A Study on the Adaptation of the Malaysian Cadastral Survey Framework for Underground Utility Detection Survey

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Abstract. The Malaysian Cadastral system has matured over the years. Starting from the manual process, the system is now fully digital with an ever-updated cadastral lots database. What contributed to this efficient system is the proven Malaysian Cadastral Survey Framework which was developed in 1974. The Malaysian Cadastral Survey Framework has matured and has benefitted the land owners, the Department of Survey and Mapping Malaysia and the Licensed Land Surveyors. Prior to 1974, the Malaysian Cadastral scene was faced with the same issues faced by the Underground Utility Detection Survey now. This paper shall study the experience of the Malaysian Cadastral Survey Framework and adapt it to the legal means of developing the Underground Utility Detection Survey Framework. A working group was established to achieve this goal. The output is a proposed Underground Utility Detection Survey Framework and a modified flow chart was issued to Ministries and Government Departments in September 2021. This paper will also discuss the issues faced in implementing the framework which is mainly related to the enabling clause and legal issues pertaining to Underground Utility Detection Survey. The authors conclude that the anticipated way forward to the implementation of the Underground Utility Detection Survey Framework is the gazettement of the amended Licensed Land Surveyors Act which is due to be tabled in the Malaysian Parliament.

1. Introduction

The Malaysian Geomatics and Land Surveying practice is based on the Cadastral system. The Cadastral system consists of land lots information in 2D format which is currently stored and updated in the Department of Surveying and Mapping Malaysia (DSMM) National Digital Cadastral Database (NDCDB). Prior to the development of NDCDB, the Cadastral lots information was stored in hardcopy standard sheets and stored manually in the NCDB (1).

NCDB was developed based on the Malaysian Cadastral Survey Framework which was established in 1974. Since 15th May 1974, a framework was developed whereby the Licensed Land Surveyors appointed by the land owners are required to deposit the title survey fees to the Land Surveyors Board

of Malaysia prior to the start of the survey work (2). The Land Surveyors Board shall then issue a certificate which is a pre-requisite by the Department of Surveying and Mapping Malaysia to issue the lot numbers for the title survey. Upon the completion of the title survey, the Licensed Land Surveyor shall submit and deposit the Certified Plans and the related documents to the Department of Surveying and Mapping Malaysia for approval. Only upon the approval of the Certified Plans by the Department of Surveying and Mapping Malaysia, the Licensed Land Surveyors shall collect their survey fees which were deposited to the Land Surveyors Board prior to the start of the survey.

The Malaysian Cadastral Survey Framework has solved many problems faced prior to its establishment such as:

a) The development and update of the Malaysian cadastral database. Prior to the establishment of the cadastral framework, there is no systematic process to update the cadastral database.
b) The assurance that the title survey job is completed and Certified Plans submitted to the Department of Survey and Mapping Malaysia. This ensures the registration of Final Titles by the Land Office.
c) Title Survey fees are regulated and collected by Licensed Land Surveyors in a systematic manner. Prior to the establishment of the cadastral framework, there were many disputes between land owners and Licensed Land Surveyors. As a result, title survey fees were not properly regulated, title surveys were not completed, Certified Plans were not deposited to the Department of Survey and Mapping Malaysia and the NCDB was not updated.

1.1 Problem Statement

The Department of Survey and Mapping Malaysia was given the mandate by the Malaysian Cabinet on 24th August 1994 as the custodian of Malaysia's underground utility survey data (3). Even after twenty-nine years, this mandate has yet to be achieved. The current Underground Utility Detection Survey practice in Malaysia is experiencing the same problems faced by the Cadastral Survey practice prior to the establishment of the Malaysian Cadastral Survey Framework. Hence, the authors are studying the possibility of adopting the Malaysian Cadastral Survey Framework for Underground Utility Detection Survey practice and therefore establishing a framework.

The objectives of this paper are:

a) Explain the Malaysian cadastral survey framework and its workflow.
b) The methodology in formulating the proposed Underground Utility Detection Survey framework.
c) The proposed Underground Utility Detection Survey framework is to be adapted from the Malaysian cadastral survey framework.

2. The Malaysian Cadastral Survey Framework

The basis of the Malaysian land management system is the Cadastral system. Land plots are being subdivided, partitioned or amalgamated and boundary marks are being planted to determine the exact boundary of the lots (4).

Licensed Land Surveyors are being licensed based on the Land Surveyors Act (Act 458, 1958)(5) to carry out title survey works. The Licensed Land Surveyor shall then submit the Certified Plans and the related documents to the Department of Survey and Mapping Malaysia for approval. The Final Titles shall be prepared and registered by the Land Office based on the approved Certified Plans.

Prior to the development of the Malaysian Cadastral Survey Framework in 1974, the contract was established between the land owners and the Licensed Land Surveyor without any participation of the Land Surveyors Board. Thus, it was the responsibility of the Licensed Land Surveyor to complete the title surveys and submit the Certified Plans to the Department of Survey and Mapping Malaysia for approval.

The whole title survey process however was met with a few issues such as:

a) Dispute between the land owners and the Licensed Land Surveyor pertaining to the contract and the survey fees.
b) Title surveys are not being completed and hence the cadastral database is not being updated.
c) Qualified Titles and Final Titles are not able to be registered due to the two issues mentioned above.

The three issues mentioned above involved three parties; the land owners, the Licensed Land Surveyor and the Department of Survey and Mapping Malaysia. In order to resolve the issues, a cadastral survey framework was proposed with the inclusion of the Land Surveyors Board. The Land Surveyors Board acted as the trustee for the title survey fees. The workflow of the Malaysian Cadastral Survey Framework is illustrated in **Figure 1**. A brief explanation of each process is described as per the numbering of each process in the workflow.

2.1 Appointment of the Licensed Land Surveyor by the Land Owner

Upon the approval of the land application by the Land Office, the land owner shall appoint the Licensed Land Surveyor to carry out a title survey on his plot of land.

2.2 Deposit of the Title Survey Fees to the Land Surveyors Board

The title survey fees calculated as per Schedule 13 of the Licensed Land Surveyors Act 1958 shall be deposited to the Land Surveyors Board as per sub-regulation 26(1) of the Licensed Land Surveyors Regulations. This is being made via the e-LJT system by the Licensed Land Surveyor.

2.3 Land Surveyors Board to Issue a Certificate to Licensed Land Surveyor

Upon the receipt of the deposited title survey fees from the Licensed Land Surveyor, the Land Surveyors Board shall then issue a certificate which is required by the Land Office to register the Qualified Title of the land to be surveyed (National Land Code, Section 409A) (6). The Land Surveyors Board certificate is also required as a prerequisite to register for the title survey job at the Department of Survey and Mapping Malaysia prior to the start of the title survey.

2.4 Licensed Land Surveyor to Initiate Process to Start Title Survey Works

The Licensed Land Surveyor shall submit the three Department of Survey and Mapping Malaysia ASCII files to initiate the title survey job at the Department of Survey and Mapping Malaysia JUPEM2U portal (DSMM, Circular 6/2009). The Land Surveyors Board certificate is one of the documents to be uploaded to the JUPEM2U portal. The Licensed Land Surveyor shall apply for lot numbers and start the title survey work.

2.5 Licensed Land Surveyor to Complete Title Survey Works and Submit to the Department of Survey and Mapping Malaysia

Upon the completion of the title survey work, the Licensed Land Surveyor shall upload the data in the form of 16 ASCII files to the JUPEM2U portal (7). The Department of Survey and Mapping Malaysia shall then check the correctness of the survey data by the Licensed Land Surveyor.

2.6 Department of Survey and Mapping Malaysia to Check Submission by Licensed Land Surveyor
The Department of Survey and Mapping Malaysia shall check the submission by the Licensed Land Surveyor via the JUPEM2U system. Any queries shall be directed to the Licensed Land Surveyor. The Licensed Land Surveyor is expected to rectify any errors before the certified plan is to be approved by the Department of Survey and Mapping Malaysia.

2.7 Department of Survey and Mapping Malaysia to Approve Certified Plan
Upon the fulfillment of the checking process, the Chief Surveyor of the Department of Survey and Mapping Malaysia shall approve the Certified Plan and notify the Licensed Land Surveyor via the JUPEM2U system. Department of Survey and Mapping Malaysia shall also submit a B1.tif file for the purpose of registering the Final Title to the Land Office upon the approval of the Certified Plan.

2.8 Licensed Land Surveyor to Submit Claims to Land Surveyors Board
Upon the approval of the certified plan by the Department of Survey and Mapping Malaysia, the Licensed Land Surveyor shall submit his claim to Land Surveyors Board via the e-LJT system. The approved Certified Plans shall be attached with the claim as evidence that the job has been completed and approved.

2.9 Land Surveyors Board to Disburse Title Survey Fees to Licensed Land Surveyor
Upon the receipt of the claim from the Licensed Land Surveyor, the Land Surveyors Board shall disburse the title survey fees to the Licensed Land Surveyor as per sub-regulation 26(7) of the Licensed Land Surveyors Regulations (5). This process shall complete the Malaysian Cadastral Survey Framework.

The workflow of the Malaysian Cadastral Survey Framework is illustrated in **Figure 1**.

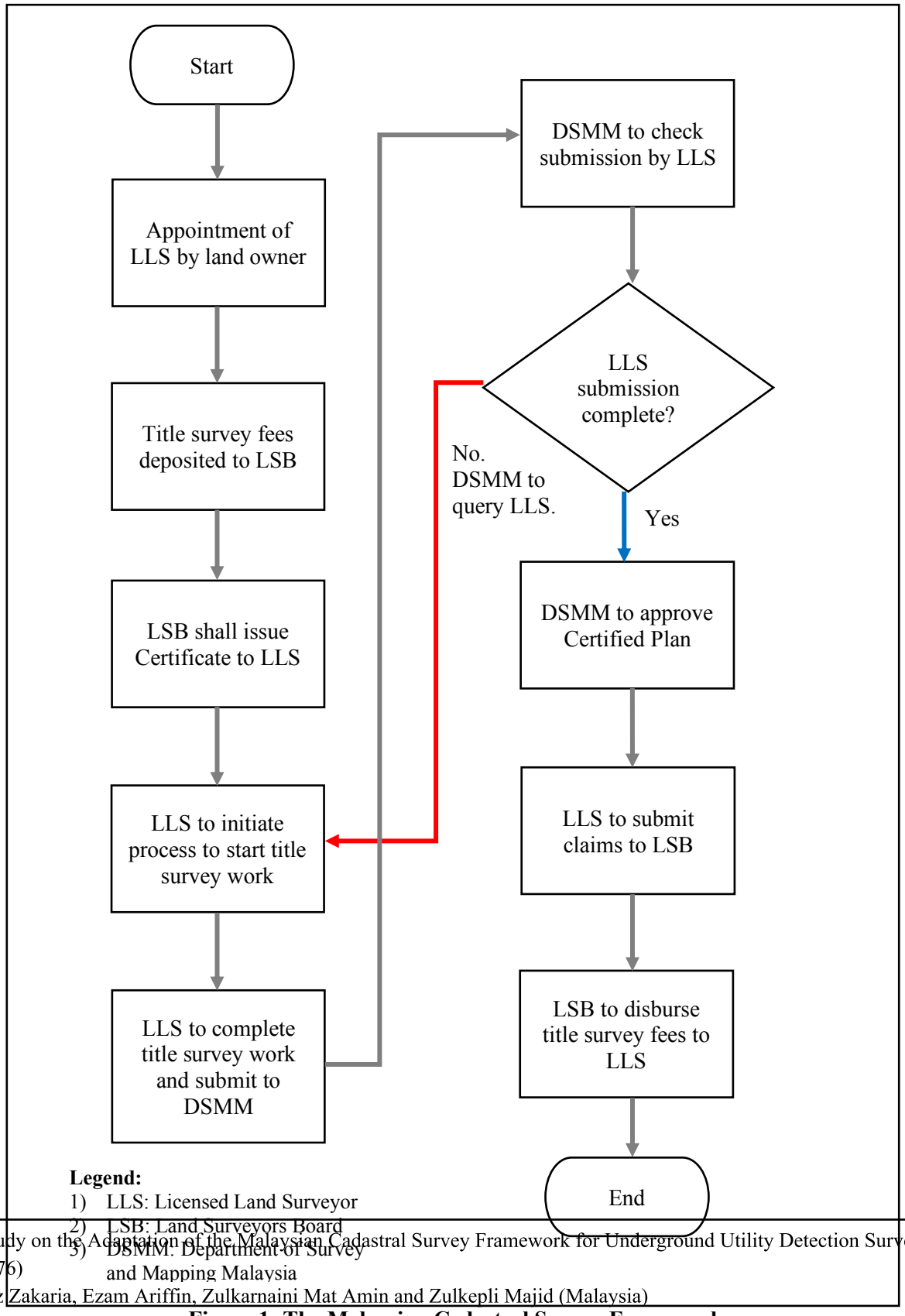

Figure 1: The Malaysian Cadastral Survey Framework

3. Methodology in Developing the Malaysian Underground Utility Detection Survey Framework

An Underground Utility Detection Survey Framework working group was established in April 2021 in order to study the process of adapting the Malaysian Cadastral Survey Framework for Underground Utility Detection Survey practice. The working group was comprised of members of the consultancy panel between the Department of Survey and Mapping Malaysia, the Land Surveyors Board and the Association of Authorized Land Surveyors of Malaysia (PEJUTA).

The Department of Survey and Mapping Malaysia was represented by the Director General and the Head of the Utility Division. The Land Surveyors Board was represented by the Secretary and Deputy Secretary while PEJUTA was represented by the President and the Head of the Underground Utility Detection Survey Committee. These three professional bodies are part of the stakeholders of the utility survey, other than the utility owners.

A series of five online discussions were carried out to discuss and deliberate on the subject matter. The final output of the working group is a proposed Malaysian Underground Utility Detection Survey Framework designed within the interest of the Malaysian context.

4. The Proposed Malaysian Underground Utility Detection Survey Framework

The final output by the Underground Utility Detection Survey Framework working group is a workflow of the overall process illustrated in **Figure 2**. The explanation of each process is described as per the numbering of each process in the workflow.

4.1 Appointment of Licensed Land Surveyor by the Utility Owner via State Utility Corridor

The utility owner shall appoint the Licensed Land Surveyor to carry out the Underground Utility Detection Survey and application for a utility installation permit. The Licensed Land Surveyor is required to be registered with the State Utility Corridor as a panel in order to carry out the Underground Utility Detection Survey. This is because the installation of underground utilities within the state and federal reserves are under the jurisdiction of the State Utility Corridor. While the Licensed Land Surveyors community questioned the role and existence of the State Utility Corridor, it was observed and noted that the existence of the State Utility Corridor is due to the commercial interests of the State.

4.2 Site Visit to Review the Suitability of Location by State Utility Corridor, Utility Owner and Licensed Land Surveyor

A site visit shall be conducted in order to study the feasibility of the site to be installed with the underground utilities. The selection of suitable sites shall comply with PLAN Malaysia Guideline number GP006A Planning Guidelines for Underground Utilities.

4.3 The Land Surveyors Board to Check the Competency Status of Licensed Land Surveyors via the CUUDS Register

Since 2012, the Land Surveyors Board has conducted a six-month course to certify Licensed Land Surveyors with a competency certificate in Underground Utility Detection Survey (CUUDS). The Department of Survey and Mapping Malaysia has issued a Circular Letter number 1/2020 (8) to only recognise Underground Utility Detection Survey carried out by Licensed Land Surveyors with the CUUDS certification. The purpose of this instruction is to regulate and maintain the quality of Underground Utility Detection Survey practice.

4.4 Utility Owner to Deposit Underground Utility Detection Survey Fees at State Utility Corridor

The utility owner shall then deposit the Underground Utility Detection Survey fees at the State Utility Corridor as a guarantee of payment to the Licensed Land Surveyor appointed for the job. While it is of

interest for the Licensed Land Surveyor to have the fees deposited at the Land Surveyors Board similar to the cadastral survey framework, there is no enabling clause for this to be implemented for the Underground Utility Detection Survey process. Furthermore, the Underground Utility Detection Survey fees have yet to be approved and gazetted by the Ministry of Finance, Malaysia.

However, the Sabah Licensed Land Surveyors have managed to pass a regulation whereby their Underground Utility Detection Survey fees are to be deposited to the Sabah Land Surveyors Board, similar to the process of depositing Title Survey fees (Sabah Surveyors Regulations, Table 13G)

4.5 Licensed Land Surveyor to Check Existing Survey Data at Department of Survey and Mapping Malaysia PADU Prior to Start of Underground Utility Detection Survey

The Licensed Land Surveyor shall check the existing Underground Utility Detection Survey of the surrounding area to be surveyed prior to the start of work. The Licensed Land Surveyor shall refer to PADU (Underground Utility Survey Database) for information.

4.6 Licensed Land Surveyor to Notify the Department of Survey and Mapping Malaysia Prior to the Start of the Underground Utility Detection Survey

The Licensed Land Surveyor shall notify the Department of Survey and Mapping Malaysia prior to the start of the Underground Utility Detection Survey in order to indicate that there is a new survey to be carried out and that the PADU (Underground Utility Survey Database) shall be updated.

4.7 Department of Survey and Mapping Malaysia to Issue Notification to Licensed Land Surveyor to Start Underground Utility Detection Survey

Upon the receipt of notification by the Licensed Land Surveyor, the Department of Survey and Mapping Malaysia shall issue a notification to proceed with the survey.

4.8 Licensed Land Surveyor to Start Survey in Quality Level B and Submit Data to State Utility Corridor

The Licensed Land Surveyor shall carry out the Underground Utility Detection Survey in Quality Level B (DSMM, Circular No. 1/2007) and submit the data to the State Utility Corridor. The State Utility Corridor shall then prepare the survey data and submit it to the consultant engineers to design the utility alignment.

4.9 State Utility Corridor to Apply for Wayleave Permit from Local Authorities

The State Utility Corridor shall apply for the wayleave permit from the local authorities prior to the installation of the utilities by the utility's contractor.

4.10 State Utility Corridor to Apply for Work Permit from Related Agencies

The State Utility Corridor shall apply for a work permit from the related agencies such as the Public Works Department prior to the installation of the utilities by the utility's contractor.

4.11 Utility Contractor to Install Utility. Underground Utility Detection Survey to be Carried Out as Due Diligence.

Upon the approval of the wayleave and work permit, the utility contractor shall install the underground utilities. The due diligence to carry out the Underground Utility Detection Survey prior to the installation of the utilities lies upon the contractor since there is a possibility of an error during the survey carried out by the Licensed Land Surveyor in the initial stage.

4.12 As-built of Underground Utility Detection Survey for Installed Utility by Licensed Land Surveyor

The Licensed Land Surveyor shall carry out the as-built Underground Utility Detection Survey for the installed utilities. This survey data shall then be uploaded to PADU (Underground Utility Survey Database) as the final survey data to ensure that PADU is up to date.

There are many options to carry out the as-built survey. The authors proposed that the Licensed Land Surveyor be the professional witness during the utility installation process. Prior to burying the utilities, the Licensed Land Surveyor shall pick up the positions of the utilities by using the RTK GPS method. Hence, the utility survey is to be carried out as a typical engineering survey with a higher degree of accuracy and reduced cost compared to the Underground Utility Detection Survey.

4.13 Licensed Land Surveyor to Submit Underground Utility Detection Survey As-Built Data to the Department of Survey and Mapping Malaysia

The Licensed Land Surveyor shall submit the as-built survey data to the Department of Survey and Mapping Malaysia as per the requirement of the Department of Survey and Mapping Malaysia Circular number 2/2016.

4.14 Department of Survey and Mapping Malaysia to update PADU and notify Acceptance of data to Licensed Land Surveyor

The Department of Survey and Mapping Malaysia shall notify the Licensed Land Surveyor that the Underground Utility Detection Survey as-built data is being accepted. The Licensed Land Surveyor shall prepare and submit his claims to the State Utility Corridor. The as-built data shall then be updated to PADU (Underground Utility Survey Database).

As a condition for the approval of the Certificate of Practical Completion (CPC), the working group has proposed that the submission of as-built data to PADU is to be made mandatory for the utility contractor. Failing to do so may affect the contractor's claims and completion of the project. Furthermore, this process is the only guarantee that the PADU database shall be updated as per the mandate of the Malaysian Cabinet dated 24th August 1994.

4.15 Department of Survey and Mapping Malaysia to Notify State Utility Corridor that Underground Utility Detection Survey is Completed and Data Uploaded to PADU

The Department of Survey and Mapping Malaysia shall notify the State Utility Corridor that the Licensed Land Surveyor has submitted the as-built Underground Utility Detection Survey data. This serves as a checking mechanism and notification prior to the release of payment by the State Utility Corridor to the Licensed Land Surveyor.

4.16 State Utility Corridor to pay Licensed Land Surveyor for completion of Underground Utility Detection Survey

The State Utility Corridor shall pay the Licensed Land Surveyor upon the receipt of his invoice. This process shall complete the Underground Utility Detection Survey Framework.

The workflow of the proposed Malaysian Underground Utility Detection Survey Framework is illustrated in **Figure 2**.

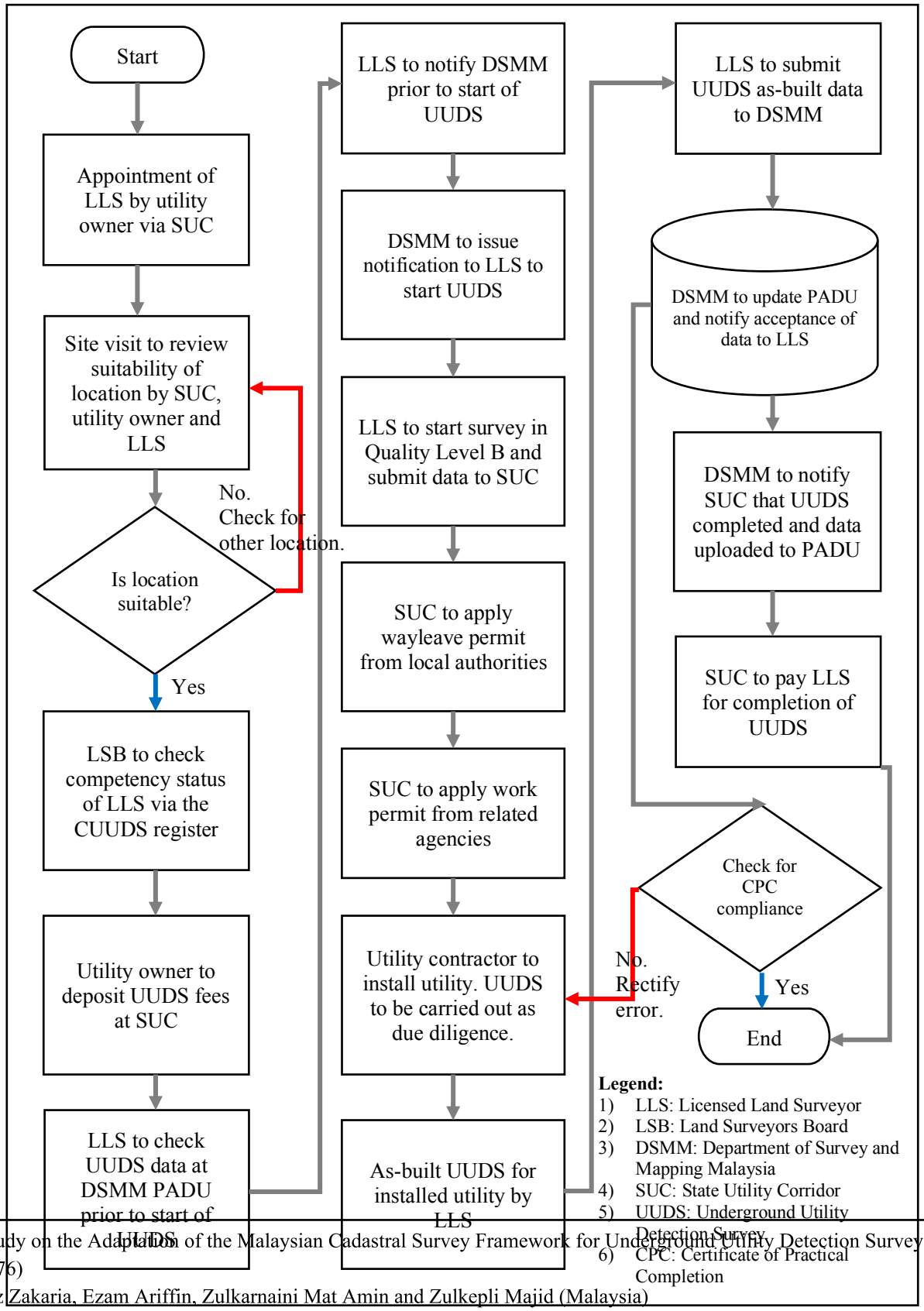

Figure 2: The Proposed Underground Utility Detection Survey Framework

5. Issues in Implementing the Underground Utility Detection Survey Framework

The main challenge faced by the working group in implementing the Underground Utility Detection Survey Framework is the enabling clause to justify the presence of the Underground Utility Detection Survey itself. Surprisingly, the Licensed Land Surveyors Act 1958 (Act 458) (5) does not define other types of survey other than Title Survey. In order to implement the Underground Utility Detection Survey Framework, the Licensed Land Surveyors Act 1958 (Act 458) has been amended and current is waiting to be debated and approved by the Malaysia Parliament.

Further to the amended Licensed Land Surveyors Act 1958 (Act 458)(5), the Licensed Land Surveyors Regulations need to be revised and to include Underground Utility Detection Survey as part of the duties of Licensed Land Surveyors.

Finally, a scale of fees for the Underground Utility Detection Survey needs to be established and gazetted by the Ministry of Finance of Malaysia.

Due to the three issues mentioned above, the Underground Utility Detection Survey Framework was modified and issued as a workflow by the Department of Survey and Mapping Malaysia and distributed to the Ministries and Government Agencies on 30th September 2021.

6. Conclusion

The proposed Malaysian Underground Utility Detection Survey Framework shall be a significant contribution to the Geomatics and Land Surveying profession. This framework shall ensure that:

a) The PADU database (Underground Utility Survey Database) is being updated with the compulsory submission of Underground Utility Detection Survey data to the Department of Survey and Mapping Malaysia by the Licensed Land Surveyors. This is to fulfill the mandate of the Malaysian Cabinet (DSMM, Circular 1/2006). The Department of Survey and Mapping Malaysia shall act as the custodian of the National Underground Utility Detection Survey data without any cost incurred by the Department in collecting the data.
b) The Underground Utility Detection Survey practice is being properly regulated in terms of professional survey fees. To date, the Underground Utility Detection Survey fees have yet to be gazetted. Due to the high-risk nature of the survey, it is incumbent that a regulated fee is being established in order to develop the profession and protect the Licensed Land Surveyors.
c) In the long run, the proposed Malaysian Underground Utility Detection Survey Framework is expected to financially benefit the utility owners and Licensed Land Surveyors by reducing the role of State Utility Corridors. The essence of the proposed framework is that the complete cycle of the Underground Utility Detection Survey is achievable without the presence of the State Utility Corridors.

In conclusion, the authors anticipate that with the gazettement of the amended Licensed Land Surveyors Act, the Underground Utility Detection Survey Framework may be implemented. The framework shall be a game changer in the industry and shall benefit the utility stakeholders in general and the Licensed Land Surveyors in particular.

Acknowledgement
The authors would like to express gratitude and appreciation for the support of the Association of Authorised Land Surveyors Malaysia (PEJUTA), Land Surveyors Board Malaysia and the Department of Survey and Mapping Malaysia in preparing for this paper.

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