monument |
| 7/Lot 1329; 2/Lot 4037 | B-9 | 482895.472 | 1247622.737 | 482898.23 | 1247623.55 | -2.759 | -0.816 | PS Monument |
| | LYT-45 | 481259.6611 | 1249042.943 | | | | | |