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GEOSPATIAL APPLICATION FOR WATER SUPPLY

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BERJAYA TIMES SQUARE HOTEL , KUALA LUMPUR

18 OCTOBER 2016

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INTRODUCTION

WHAT IS GEOSPATIAL TECHNOLOGIES?

- Is the range of modern tools contributing to the geographic mapping and analysis of the Earth and human societies.
- Airborne photo/satellite imagery allowed image capturing of the Earth's surface and human activities with certain limitations.
- Computers allowed storage and transfer of imagery together with the development of associated digital software, maps, and data sets on socioeconomic and environmental phenomena, collectively called geographic information systems (GIS).

WHAT IS GEOSPATIAL TECHNOLOGIES?

- GIS assemble the range of geospatial data into a layered set of maps which allow complex themes to be analyzed and then communicated to wider audiences. This ‘layering’ is enabled by the fact that all such data includes information on its precise location on the surface of the Earth, hence the term ‘geospatial’.

- In the last decade, satellite technologies have evolved into a network of national security, scientific, and commercially operated satellites complemented by powerful desktop GIS. High quality hardware and data is now available to new audiences such as universities, corporations, and non-governmental organizations.

- The fields and sectors deploying these technologies are currently growing at a rapid pace, informing decision makers on topics such as industrial engineering, biodiversity conservation, forest fire suppression, agricultural monitoring, humanitarian relief, and much more.

TYPE OF GEOSPATIAL TECHNOLOGY

- **Remote Sensing**: imagery and data collected from space- or airborne camera and sensor platforms. Some commercial satellite image providers now offer images showing details of one-meter or smaller, making these images appropriate for monitoring humanitarian needs and human rights abuses.
- **Geographic Information Systems (GIS)**: a suite of software tools for mapping and analyzing data which is georeferenced (assigned a specific location on the surface of the Earth, otherwise known as geospatial data). GIS can be used to detect geographic patterns in other data, such as disease clusters resulting from toxins, sub-optimal water access, etc.

TYPE OF GEOSPATIAL TECHNOLOGY

- **Global Positioning System (GPS)**: a network of U.S. Department of Defense satellites which can give precise coordinate locations to civilian and military users with proper receiving equipment (note: a similar European system called Galileo will be operational within the next several years while a Russian system is functioning but restricted).
- **Internet Mapping Technologies**: software programs like Google Earth and web features like Microsoft Virtual Earth are changing the way geospatial data is viewed and shared. The developments in user interface are also making such technologies available to a wider audience whereas traditional GIS has been reserved for specialists and those who invest time in learning complex software programs.

GEOSPATIAL APPLICATIONS IN WATER SUPPLY

GIS can be applied in the various sub-fields of the following areas:

- Water Resource Planning, Monitoring and Forecasting
- River Basin Planning and Management
- Monitoring of River Basin for Pollution
- Dam Safety Monitoring
- Planning, Management & Operation of the Water Supply System
- Asset Management
- Non-Revenue Water Programme
- Water Quality Monitoring of Distribution System

ADVANTAGE OF USING GIS

- Lowering operation and maintenance cost by adopting preventive maintenance practices.
- Increasing revenue
- Improving services to customer in terms of quality, achieving public participation and customer satisfaction.
- Development of hydraulics models fulfilling the various requirement such as variations in nodal demands, adding new pipelines to serve newly developing areas etc;
- Searching other alternatives of water that can be turned into useful resources of water in adverse condition.

HISTORY OF APPLICATIONS IN WATER SUPPLY

HISTORY OF APPLICATIONS IN WATER SUPPLY

- Early 1980's, Selangor Water Supply Dept. implement Telemetry System for Monitoring Service Reservoir Water Level
- 1990's Lembaga Air Perak Automated Pipeline Mapping System using AutoCad, later on MapInfo
- JICA-JKR Study 1996 Study to map W.P Labuan pipeline using ArcInfo/ArcView
- JKR Study 2005, using ArcView to carryout Distribution System Study
- 2007, JBA implement WP Labuan NRW Control Programme using GIS technology

FINANCIAL ALLOCATIONS FOR GIS RELATED PROJECTS

FINANCIAL ALLOCATIONS : GIS & NRW CONTROL PROGRAMME

9th MP	10th MP	11th MP (estimate)
RM1.08 Billion	RM844 Million	RM500 Million

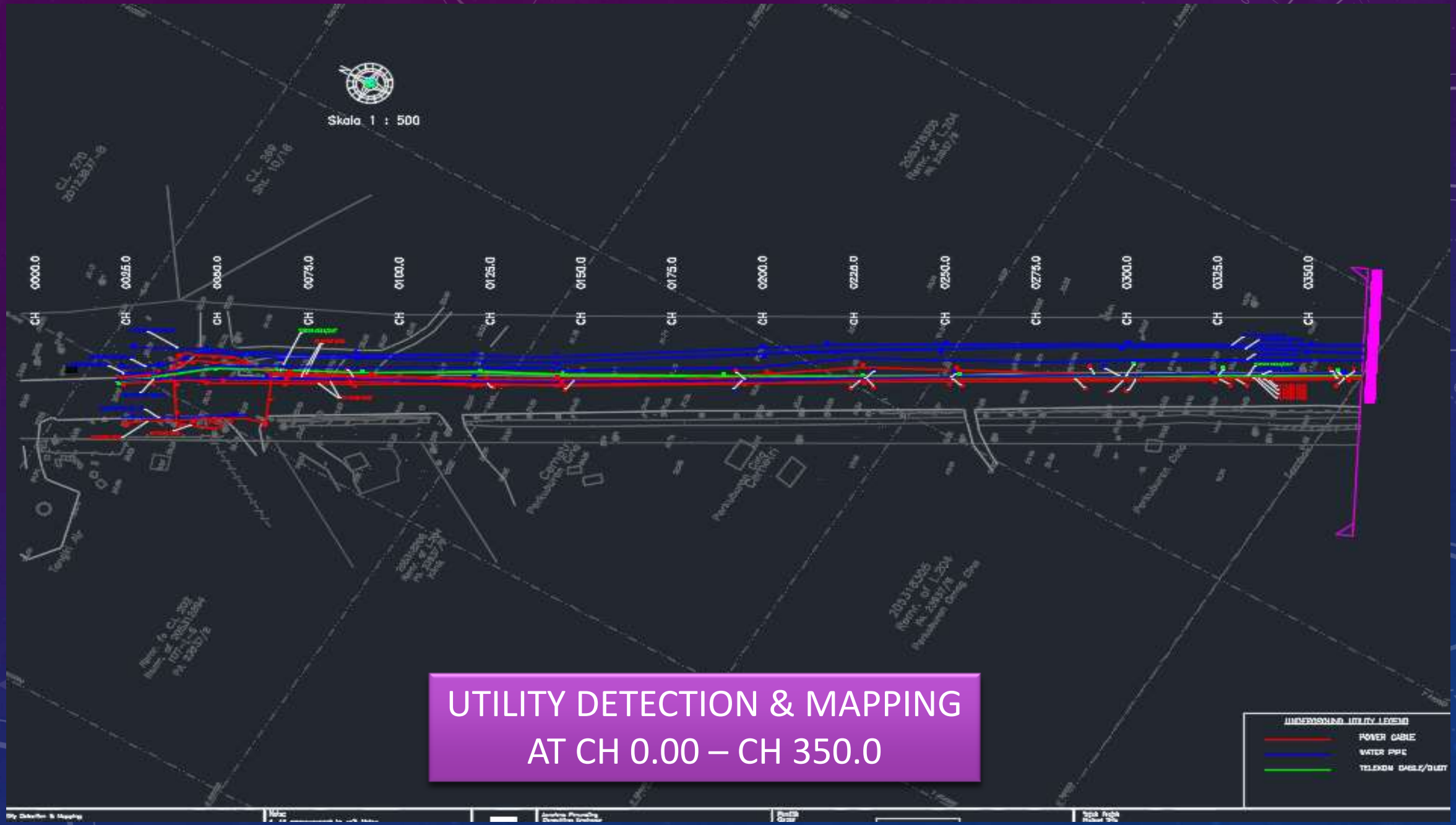
EXAMPLE OF PROJECTS USING GIS SYSTEM

Project Title: Projek Penggantian Paip AC Dari Tangki SGI Ke Kawasan Industri Rancha-rancha Sepanjang 6km Menggunakan Paip MSCL Berukuran 600mm Di WP Labuan.

Method Of Survey: Utilities and Ground Mapping

CURRENT GEOSPATIAL RELATED APPLICATIONS

UTILITY DETECTION & MAPPING AT CHAINAGE A,B AND C AT JALAN RANCHA-RANCHA



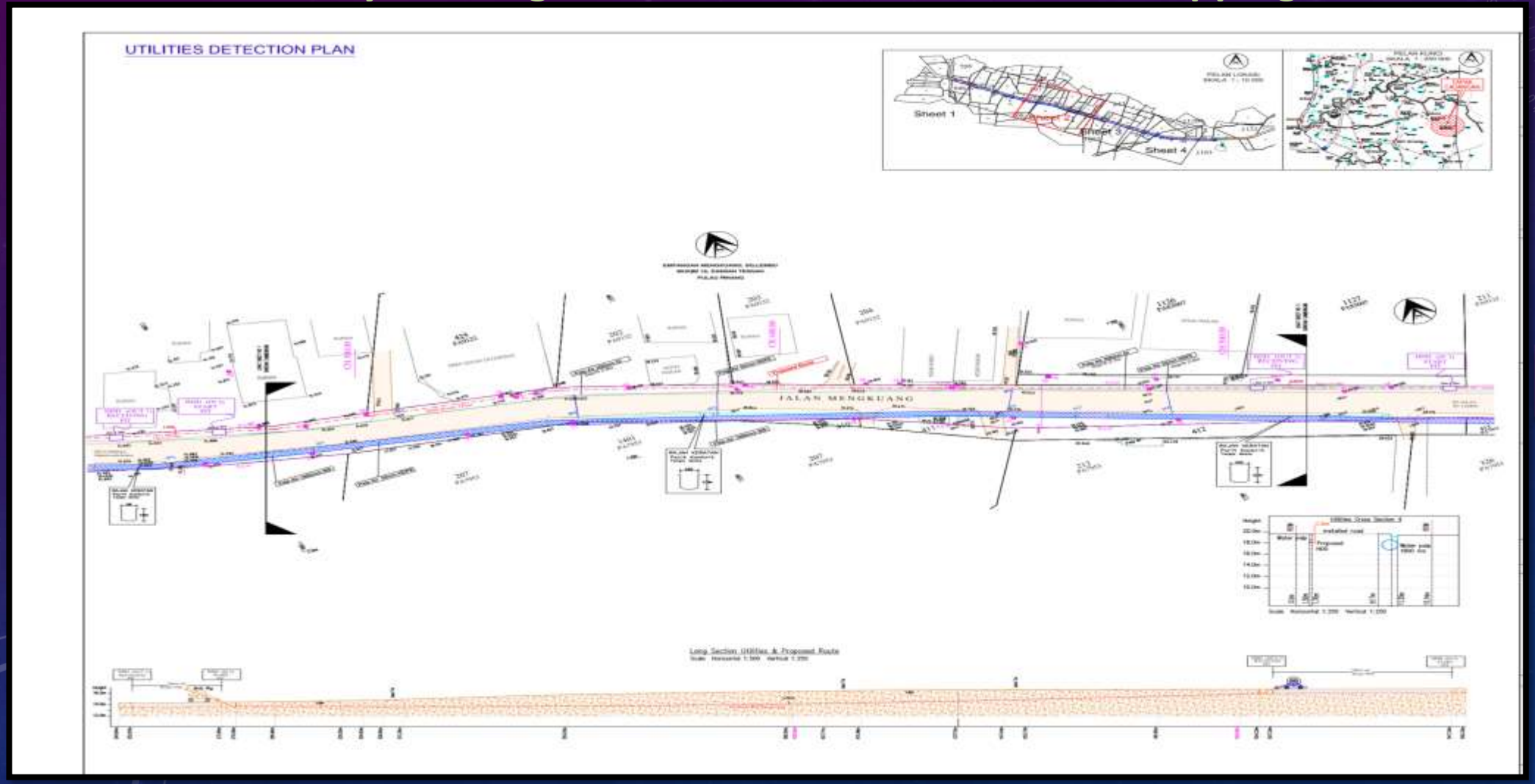
UTILITY DETECTION & MAPPING AT CH 0.00 – CH 350.0

UTILITY DETECTION & MAPPING AT TOWN AREA (PHASE 1A)

EXAMPLE OF PROJECTS USING GIS SYSTEM

Project Title: Cadangan Pembesaran Empangan Mengkuang, Pulau Pinang.

Method Of Survey: Underground Utilities Detection and Mapping



RESULT

RMK-9 PROJECT

Project Title: GIS, SCADA dan SISTEM TELEMETRI NEGERI KELANTAN' Cadangan Merekabentuk dan Menyiapkan Projek GIS Untuk Sistem Bekalan Air Negeri Kelantan Dalam RMK-9'

Project Scope :

- GIS hardware & software
- Software development
- Integration with other softwares
- Digitization of the entire pipe network in Kelantan
- Preparation of data remote sensing and landbase

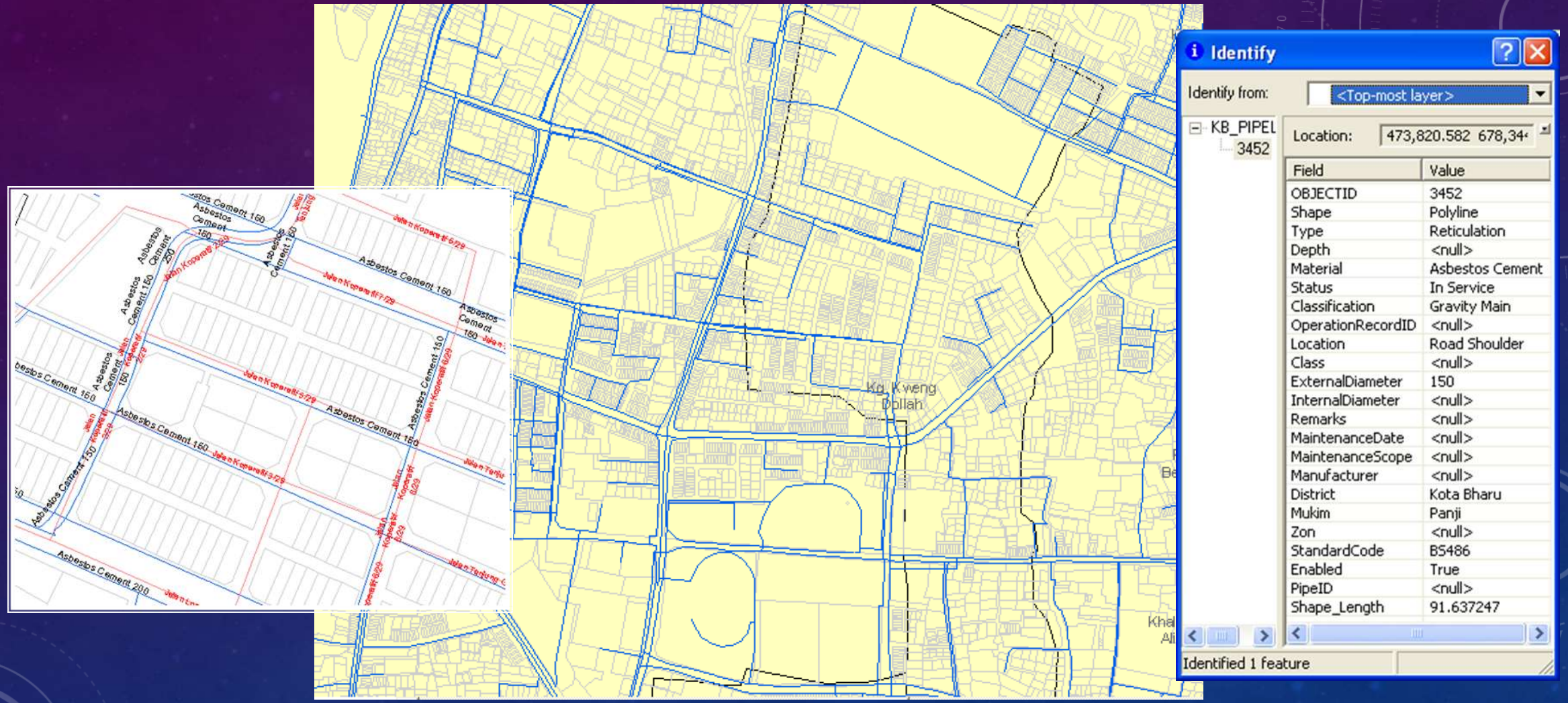
Contract Cost :RM 5,550,793.52

Site Possession Date : 4 Mei 2008

Completion Date: 31 Disember 2010

SUMMARY OF THE OUTCOMES AND RESULTS

DIGITIZATION OF THE ENTIRE PIPE NETWORK



PIPE UTILITY VERIFICATION

VALVE

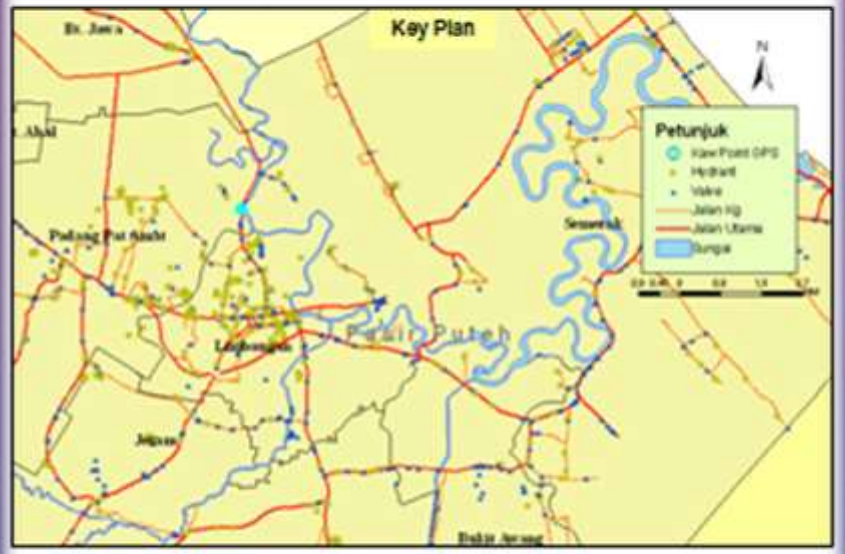
ARSB WATER FACILITIES

FIELD VERIFICATION USING GPS

Observed by: Mohamad Shafiuddin bin Din	Date: 01 Oct 2009
District: Pasir Puteh	

ID	Cassini Kelantan (m)		MRSO (m)		Altitude Ht. (m)
	Easting	Northing (m)	Easting	Northing	
3	24775.22	44044.36	489937.230	647746.765	

Location Description	Jalan D13, Kg. Gong Tasik
Remarks	Keadaan Baik



Detail Location Plan

Photographs

ARSB WATER FACILITIES

FIELD VERIFICATION USING GPS

Observed by: Mohamad Shafiuddin bin Din	Date: 23 Jun 2009
District: Bachok	

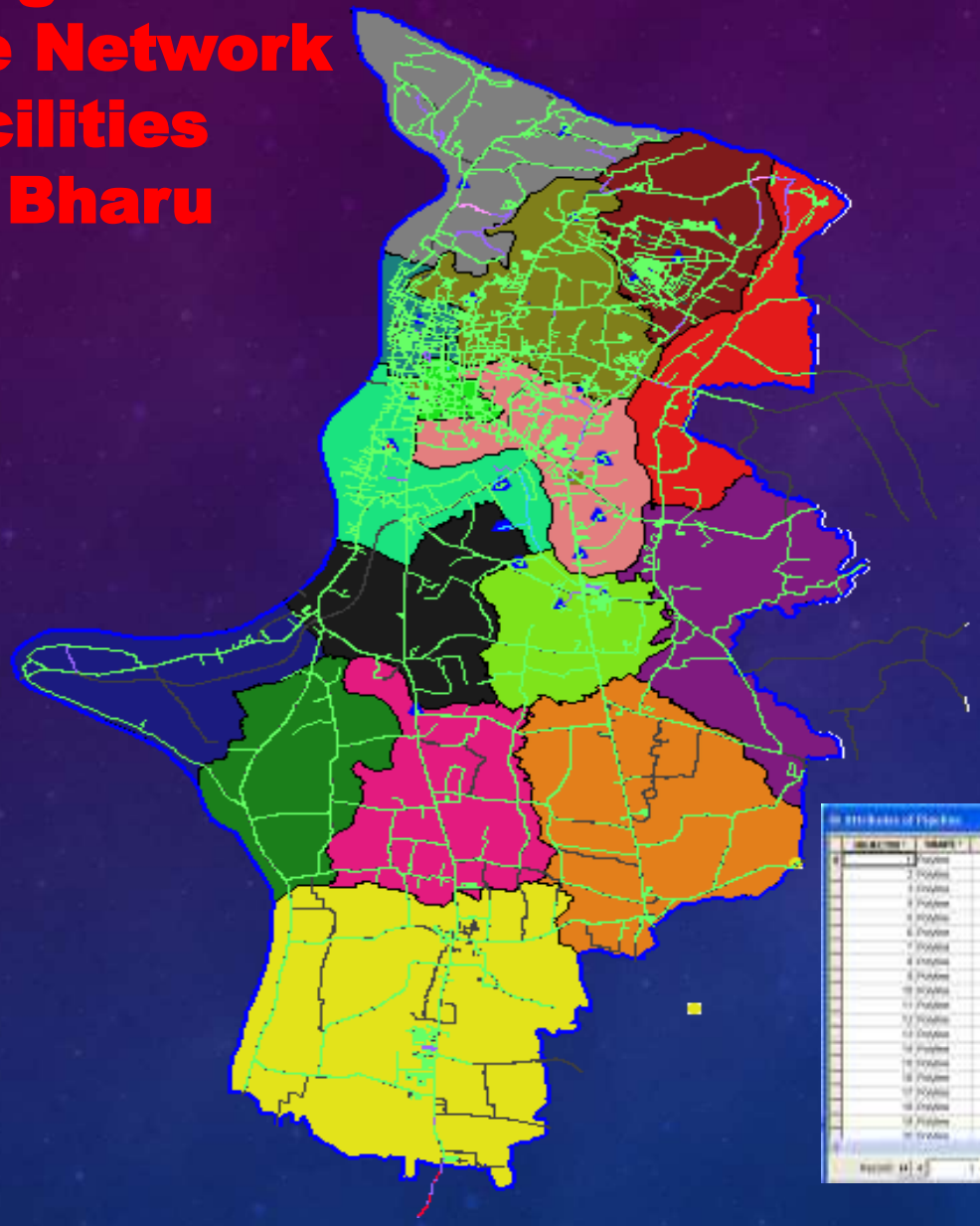
ID	Cassini Kelantan (m)		MRSO (m)		Altitude Ht. (m)
	Easting	Northing (m)	Easting	Northing	
1	18166.9560986	27804.5882927	483382.149955	679609.753256	

Location Description	Jalan Kg. Kubor, Kg. Kubor
Remarks	Keadaan Baik

Detail Location Plan

Photographs

Digitizing Pipeline Network And Facilities In Kota Bharu



Plant = 5

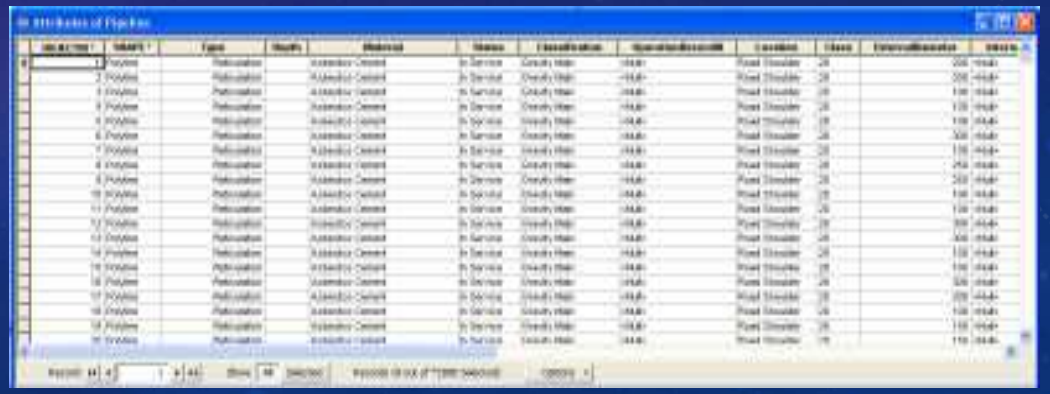
Reservoir = 45

Pipeline = 1363.976 km

Hydrant = 2044

Valve = 3576

Intake = 82



PREPARATION OF DATA REMOTE SENSING & DATABASE

Quickbird Images

SPOT Images

DEM

Rivers and water body

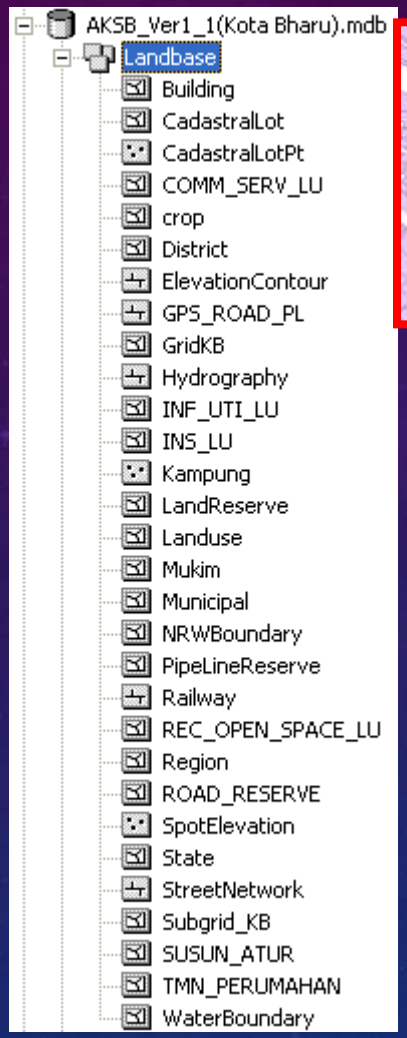
Cadastral lot and Building Foot Print

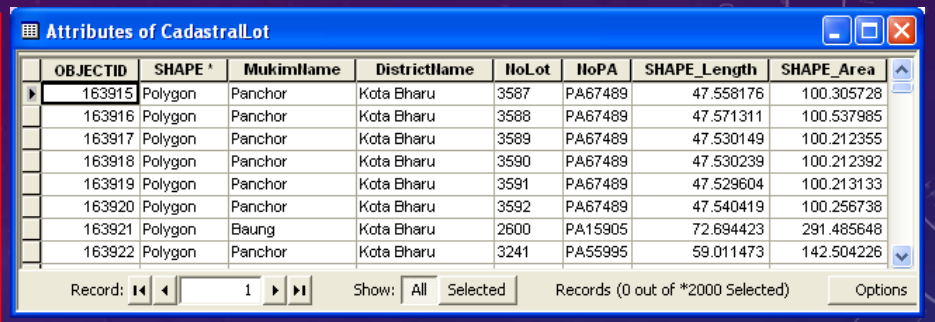
District Boundary

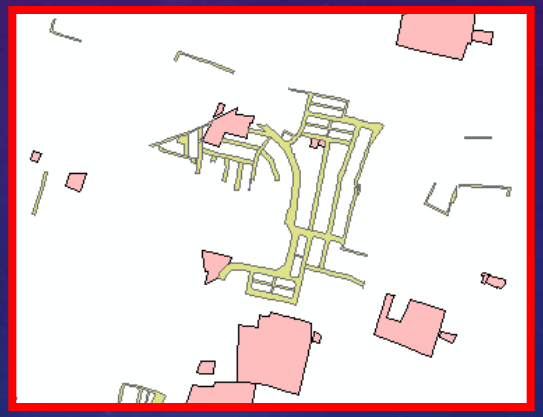
Road and Railways

The use of satellite images and data in GIS landbase is to ensure that the digitization of the network and facilities is exactly the actual site conditions.

LANDBASE DATA







PROJECT TITLE : KAJIAN DAN PENGAMBILAN TANAH BAGI SKIM BEKALAN AIR LEMBANGAN LINGGI (BUNDED STORAGE), NEGERI SEMBILAN

METHOD OF SURVEY: BATHYMETRIC SURVEY

- Bathymetric profiling at 50m x 50m grid line (Figure 1) of the watered portion was carried out over the 7 ponds (Pond 1, 2, 3, 4, 5, 7, and 9). Remaining 3 ponds (Pond 6, 8 and 10) was carried out by method of manual sounding and topographic profiling.
- Continuous echo soundings were carried out and depths were logged into the online navigation system at intervals of not more than 5 metres interval along the profiles. A single high frequency echo sounder (~210 kHz) was used for the bathymetric survey with the transducer mounted over the side of the survey vessel.
- The echo sounder was calibrated at the start and end of each day's work when sounding was required using the calibration method known as "Bar Check". The "Bar Check" calibration was taken into account for the daily variation in acoustic velocity propagation through the water column and also used to check the echo sounder's transducer draft.
- The survey was extended as far as possible without endangering the safety of the vessel, equipment and survey team. Soundings were reduced to datum from observed water level at the vicinity of survey area. The bathymetric survey was carried out from 10th August 2016 to 17th August 2016 in order to complete the bathymetric survey process.

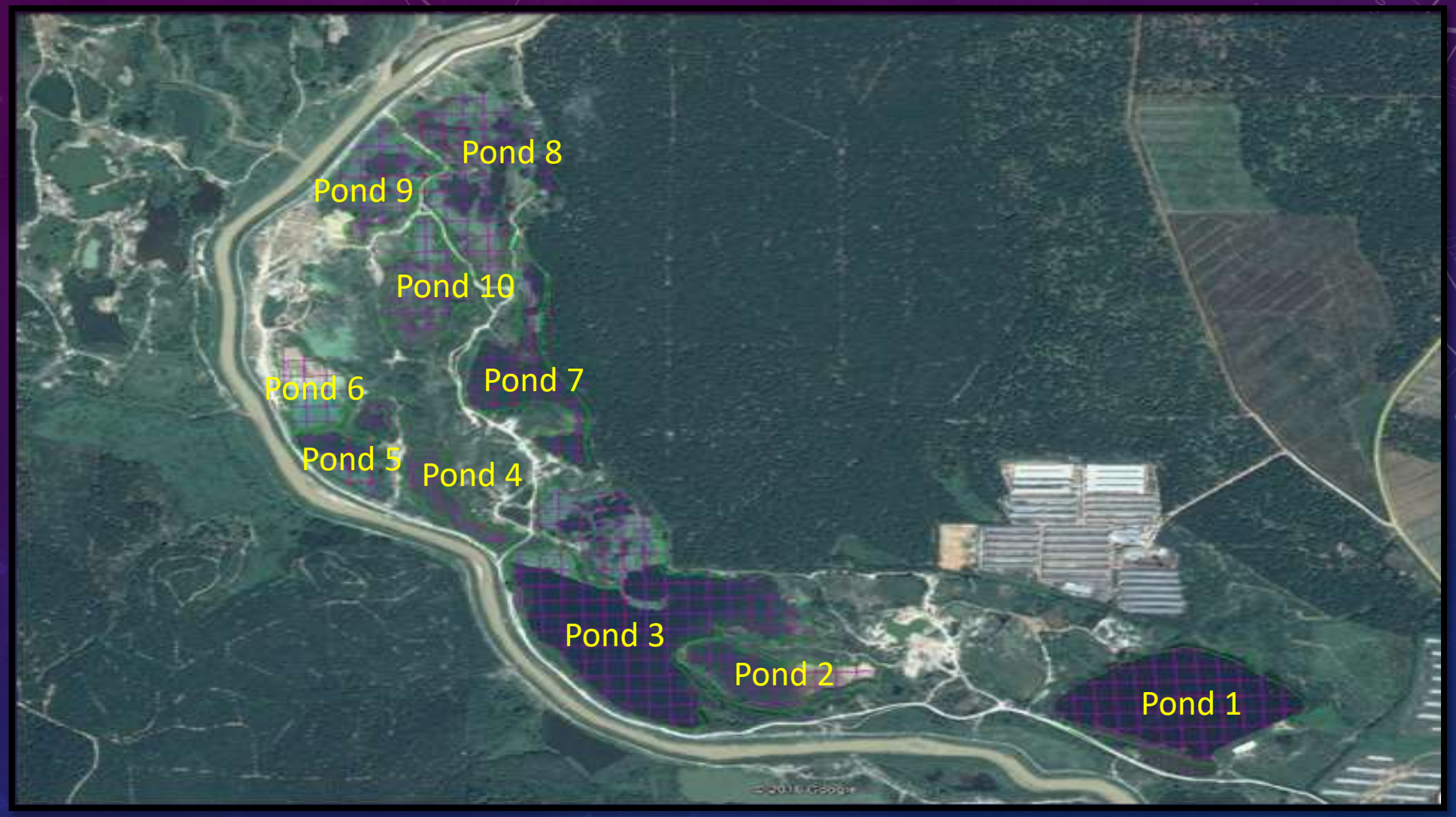


Figure 1:Topographic and Bathymetric Survey Areas

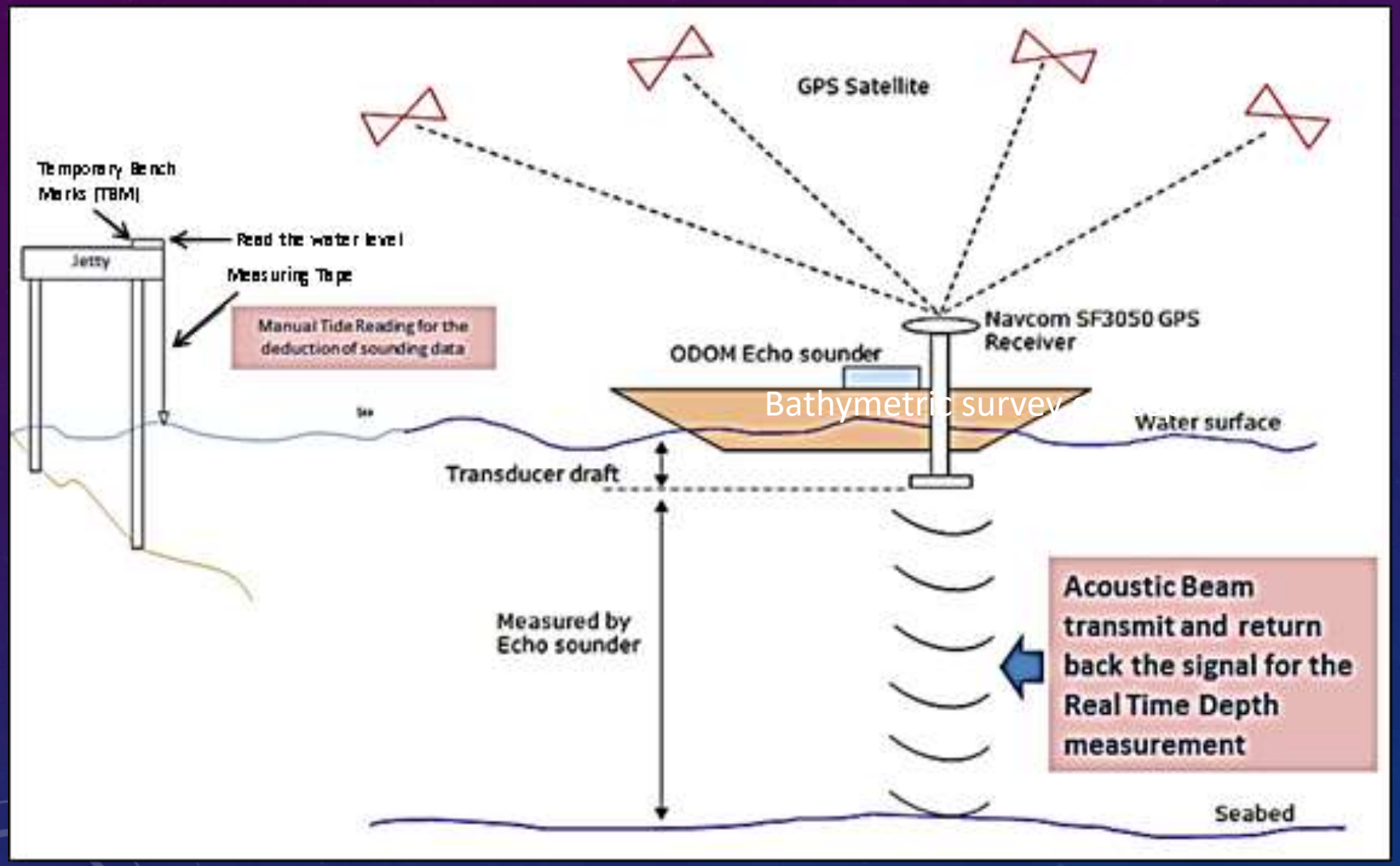


Figure 2: Bathymetric Survey Concept

RESULT

Contour

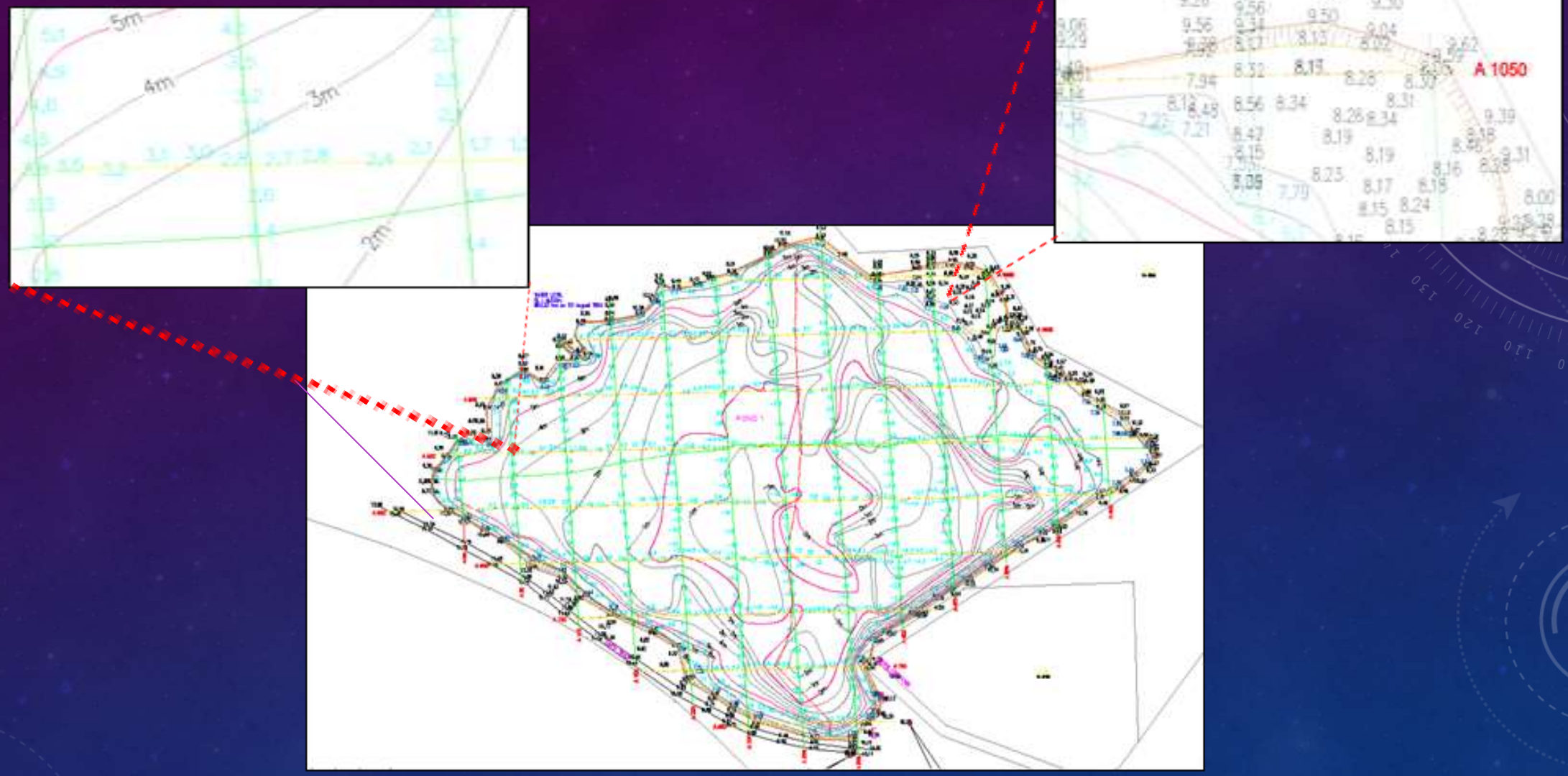
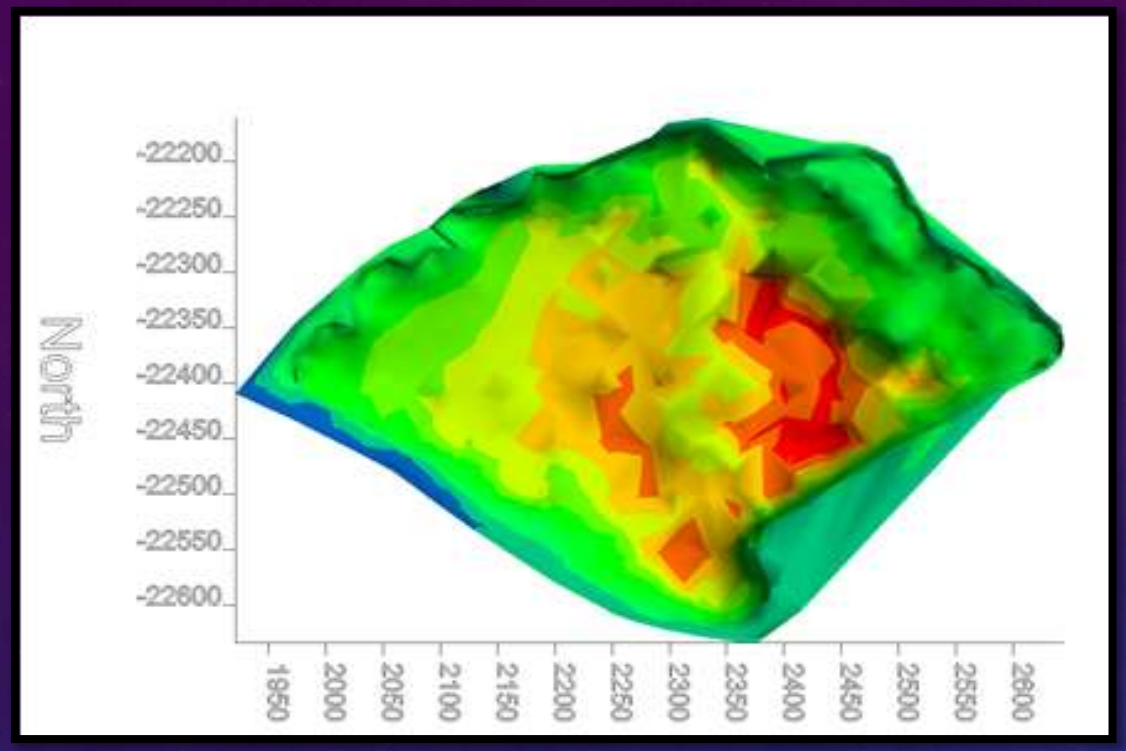


Figure 3: Example of Bathymetric Survey Plan For Pond 1



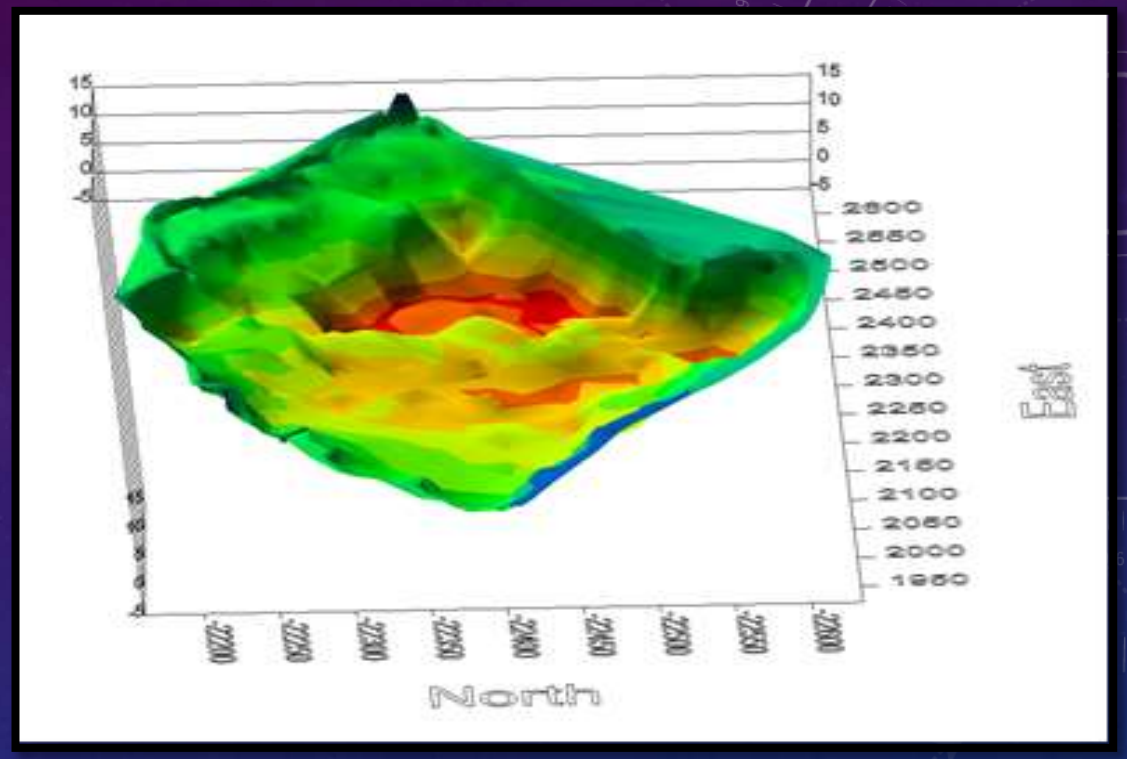


Figure 4 :3D view of Bathymetric Survey Plan for Pond 1

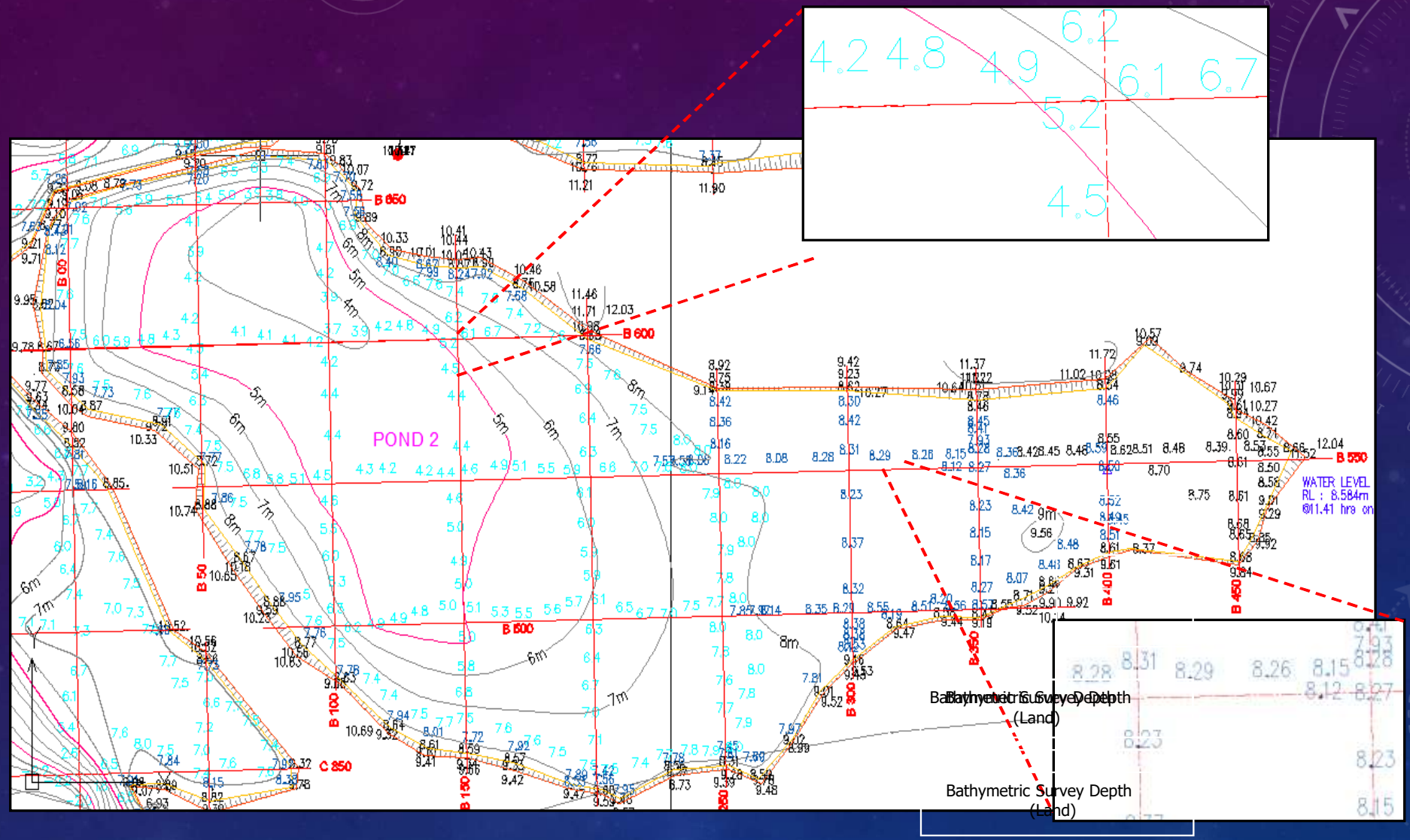
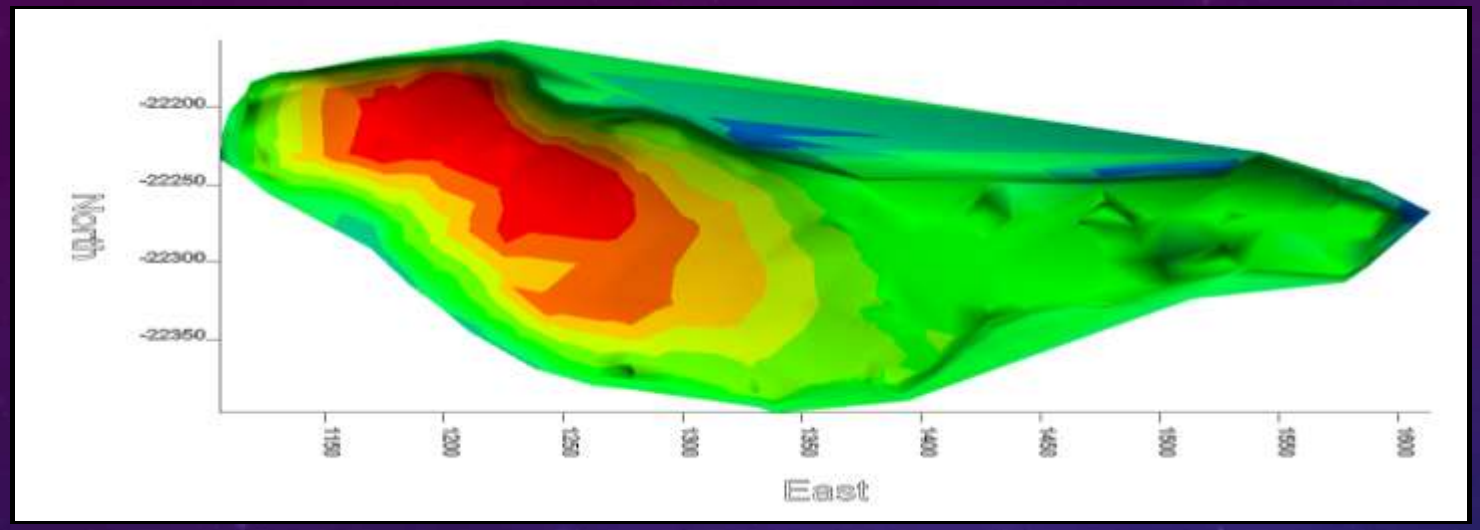


Figure 5: Example of Bathymetric Survey Plan For Pond 2



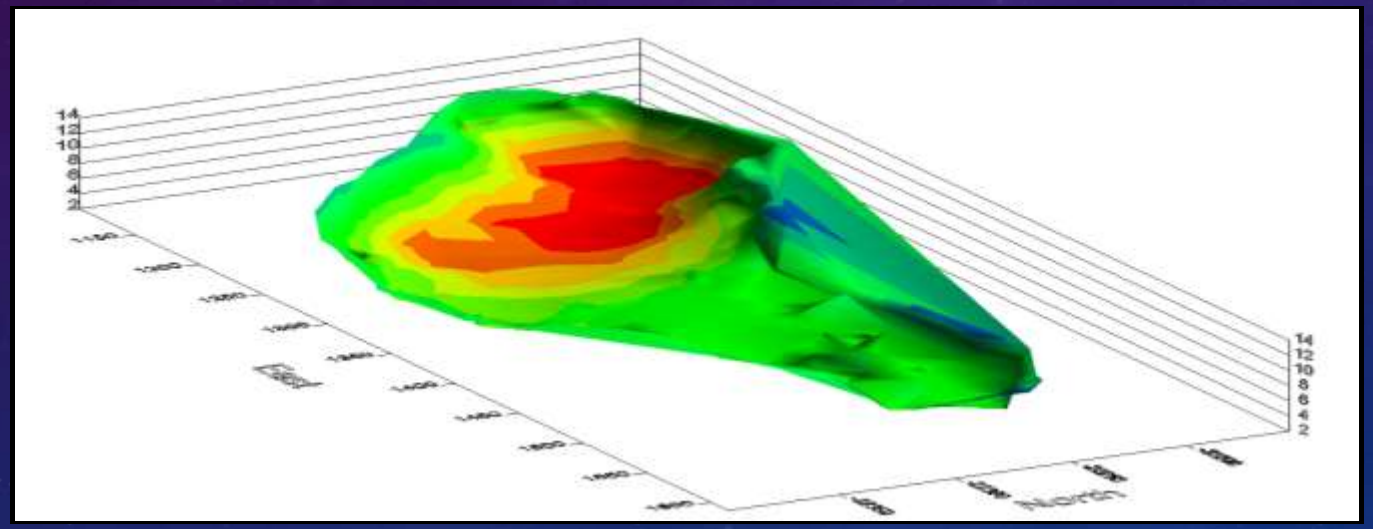


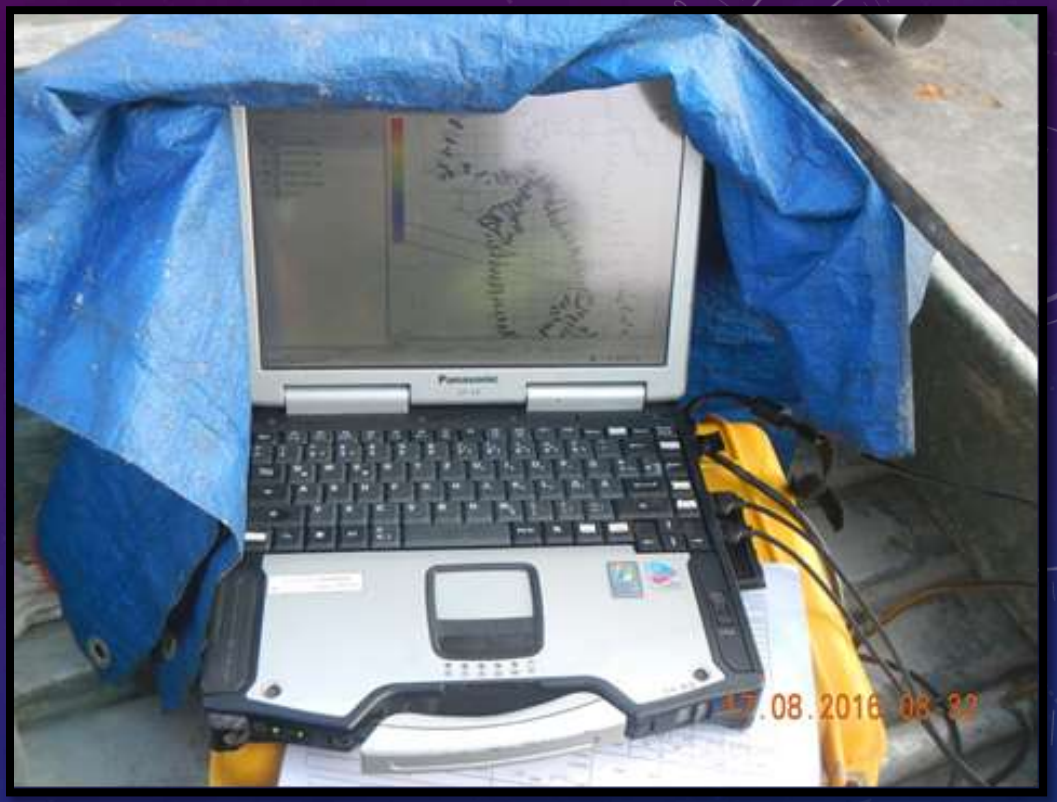
Figure 6: 3D view of Bathymetric Survey Plan for Pond 2

Photo of Bathymetric Survey System

Survey Boat

Bathymetric survey system on board

Hypack Navigation/positioning and Data Acquisition



D-GPS StarFire Integrity Check On Station L8A

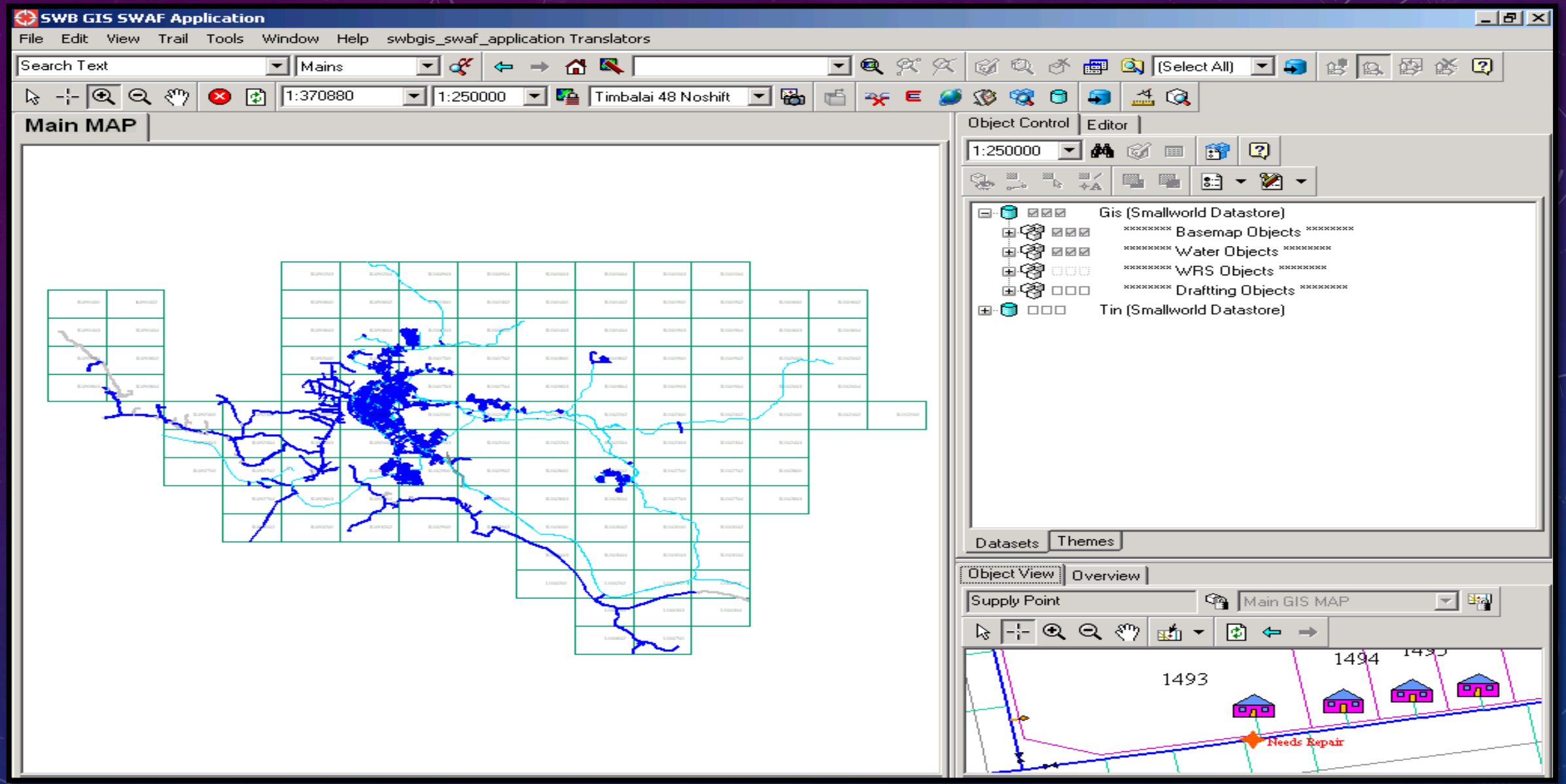
EXAMPLE OF NEW TECHNOLOGY FOR GIS SYSTEM IN WATER SUPPLY PROJECT

SIBU WATER BOARD: GIS APPLICATION IN WATER SUPPLY

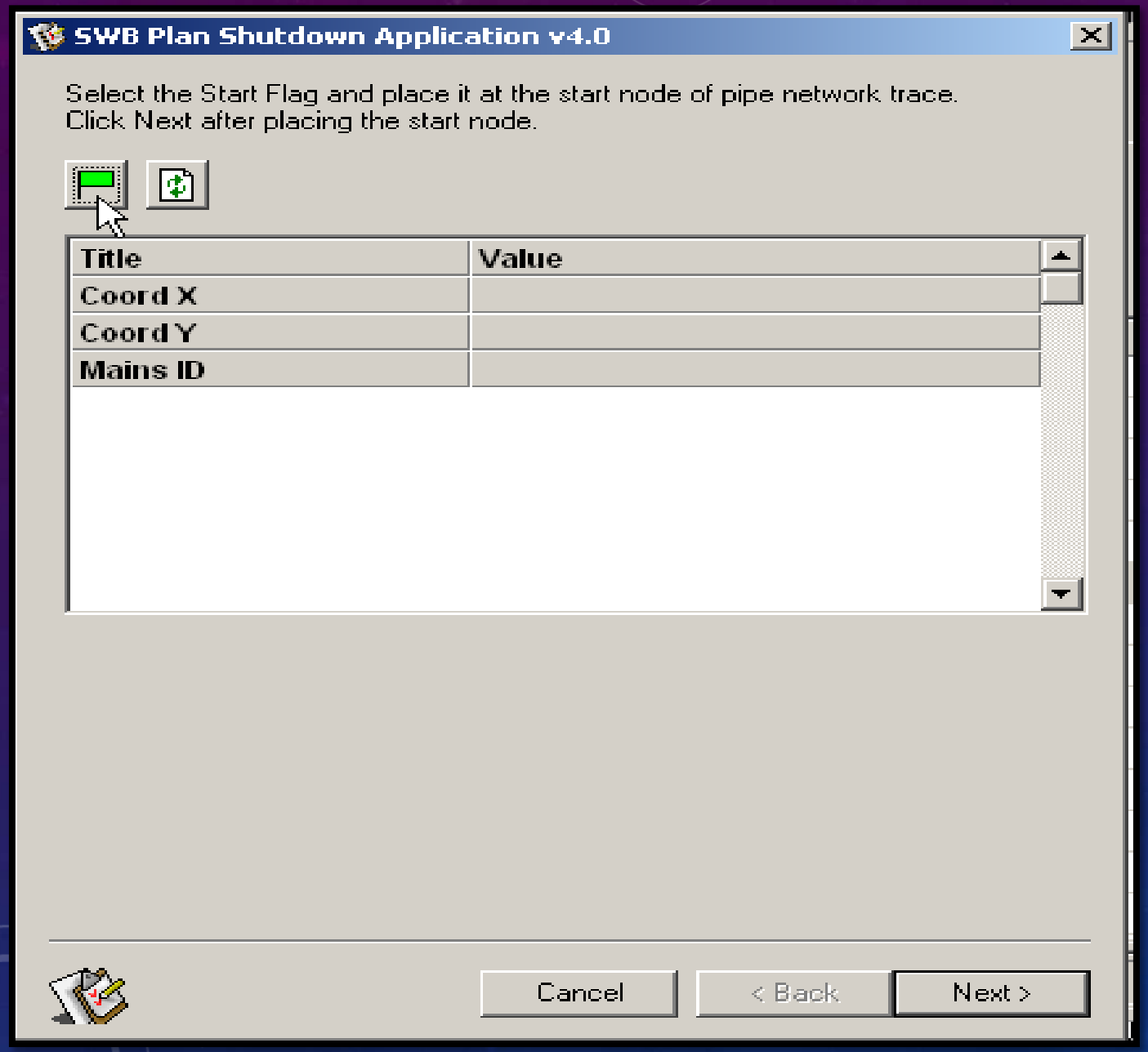
Sibu Water Board using GIS application in water supply for: -

- ❑ Planned Shutdown
- ❑ Assets Management Reporter

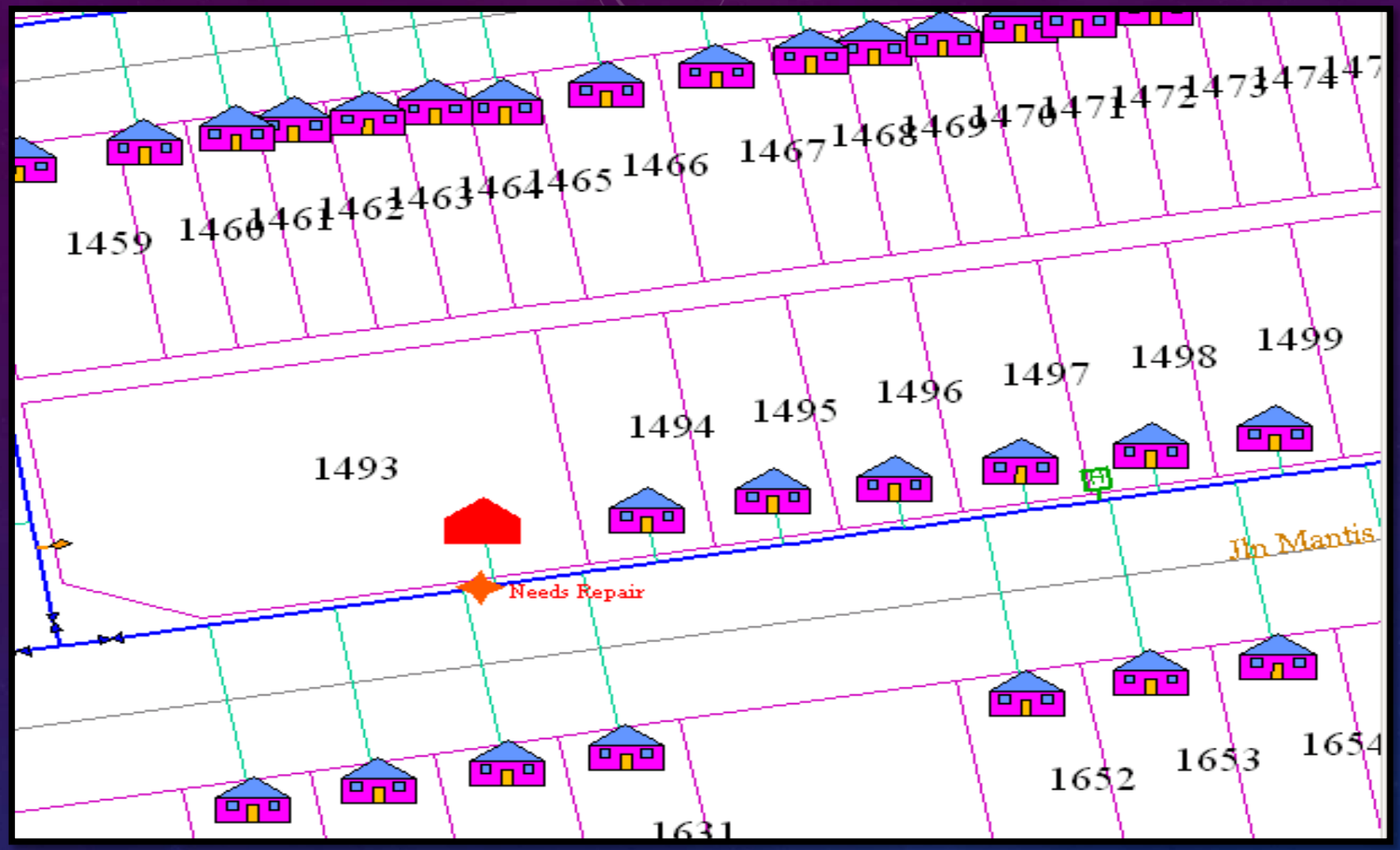
PLANNED SHUTDOWN APPLICATION


SWB GIS SWAF Application
File Edit View Trail Tools Window Help swbgis_swaf_application Translators
Search Text
Mains
(Select All)
1:370880
1:250000
Timbalai 48 Noshift
Main MAP
Object Control
Editor
1:250000
Gis (Smallworld Datastore)
******** Basemap Objects ********
******** Water Objects ********
******** WRS Objects ********
******** Draftting Objects ********
Tin (Smallworld Datastore)
Datasets
Themes
Object View
Overview
Supply Point
Main GIS MAP
1494
1493
Needs Repair

Sibu Area

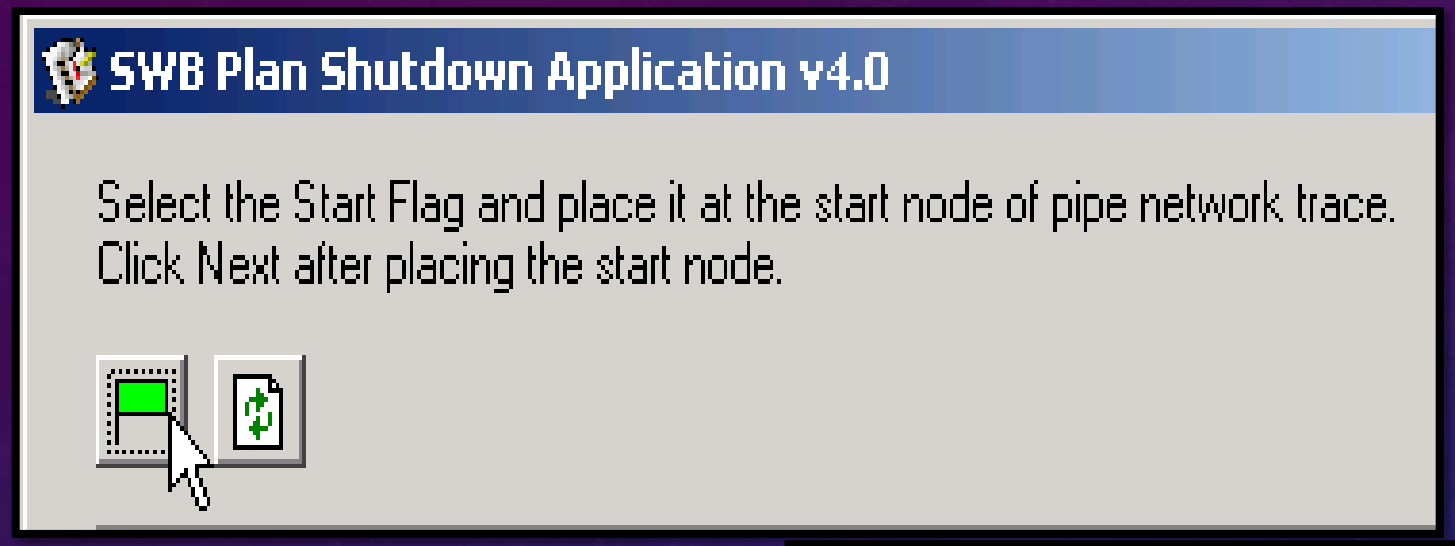


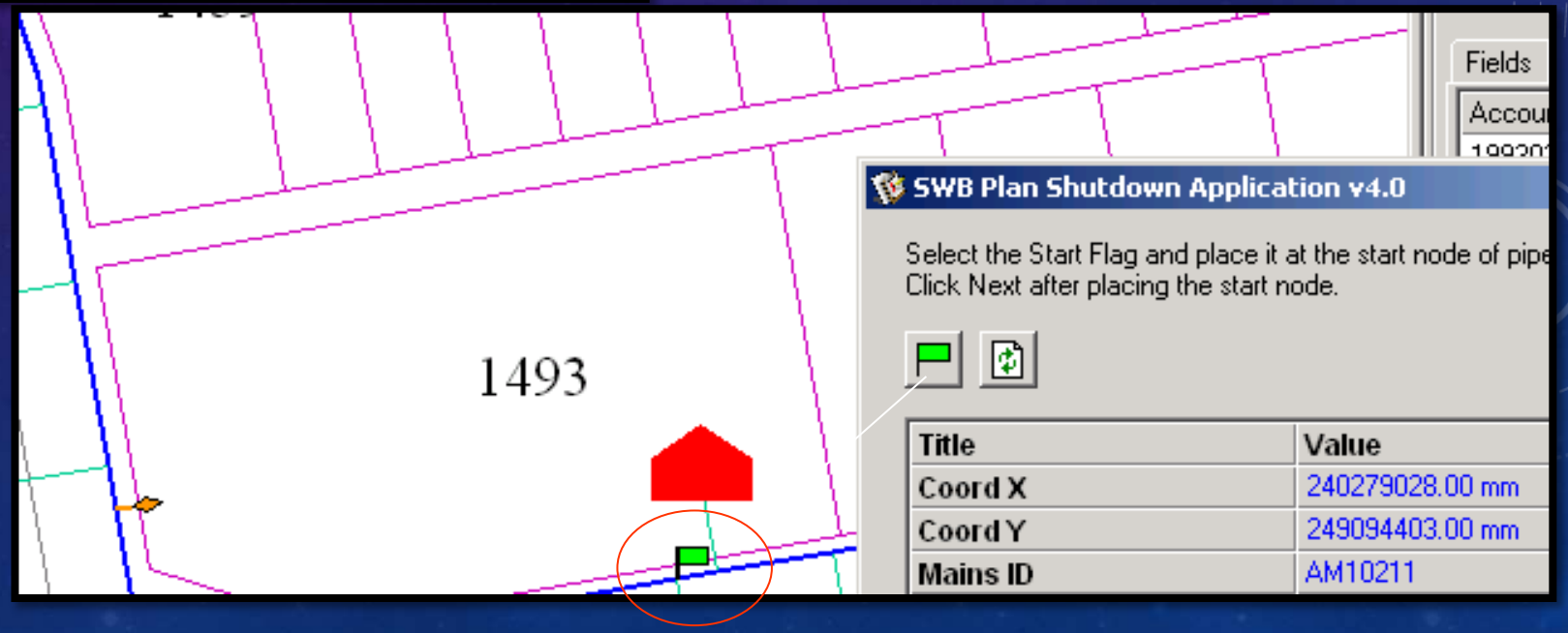
Select Area/Location To Plan Shutdown



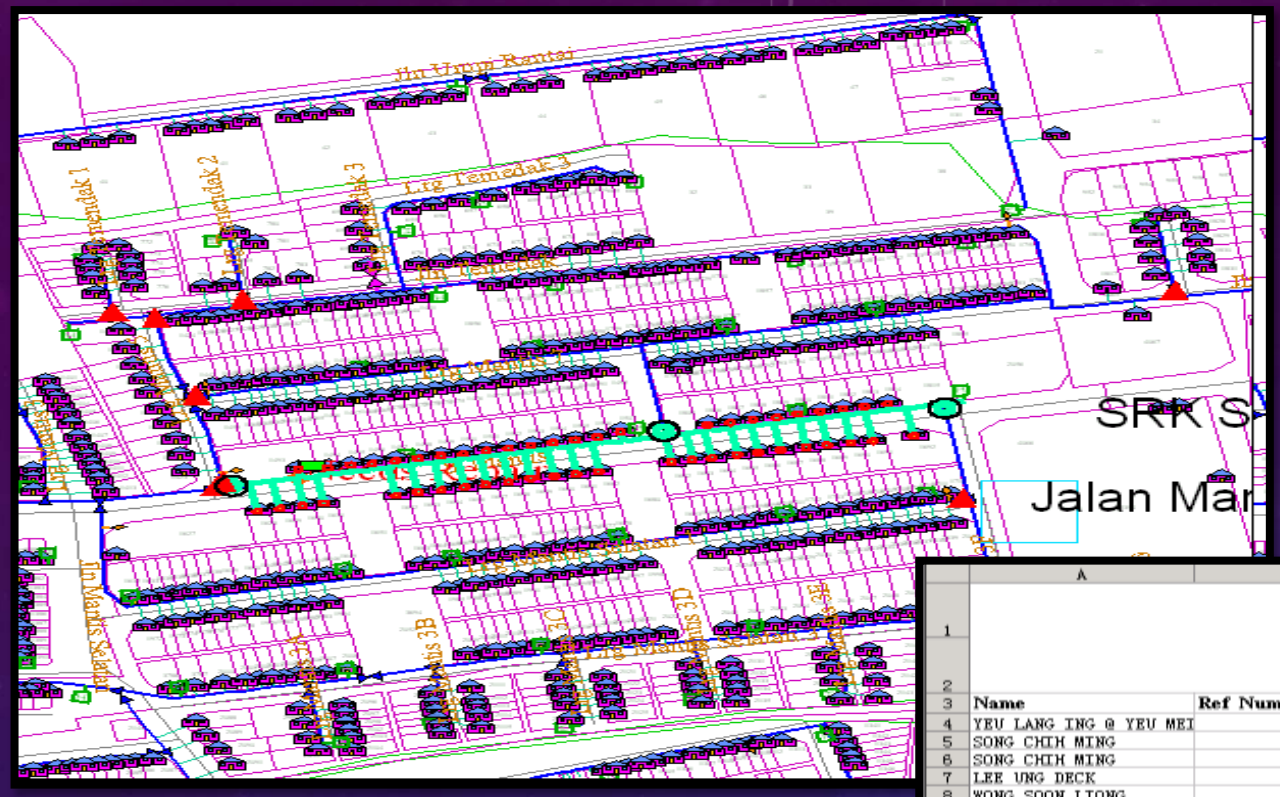
Zoom To Location Of Consumer

Create Pipe Burst Location





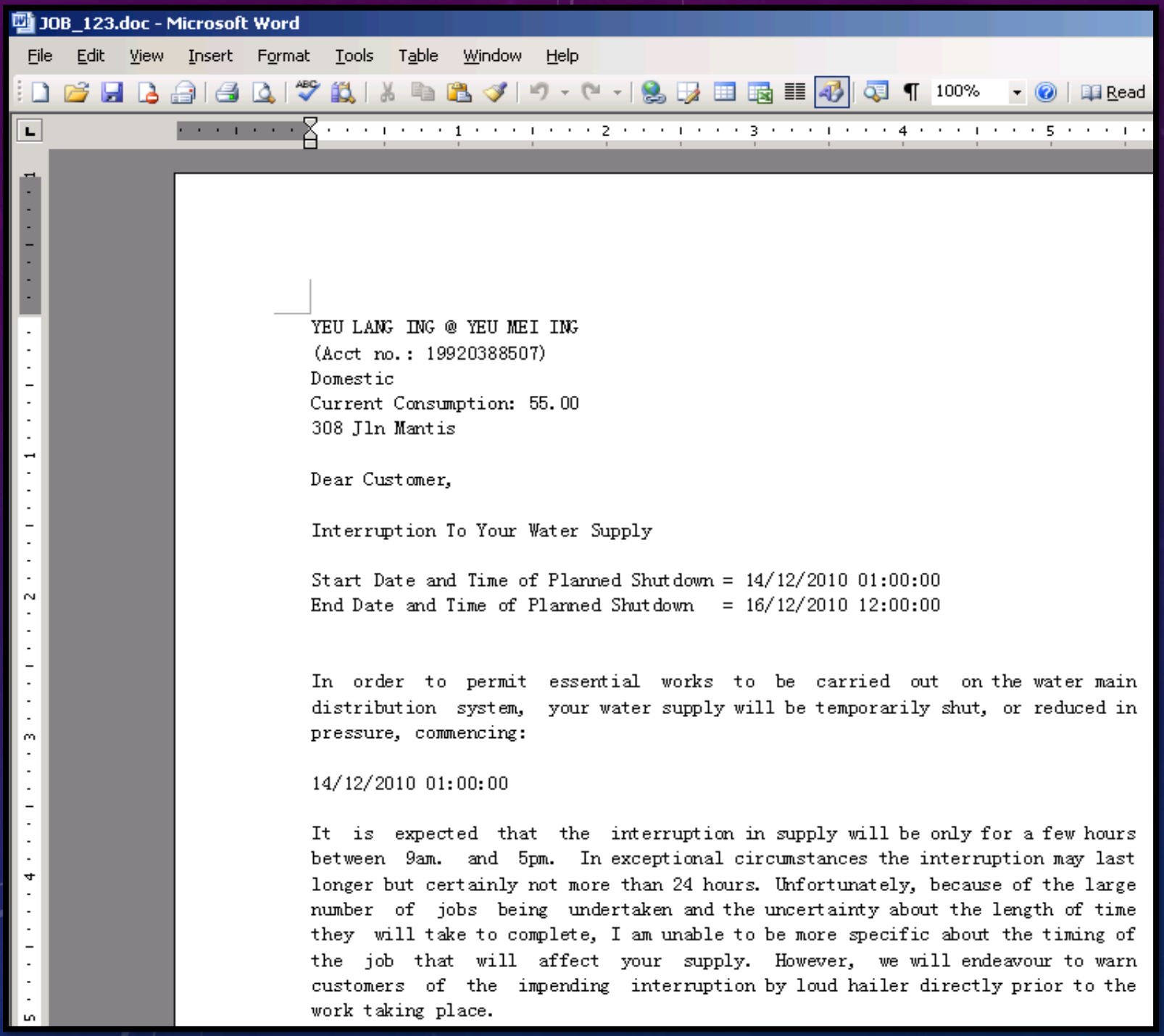
Map And List Customers Of Affected Area



Full Report on Customers Affected By Planned Shutdown

Name	Ref Number	Cust Type	Special Need	Location 0	Location 1	Location 2
YEU LANG ING @ YEU MEI	19920386507	Domestic	unset	28-A	TMN GRAND HEIGHTS	96000 SIBU
SONG CHIH MING	19910422704	Domestic	unset	13-B SL/114	JLN MANTIS	96000 SIBU
SONG CHIH MING	19910422803	Domestic	unset	13-A SL/115	JLN MANTIS	96000 SIBU
LEE UNG DECK	19910424403	Domestic	unset	22-B	TMN GRAND HEIGHTS	96000 SIBU
WONG SOON LIONG	19920388210	Domestic	unset	14-B	TMN GRAND HEIGHTS	96000 SIBU
YEU LANG ING @ YEU MEI	19920388903	Domestic	unset	34A	TMN GRAND HEIGHTS	96000 SIBU
SONG CHIH MING	19910424205	Commercial	unset	20-B	TMN GRAND HEIGHTS	96000 SIBU
SONG CHIH MING	19920389109	Domestic	unset	36-B	TMN GRAND HEIGHTS	96000 SIBU
HU SING KHO	19910424711	Domestic	unset	26-A	TMN GRAND HEIGHTS	96000 SIBU
SONG CHEE BENG	19930275701	Domestic	unset	25-B	JLN MANTIS	96000 SIBU
MII GING CHOONG	19910424502	Domestic	unset	24-A	TMN GRAND HEIGHTS	96000 SIBU
WONG SOON SENG	19920388309	Domestic	unset	16-A	TMN GRAND HEIGHTS	96000 SIBU
YEU GING ING	19920388804	Domestic	unset	30B	TMN GRAND HEIGHTS	96000 SIBU
WONG ENG CHUONG	19910423702	Domestic	unset	3-B	TMN GRAND HEIGHTS	96000 SIBU
KIU TUONG KONG	19910423603	Domestic	unset	5-A	TMN GRAND HEIGHTS	96000 SIBU
YEU GING ING	19920388705	Domestic	unset	30A	TMN GRAND HEIGHTS	96000 SIBU
KAW POH HUNG	19910424601	Domestic	unset	24-B	TMN GRAND HEIGHTS	96000 SIBU
YOU SIEW KUONG	19910424909	Domestic	unset	32-A	TMN GRAND HEIGHTS	96000 SIBU
LAU NAI LIOK	19930276105	Domestic	unset	21-B	JLN MANTIS	96000 SIBU
KONG LUNG FUI	19930275910	Domestic	unset	23-B	JLN MANTIS	96000 SIBU
WONG ENG CHUONG	19920388111	Domestic	unset	14-A	TMN GRAND HEIGHTS	96000 SIBU
CHUNG CHING LIEN	19910423801	Domestic	unset	3-A	TMN GRAND HEIGHTS	96000 SIBU
SONG CHIH MING	19910424007	Domestic	unset	18-B	TMN GRAND HEIGHTS	96000 SIBU
TING CHUI PING	19910425104	Domestic	unset	34-B	TMN GRAND HEIGHTS	96000 SIBU
WONG SOON HIIK	19930276006	Domestic	unset	23-A	JLN MANTIS	96000 SIBU
SONG CHEE BENG	19930275811	Domestic	unset	25-A	JLN MANTIS	96000 SIBU
TING PIEK LING	19930276611	Domestic	unset	17-A	JLN MANTIS	96000 SIBU
SONG CHIH MING	19910423911	Domestic	unset	18-A	TMN GRAND HEIGHTS	96000 SIBU
LEE FOK YAN	19910422506	Domestic	unset	SL/112 15-B	JLN MANTIS	96000 SIBU
KIU TUONG KONG	19910423306	Domestic	unset	7-B	TMN GRAND HEIGHTS	96000 SIBU
TEO ENG LIAN	19920389208	Domestic	unset	38	JLN MANTIS	96000 SIBU
LEE FOK YAN	19910422605	Domestic	unset	SL/113 15-A	JLN MANTIS	96000 SIBU
YOU SIEW KUONG	19910425005	Domestic	unset	32-B	TMN GRAND HEIGHTS	96000 SIBU
KIU TUONG CHIU	19910423108	Domestic	unset	9-B	TMN GRAND HEIGHTS	96000 SIBU
CHUNG CHOON YAN	19910424810	Domestic	unset	26-B	TMN GRAND HEIGHTS	96000 SIBU
KIU TUONG KONG	19910423405	Domestic	unset	7-A	TMN GRAND HEIGHTS	96000 SIBU
CHUNG CHING LIEN	19920386408	Domestic	unset	16-B	TMN GRAND HEIGHTS	96000 SIBU
TING MOI MIN	19910423009	Domestic	unset	11-A	TMN GRAND HEIGHTS	96000 SIBU

Full_report | Snapshot



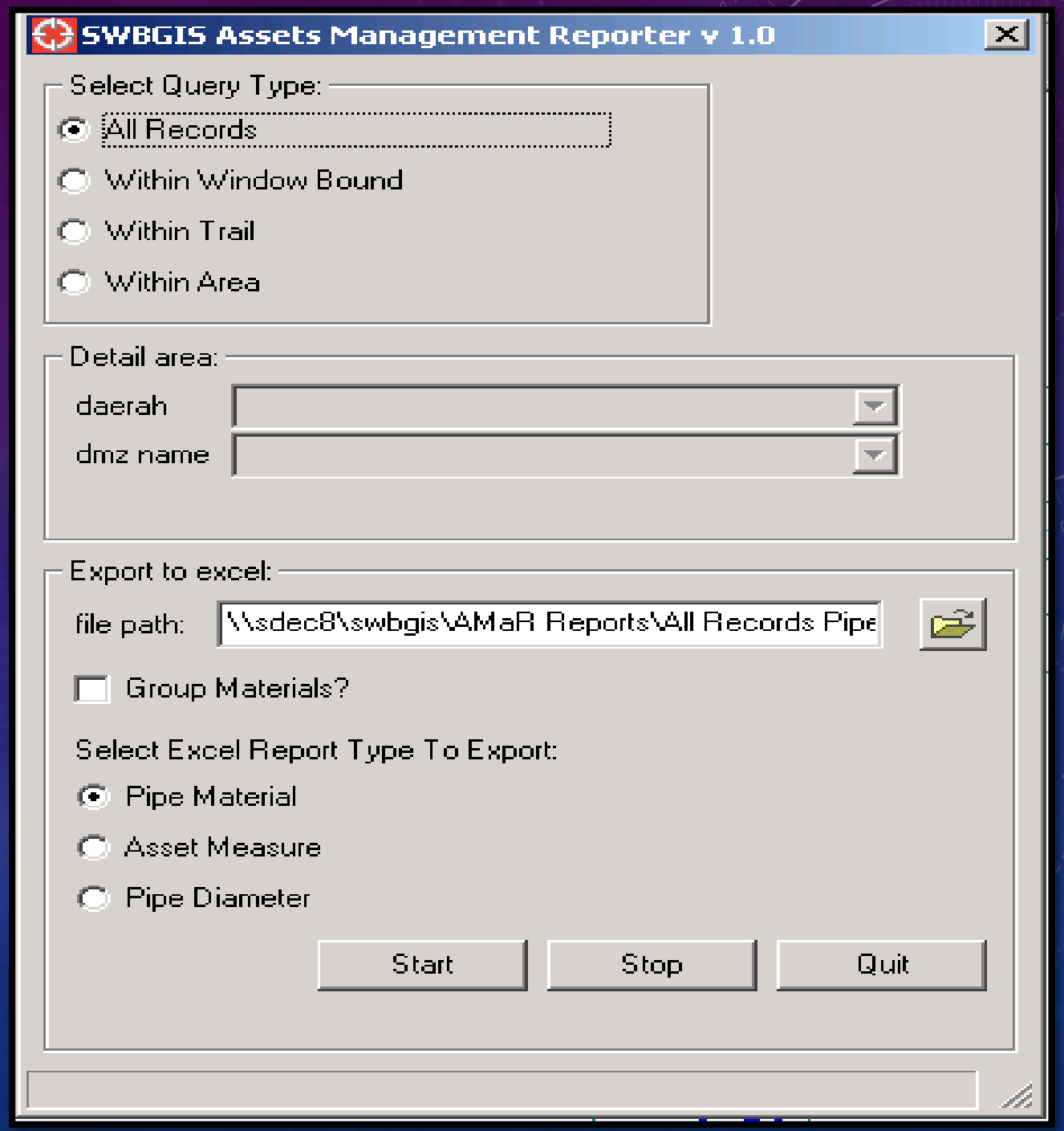
Message To Customer Informed Date Of Interruption

ASSETS MANAGEMENT REPORTER

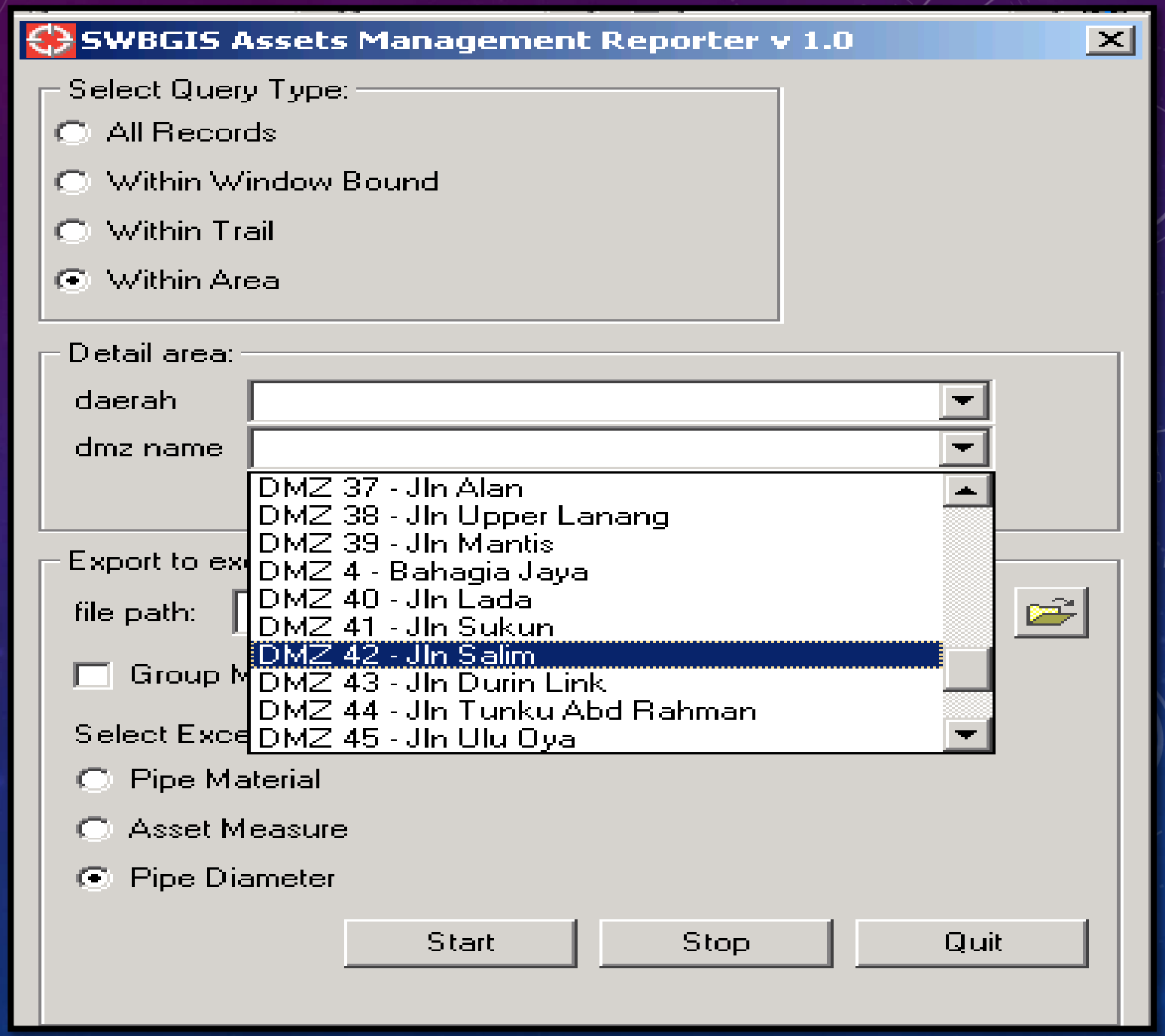
ASSETS MANAGEMENT REPORTER

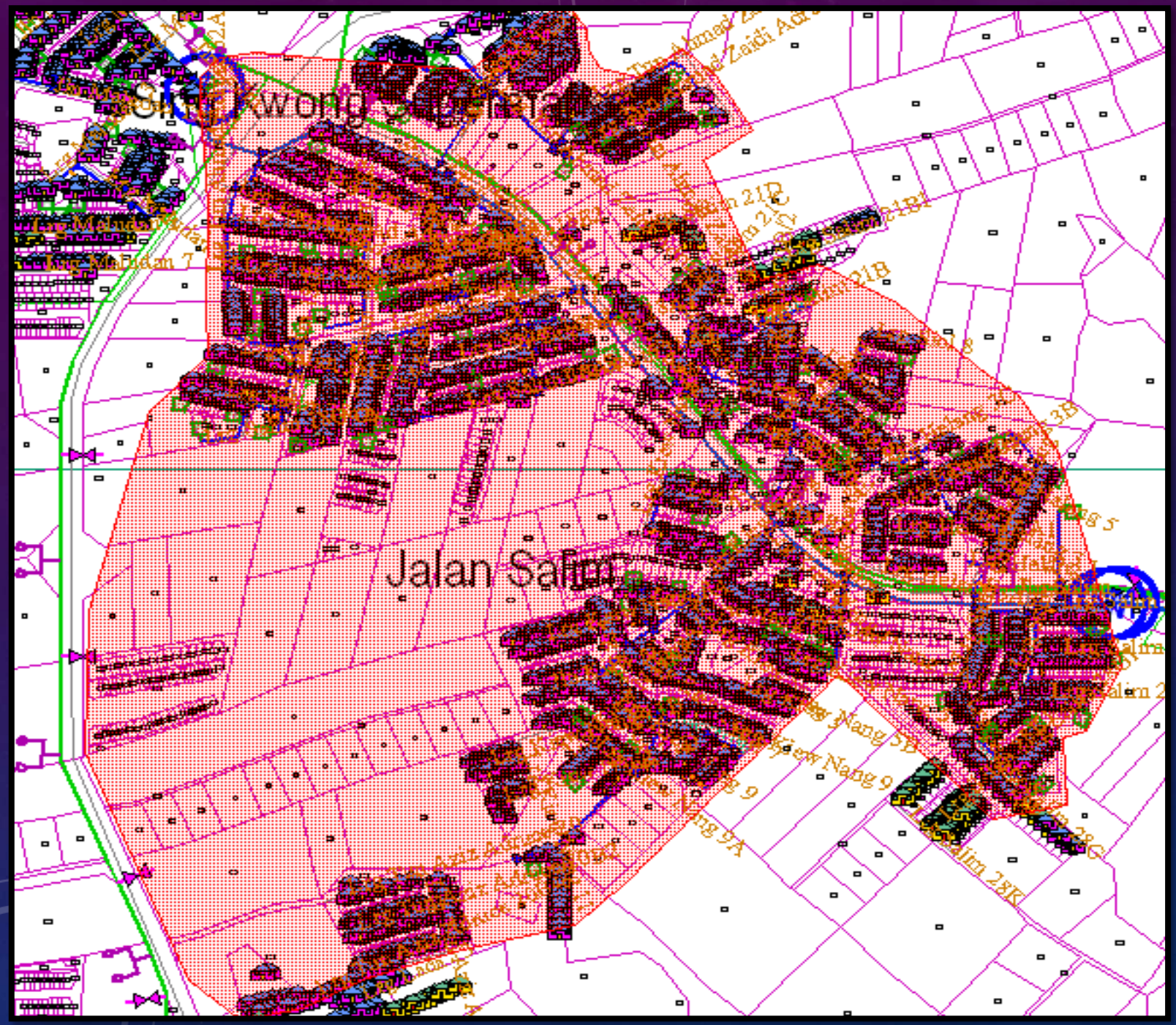
Assets Management Reporter is using in Sibu Water Apply to determine:-

- Pipe material
- Asset measure
- Pipe diameter



To Determine DMZ



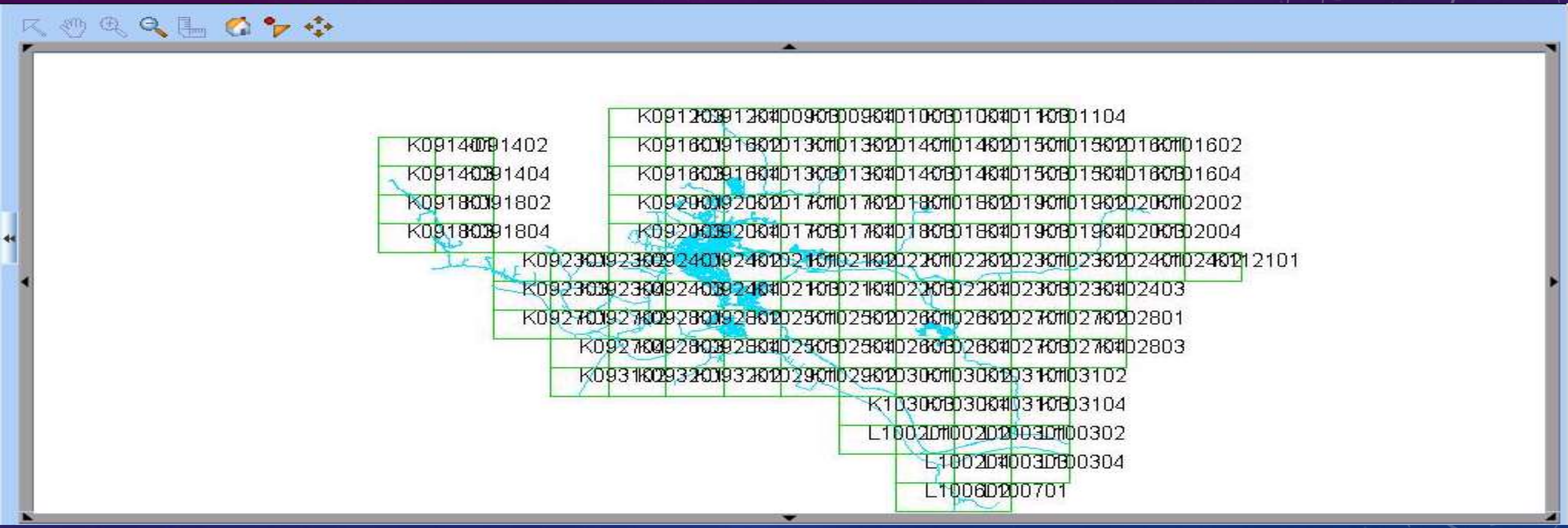


Area of DMZ

ASSETS MEASUREMENT REPORT

SWBGIS-Asset Measure - All records - 14 December 2010					
Mode of Measurement	**Unit**	**Length(m) District**			**Total(m)**
		Sibu	**Kanowit**	**Selangau**	
Pipe Length		906402.646	0	0	906402.646
Distribution	m	223467.774			223467.774
Raw Water	m	3905.54			3905.54
Reticulation	m	592920.471			592920.471
Trunk	m	60385.929			60385.929
Unknown	m	25678.416			25678.416
Washout	m	44.517			44.517
Valve	Nos	3132			3132
Hydrant	Nos	3135			3135
Fitting		1499			1499
Air Valve	Nos	985			985
Double Air Valve	Nos	212			212
Endcap	Nos	2			2
Altitude Valve	Nos	8			8
PRV	Nos	14			14
Other Fitting	Nos	278			278
Water Treatment Plant	Nos	3			3
Intake(Water Site)	Nos	2			2
Reservoir	Nos	27			27

Map View in Web Browser



Map View Of DMA 39

KeTTHA INTELIGENT INFORMATION SYSTEM (KIIS)

- KIIS is also known as monitoring system that used to monitor all important data & information that involving all the sectors (Energy, Water, Green Technology) under KeTTHA.
- The system was built using IBM Intelligent Operation Center (IOC) Technology which is the the first one establish in Malaysia.

Features of KIIS

- able to manage the data structured and unstructured such as PDF, excel and so on
- provide analyse visually to get statistical and graphic information and generate reports through dashboards
- monitor and addressing critical issues of national utility based on business needs and system parameters specified in the stakeholders

CONCLUSION

GIS is a powerful tool in developing water supply system and can be applied in the followings:

1. Data collection and monitoring
2. Site selection for source of water
3. Water quality monitoring, assessment & enforcement
4. Network analysis and design of pipe line path.
5. Site selection for reservoirs and pumping stations
6. Site selection for surge tank and control valves
7. Routing optimization and visualization
8. Holistic NRW Control & Asset Management