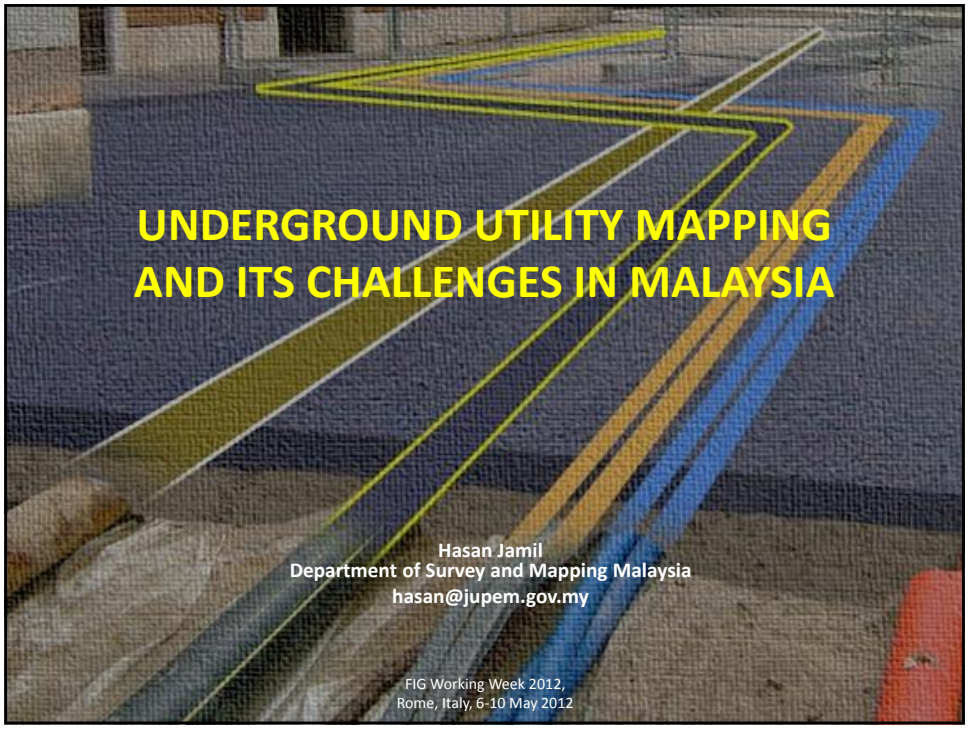
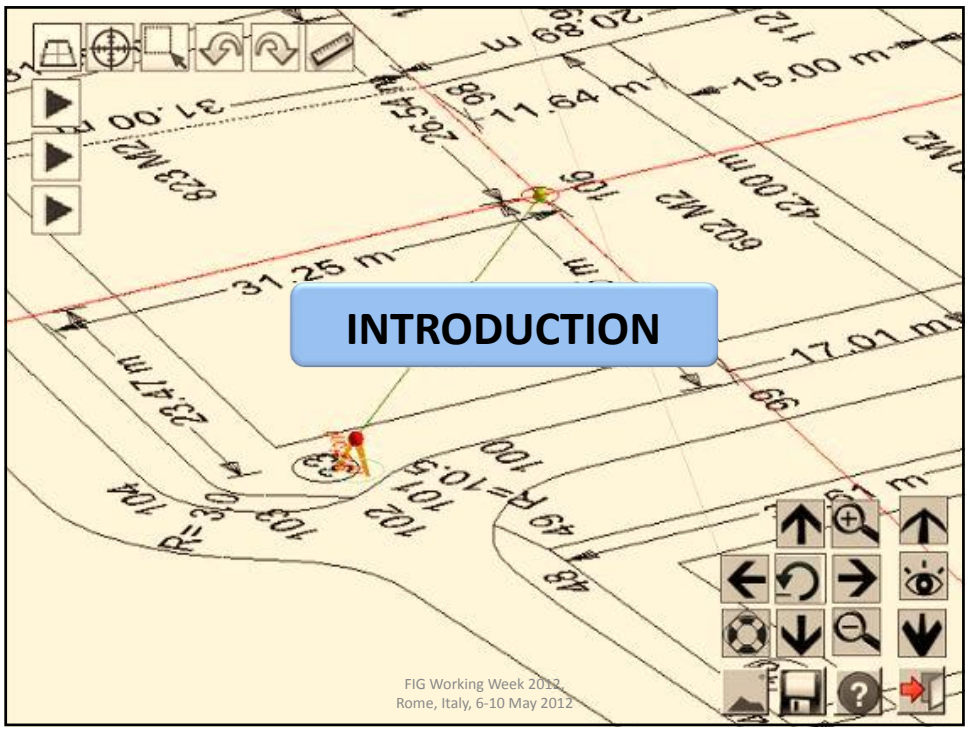


PRESENTATION OUTLINE

- Introduction
- The Role of JUPEM
- Issues and Challenges
- Development and Directions
- Conclusion

FIG Working Week 2012,
Rome, Italy, 6-10 May 2012



Real Scenario

Three killed in Texas gas pipe explosion – Telegraph online news - 7 June 2010

An underground natural gas pipeline exploded in rural Texas killing three people and leaving 10 others missing.

Official said it was believed workers had accidentally hit pipeline while digging.

FIG Working Week 2012,
Rome, Italy, 6-10 May 2012

WHAT WOULD A DISASTER CONTROLLER AND RESCUER DO IN SUCH SITUATION?

- Turning off valves feeding gas to the section
- What sections?
- Route of pipelines? Pipelines criss-crossing
- Where are the valves located?
- Existence of other utilities nearby?
- Utility maps? Is there any?

WHAT CAN BE LEARNED FROM SUCH ACCIDENT?

- Need Accurate Utility Map
- Where to Get It?
- Which Authority In Charge?

POSSIBLE REASONS THAT LEAD TO DISASTER

- Information on utility position not adequate
- Information (utility map)not accurate
- Utility maps not up-to-date
- No utility maps available
- Faulty equipment
- Careless
  - misleading information
  - misunderstood information

MAP OF MALAYSIA

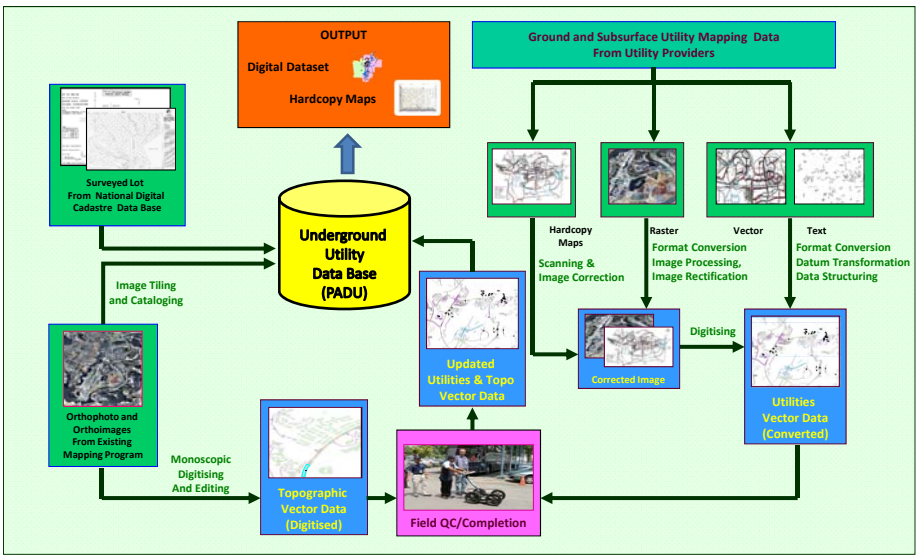
NEED FOR ACCURATE & RELIABLE INFORMATION

- JUPEM – government agency for cadastral and mapping in Malaysia
- Entrusted by the government to compile and manage underground utility information
- Due to frequent disruption of services caused by damage to underground utilities
- Damage due to unknown location and depth of underground utilities

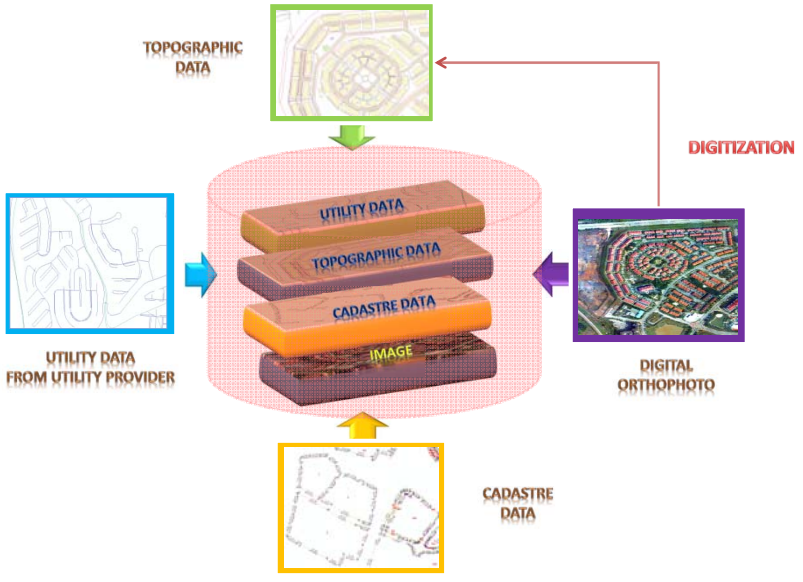
UNDERGROUND UTILITY DATA

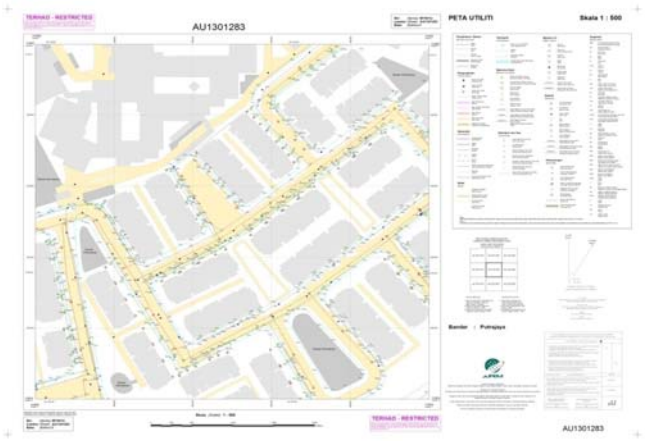
- Electricity Cables - Tenaga Nasional Bhd
- Telecommunication - Telekom Malaysia Bhd
- Water - SYABAS
- GAS - Gas Malaysia Sdn. Bhd
- Sewerage - Indah Water Konsortium Sdn. Bhd

DATAFLOW FOR UNDERGROUND UTILITY MAPPING



NATIONAL UNDERGROUND UTILITY DATABASE (PADU)





Example of JUPEM Utility Map

An 1:500 scale utility map showing position of utilities and important topographic features with centimetre accuray

UTILITY MAPPING GUIDELINES

- 2 Circulars developed through consensus of Technical Committee for Underground Mapping
  - Circular KPUP 1/2006 – describes the roles of stakeholders, quality levels in utility mapping, way of obtaining utility information, deliverables and the national underground utility database (PADU) maintained by JUPEM
  - Circular KPUP 1/2007 – provides surveyors with the recommended technique and practice for the execution of utility detection for quality level A and B

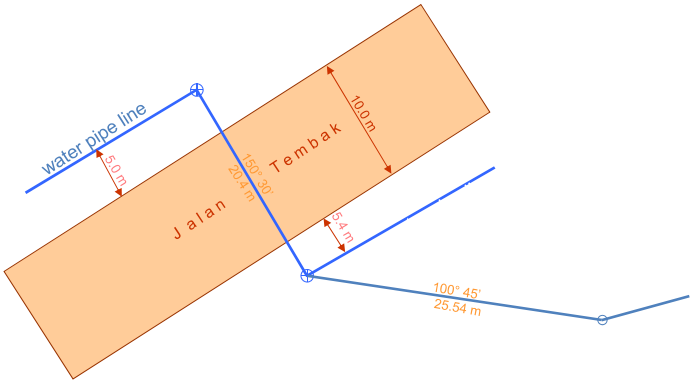
JUPEM

QUALITY LEVEL D

- The position of buried utilities based on design plans or sketches
- For utilities where quality level is not known
- Lowest quality level

QUALITY LEVEL C

- Better than quality level D
- The position or alignment of buried utilities determined from surface features



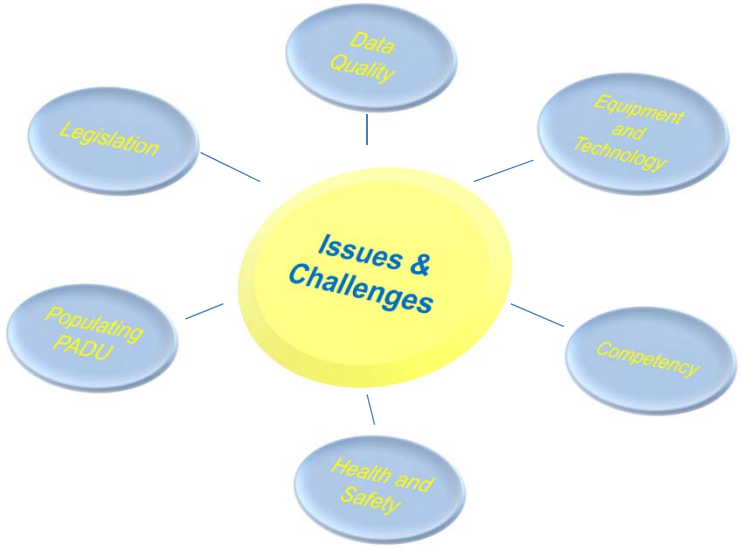
QUALITY LEVEL B

- Better than quality level C
- The position of buried utilities is determined and marked on the surface by geophysical methods
- The position of the marks is surveyed to the accuracy of 10 cm

QUALITY LEVEL A

- Better than quality level B
- The position of buried utilities is determined by exposing the utilities by intrusive excavation methods at specific locations
- The horizontal and vertical location is surveyed reference to the approved datum
- The position of utilities is surveyed during installation
- Survey done to the accuracies at 10 cm or better
- Highest quality level

ISSUES & CHALLENGES IN UTILITY MAPPING



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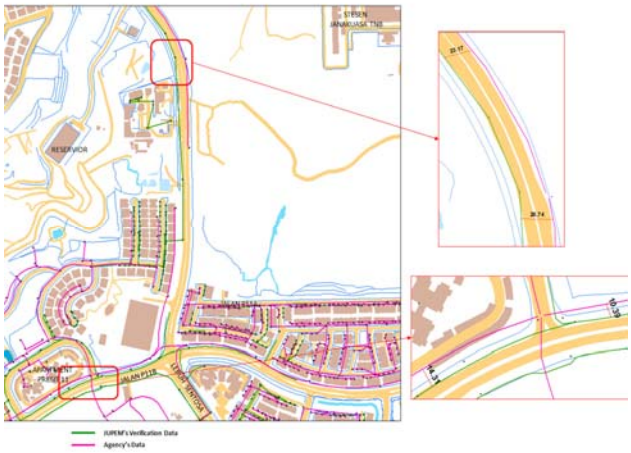
DATA QUALITY

- Getting accurate data from utility providers :
  - Data quality varies based on providers specification and accuracy requirements
  - Mostly provided are proposed/design/schematics plans rather than as-built plans
  - Data not properly kept and updated
  - No survey done during installation
  - No requirement (by law) to provide accurately surveyed endorsed plan

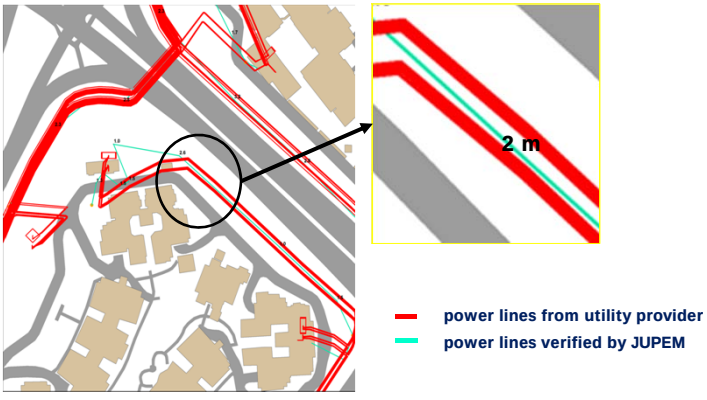
DATA QUALITY

- Regulatory bodies governing utility providers, eg. MCMC and SPAN
  - Have own requirements and guidelines



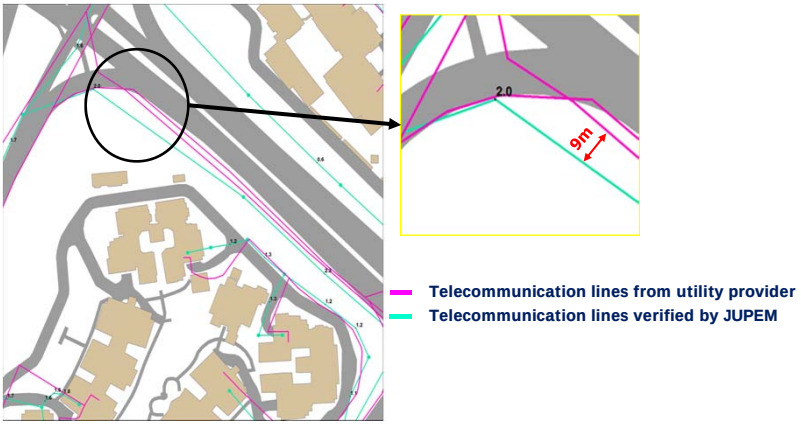
Example of inaccurate data

Comparison made between utility provider's data and JUPEM verified data on a 1:500 scale topographic map indicates large positioning differences and utilities drawn on the wrong side of the road in some places



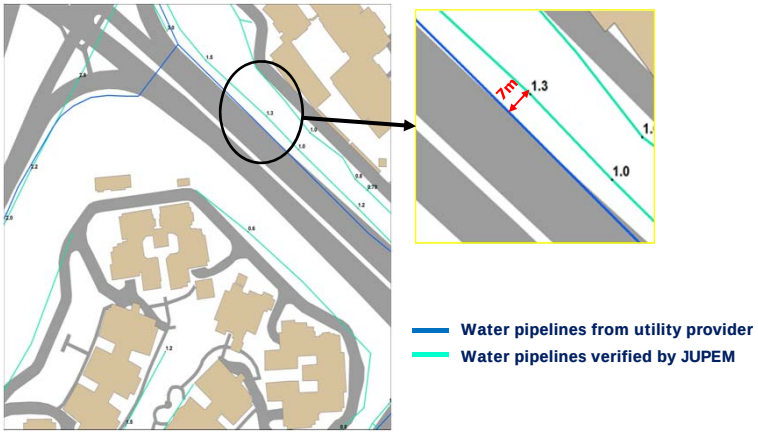
Example of inaccurate data

Comparison made between utility provider's data and JUPEM verified data on a 1:500 scale topographic map indicates a positioning difference of up to 2 meters in certain places



Example of inaccurate data

Comparison made between utility provider's data and JUPEM verified data on a 1:500 scale topographic map indicates a positioning difference of up to 9 meters in certain places

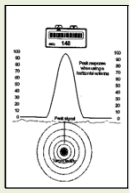


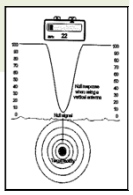
Example of inaccurate data

Comparison made between utility provider's data and JUPEM verified data on a 1:500 scale topographic map indicates a positioning difference of some 7 meters in certain places

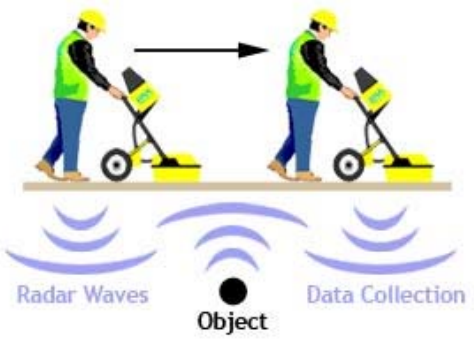
EQUIPMENT AND TECHNOLOGY

- Technology available but may not be able to provide accurate underground information
- Advantages and disadvantages of detection technology
- Proper equipment calibration required
- Equipment cost
- Limitations

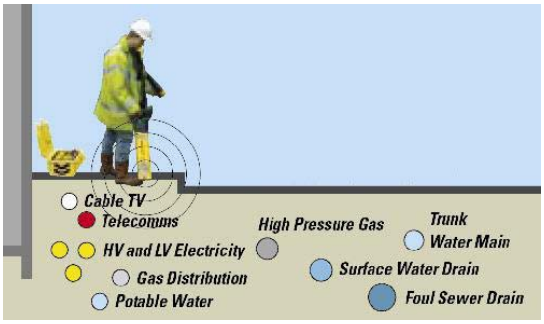




GROUND PENETRATING RADAR (GPR)



ELECTROMAGNETIC LOCATOR (EML)



COMPETENCY IN UTILITY MAPPING

- Keeping land surveyors abreast with latest knowledge on:
  - Equipment
  - Detection and surveying technique and limitation
  - Coordinate systems
  - Reference datum
  - Liability

COMPETENCY IN UTILITY MAPPING

- Understanding of laws and requirements.
- Understanding of health and safety aspect (OSHA, 1994) of practice:
  - Risk and failure to observe precaution

LEGISLATION ON UNDERGROUND UTILITY MAPPING

- No depository centre sanction by law for utility mapping - that requires compliancy
- No one party specified by law is responsible for compiling and safe keeping all utility data
- Utility mapping is the responsibility of every utility provider to acquire and to safe keep

JUPEM

LEGISLATION ON UNDERGROUND UTILITY MAPPING

- JUPEM (through cabinet decision) is given the responsibility of compiling and manage underground utility data for the purpose of data sharing
  - Acting as a depository centre
  - Sharing on voluntary basis

AVAILABLE ACT

- Street, Drainage and Building Act 1974 (Act 133)
  - Silent on mandatory requirement for utility mapping
  - Gives power to government to impose condition necessary
  - Condition set local government – for eg. submission of “as-built survey plan” upon completion of any project
  - Good source for updating database but no requirement to channel this information to any party

AVAILABLE ACT

- Lack of legal requirement to provide accurate data main cause of difficulties in collecting, sharing, contributing and maintaining of data

DEVELOPMENT AND DIRECTIONS IN UTILITY MAPPING

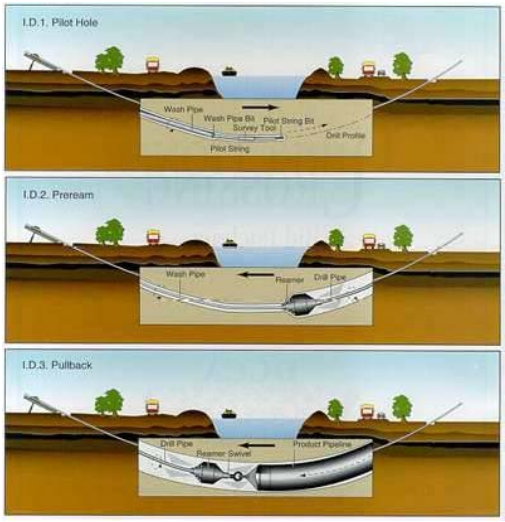
INVOLVEMENT OF LAND SURVEYOR

- All newly laid utilities to be surveyed during installation
- Preparation of as-built utility plans
- Submission to PADU
- Existing underground utilities to be detected using EML and GPR techniques in accordance to guidelines set by JUPEM

INVOLVEMENT OF LAND SURVEYOR

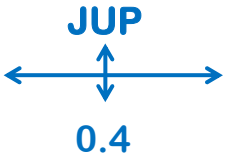
Use of gyro-based inertia measurements systems for utilities installed by Horizontal Directional Drilling (HDD) techniques

HORIZONTAL DIRECTIONAL DRILLING (HDD)



STANDARD CODES & MARKING

- Development of Malaysian Standard 1759 – Geographic Information/Geomatics Feature and Attribute Codes.
- to be used for all utility and topography (road furniture) data submitted by land surveyors
- to enable data sharing among various agencies



STANDARD CODES & MARKING

- In development ……..
  - guidelines for survey of utilities during installation
  - standard markings and colour codes to depict the location of all underground utilities at site

KNOWLEDGE ACQUISITION

- Knowledge in utility mapping involves 2 major disciplines
  - Geomatics
  - Geophysics
- Developing expertise at tertiary level educations by institution of higher learning.
- Introduce as part of syllabus for geomatic undergraduate studies (UiTM, USM) and master program (UTM)

SHORT COMPETENCY COURSES AND ACCREDITATION

- Short professional courses leading to certificate of competency in utility mapping being conducted by Land Surveyors Board (LJT) for the licensed land surveyors

TRAINING AND RESEARCH

- Parties collaborating with universities in conducting training and research on:
  - Technical aspect
  - Policy and law (formulation and implementation of sustainable and innovative policy)

STANDARD RATES FOR UTILITY MAPPING

- No standard rates for underground utility survey
- Unhealthy practice may lead to sub-standard work quality and inferior results
- Appropriate and standard rates have been introduced for utility detection work and as-built survey during utility installation (initiative by JUPEM, PEJUTA and LJT)

STUDIES ON LEGISLATION

- No Act currently on utility mapping
- Street, Drainage and Building Act 1974
  only Act that governs utility facilities but is silent on the requirement of utility mapping
- Utility Act requiring all utility providers to update their database with accurate and reliable underground utility information and submission to PADU is needed. JUPEM to focus on large scale base map
- Studies on legislation for efficient system of information exchange between all parties involve

IN SUMMARY

- JUPEM is in the process to develop national underground utility database

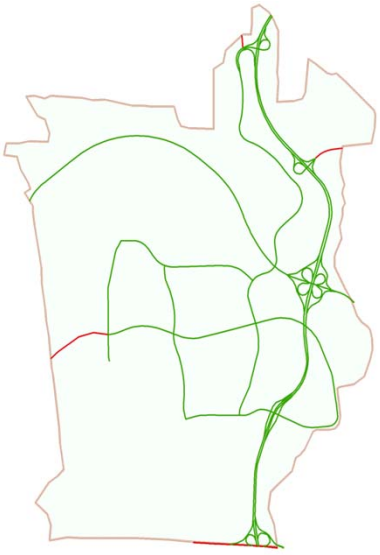
PROGRESS

PROGRESS OF PUTRAJAYA

PUTRAJAYA

Progress : 98%
(Main Road - 106km)

PROGRESS OF CYBERJAYA



CYBERJAYA

Progress : 95%
(Main Road - 58km)

IN SUMMARY

- Accuracy and quality of data
  not reliable for planning and excavation works
- Data quality, competency and legislation on utility mapping
  critical requirements and biggest challenge
- Engagement of land surveyors in utility mapping
  appropriate for quality products

Look Forward To Meet You In Kuala Lumpur, June 2014

XXV FIG Congress
KUALA LUMPUR 2014
Fédération Internationale des Géomètres
International Federation of Surveyors
Internationale Vereinigung der Vermessungsingenieure

Thank you for your attention ....