

A Review of 3D Cadastre Pilot Project and the Policy of 3D NSDI in the Republic of Korea

2011. 11 .17



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I. Introduction



1.1 Background

- Due to rapid urbanization, industrialization and population growth, the structures of cities are changing rapidly
 - Multi-purpose three dimensional facilities above and below surface have been increased.
 - Despite the three dimensional space registration such as building and basement facilities is necessary
- It is impossible to represent those rights in the 2D Cadastre.
 - We can say that it's time to introduce 3D cadastral system for registration of land in the 3D space.



1.2 Objectives

1

3D cadastre registration in Seoul

- Applies to the land administration
- Used as service to the citizen in the future

2

Provide the **foundation for the ubiquitous 3D cadastre**

- Defining the right relationship of land space
- Suggesting a registration and management scheme

3

If **condominium leasehold registration map** is improved

- Citizens could relate their property right more easily
- Government can manage land more efficiently

2

. Performing Method



2.1 Project Overview

- Ⓢ Performed in several regions of Seoul (2009. 3.~12.)
- Ⓢ Contains whole process for establishing a 3D cadastre

Site selection and 3D cadastral survey

Design surveyor's manual and registration methods

Make a medium and long-term road map

Construct the DB and develop the full 3D prototype system

2.2 Selection of Project Site

1. Subway tunnel



2. Tunnel



3. Aerial pathway



4. Basement pathway



5. Shopping mall



6. Subway station and connected building



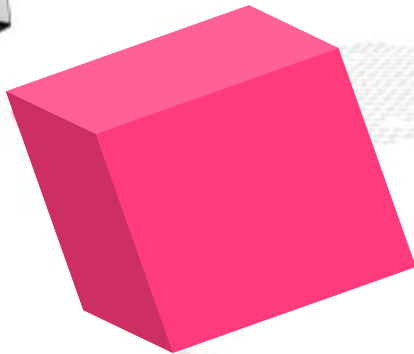
7. Power transmission tower and parcel below



8. Apartments and stores



3 . Contents of the Project

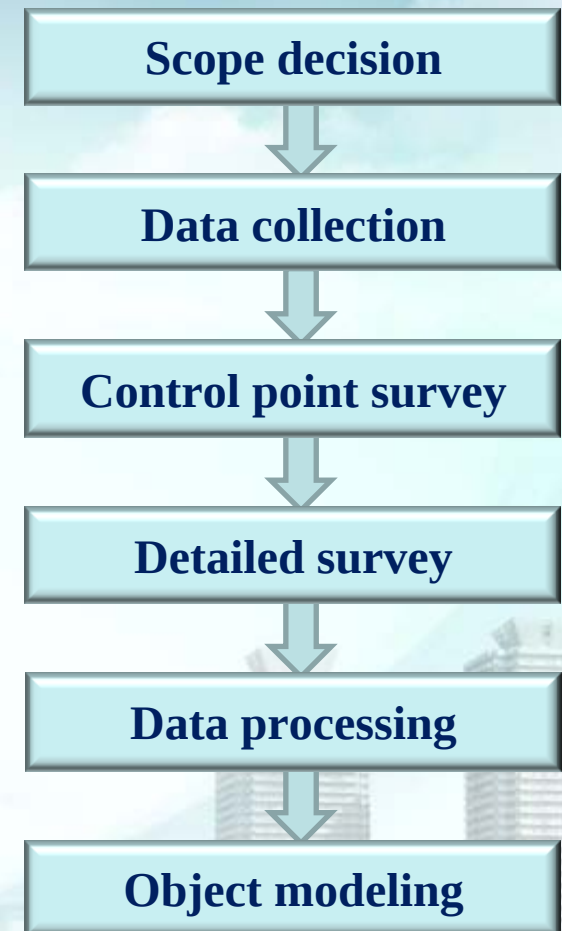


3.1 3D Cadastral Survey

Survey Procedures

- Detailed survey procedure is similar to the general (2D) cadastral
- Collected datum is used to **the object modeling process**
- In the data processing, **synchronization of the survey result** with the facility drawings and topographic maps is needed by superimposition of data, also in addition to cadastral map.

Tasks



3.1 3D Cadastral Survey

Survey reference & height

- Survey references are **defined by law**
 - “The act on land survey, waterway survey and cadastre”
- Cadastral control point and supplementary control point
 - Survey results are presented in the **ITRF**(International Terrestrial Reference Frame)
- Height is calculated **GPS Leveling** method
 - Difference between unknown benchmark’s ellipsoidal height and known national benchmarks height of the near the project sites.

3.1 3D Cadastral Survey

Detailed Survey Method

- **Supplementary points should be installed near the site**
 - Control points are not available at a basement site (subway)
- **Surveying points should be selected by a facility's lay out**
- **Observe representative points**
 - Where the object's shape or height is irregular
- **For ground facilities, survey all points as far as possible**
 - needed points to the 3D object modeling
 - wall- and building-corner point sufficiently.

3.1 3D Cadastral Survey

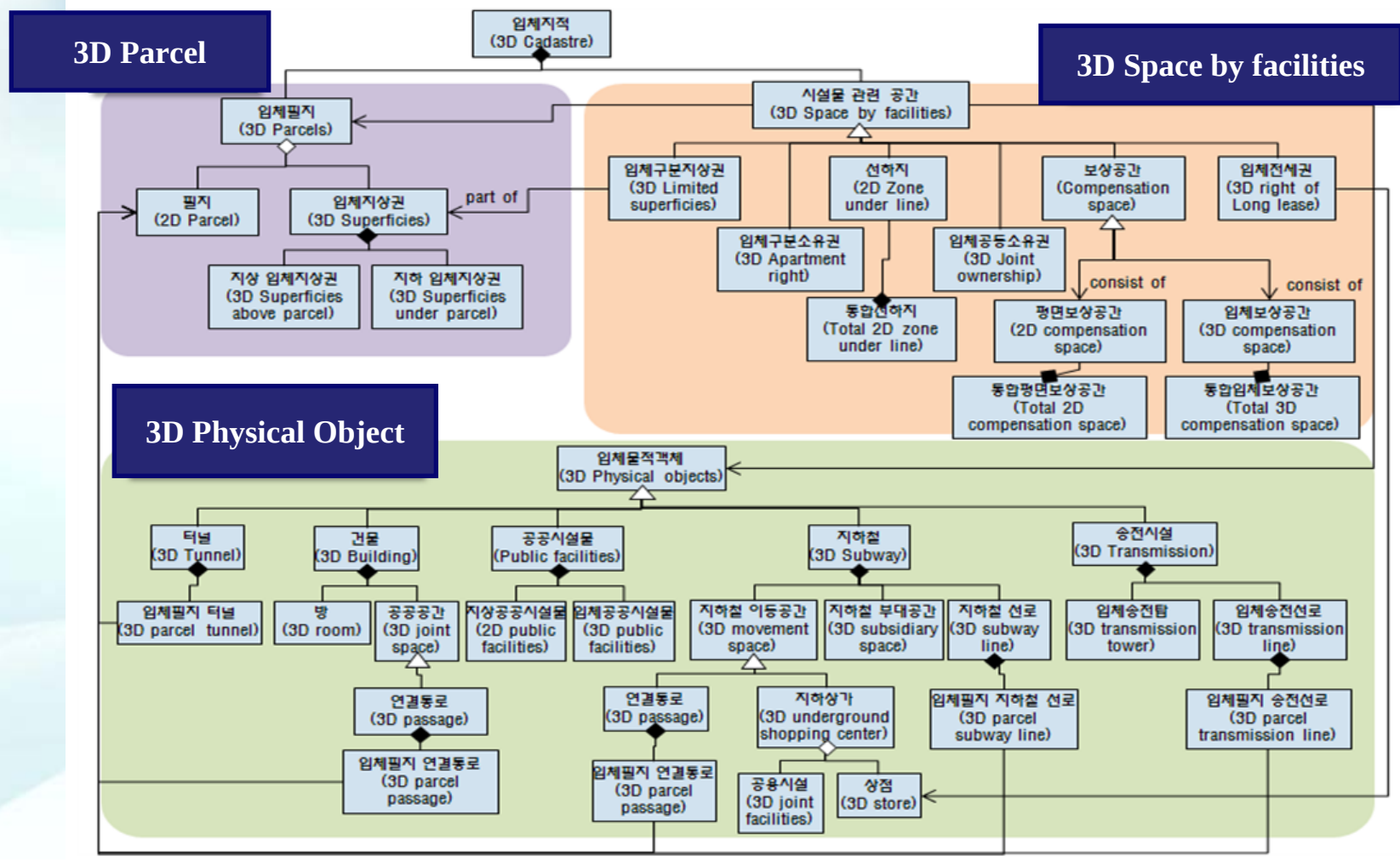
Surveyors manual

@ 3D cadastral survey methods and approaches for public facilities have been described in a Surveyor's manual.

Part	Items
General Provisions	1. Goal
	2. Application scope
	3. Terminology
3D cadastral survey	4. Classification
	5. Reference frame
	6. Marker of control point
	7. Coordinate transformation
	8. Preparations and cautions
	9. Detailed survey method by site
	10. Result calculation
	11. Generation survey result drawings
	12. Qualification
	13. Result evaluation

3.2 Data Model & Prototype System

Data Model



Prototype System

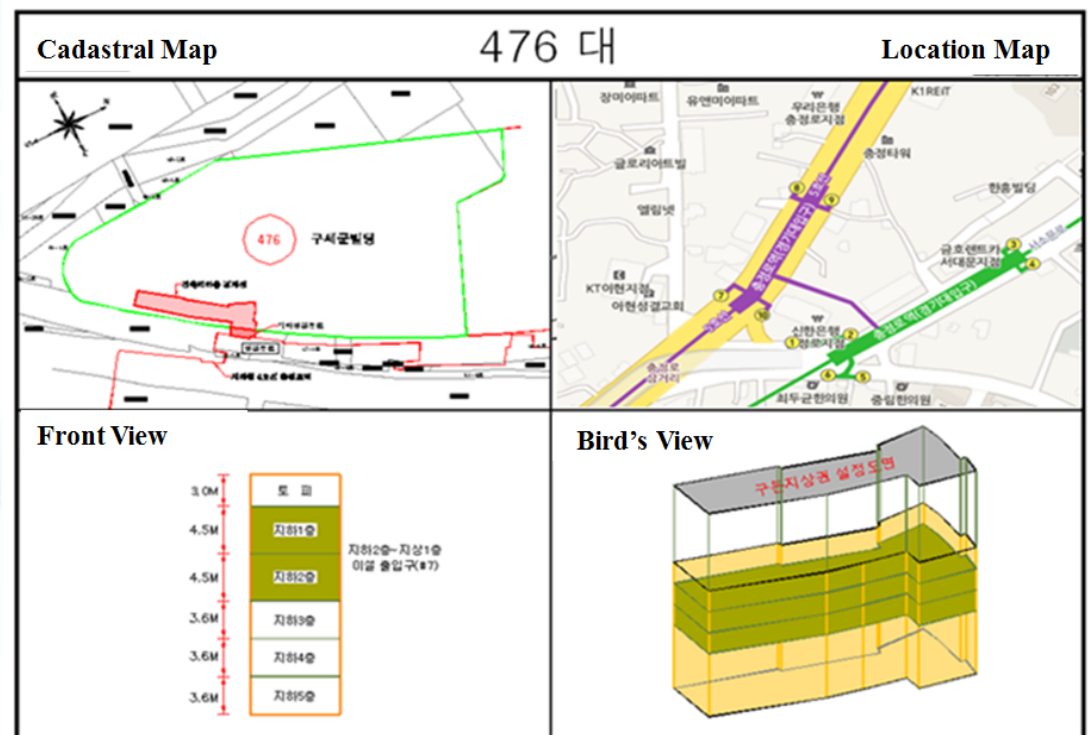


3.3 Attaching Manner of Drawing

㉔ Cadastral map or 3D drawing of the building should be attached to the right document instead of field sketch

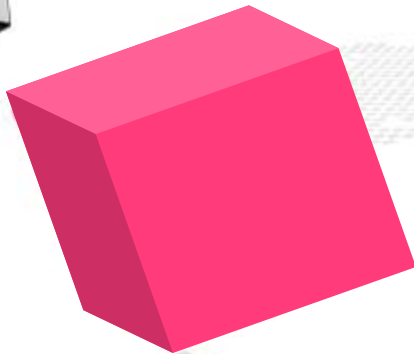
- When the rights are newly established
 - Leasehold right
 - Right of superficies
 - Condominium leasehold right

Suggested form



4

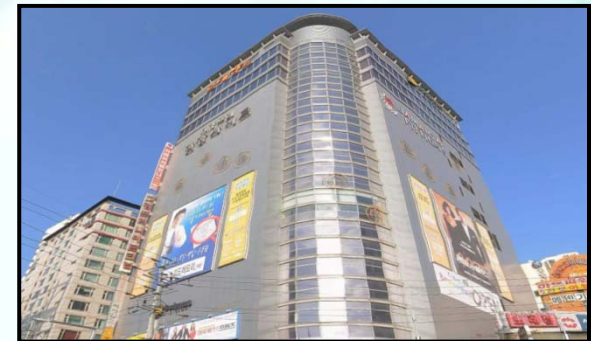
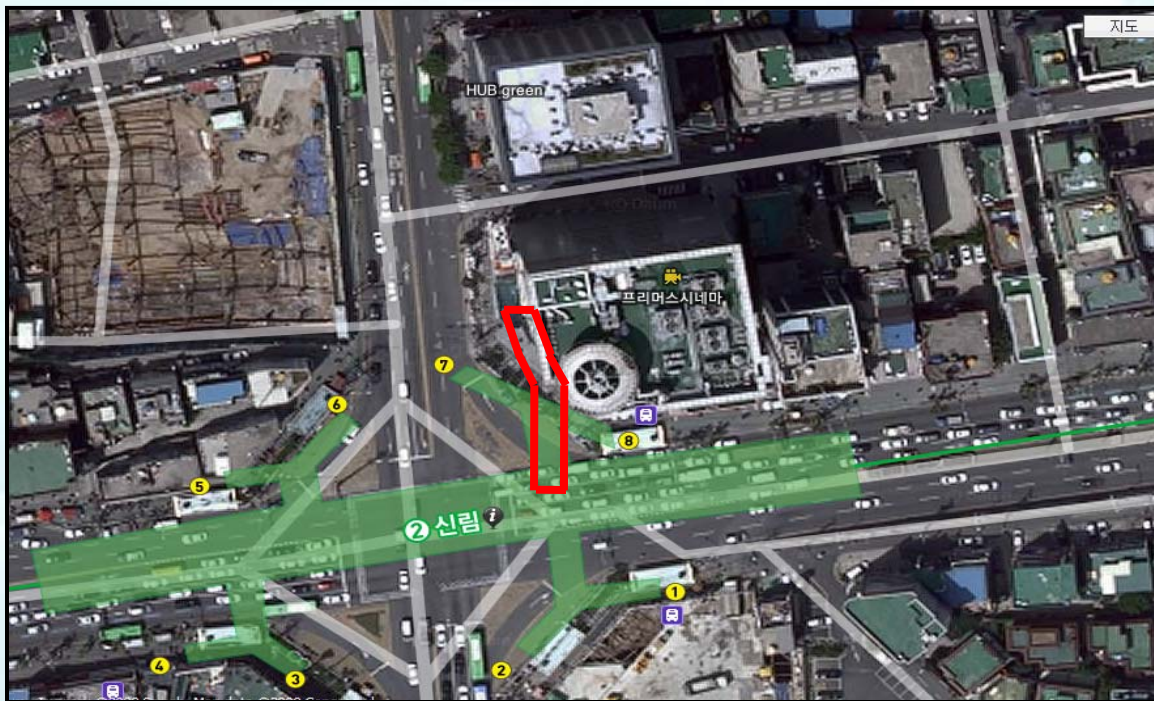
. Applications (2 Cases)



4.1 Site that right Registration is Important

Environment

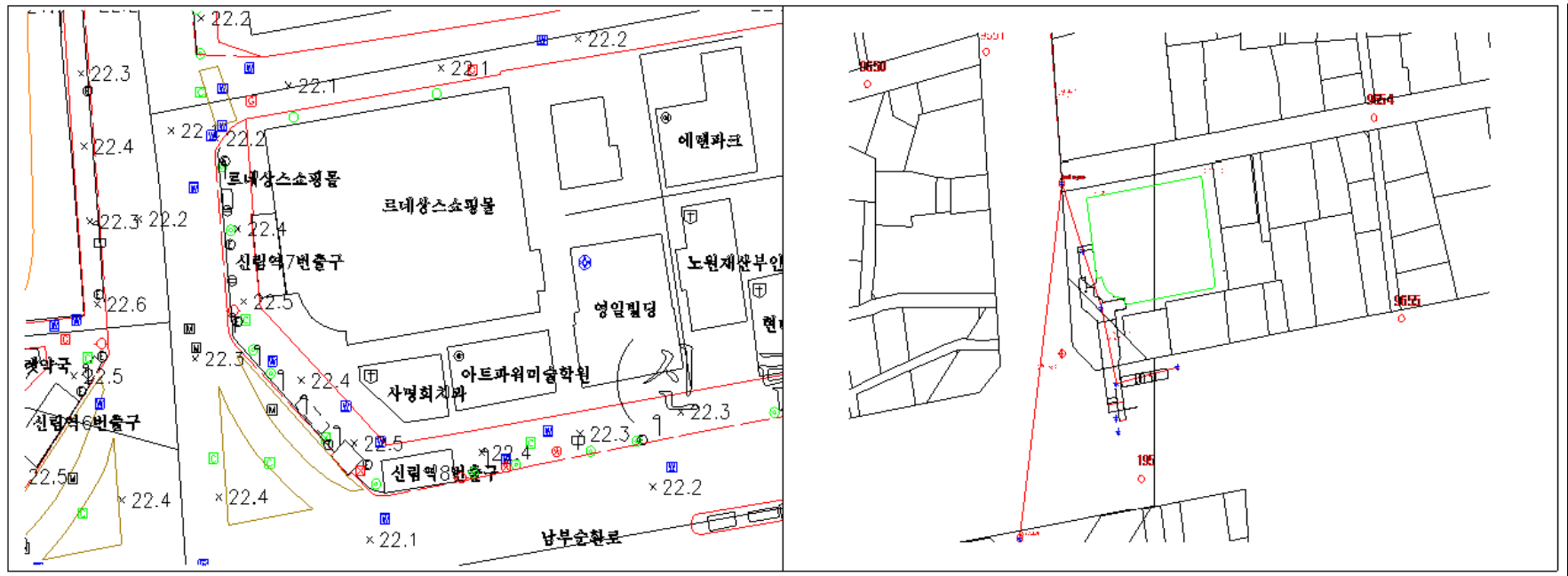
- ② The Sinlim basement pathway under the road and pavement
- ② Connecting the subway station and the complex building



4.1 Site that right Registration is Important

Maps

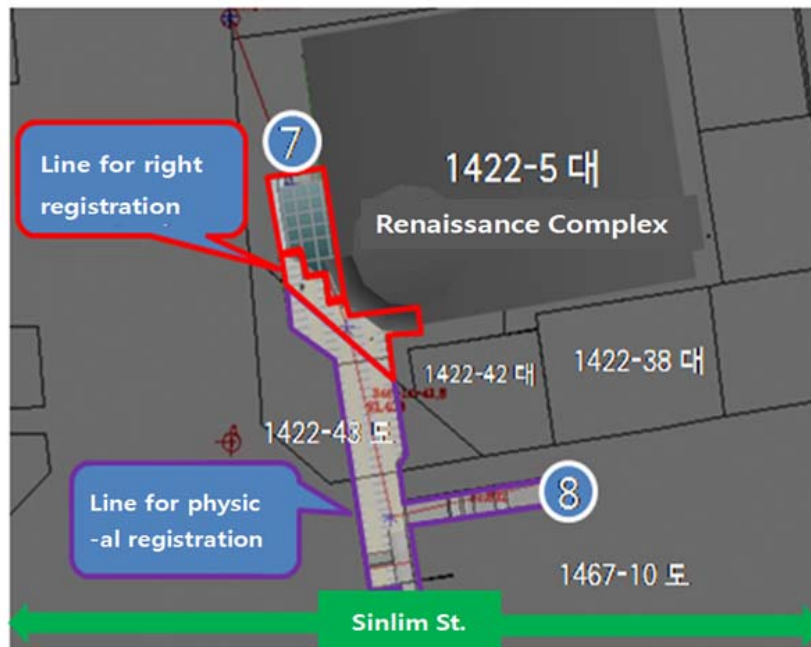
- ② Survey control points on the ground are connect to the basement
- ② Topographic map and cadastral map are used together for survey



4.1 Site that right Registration is Important

Simulation

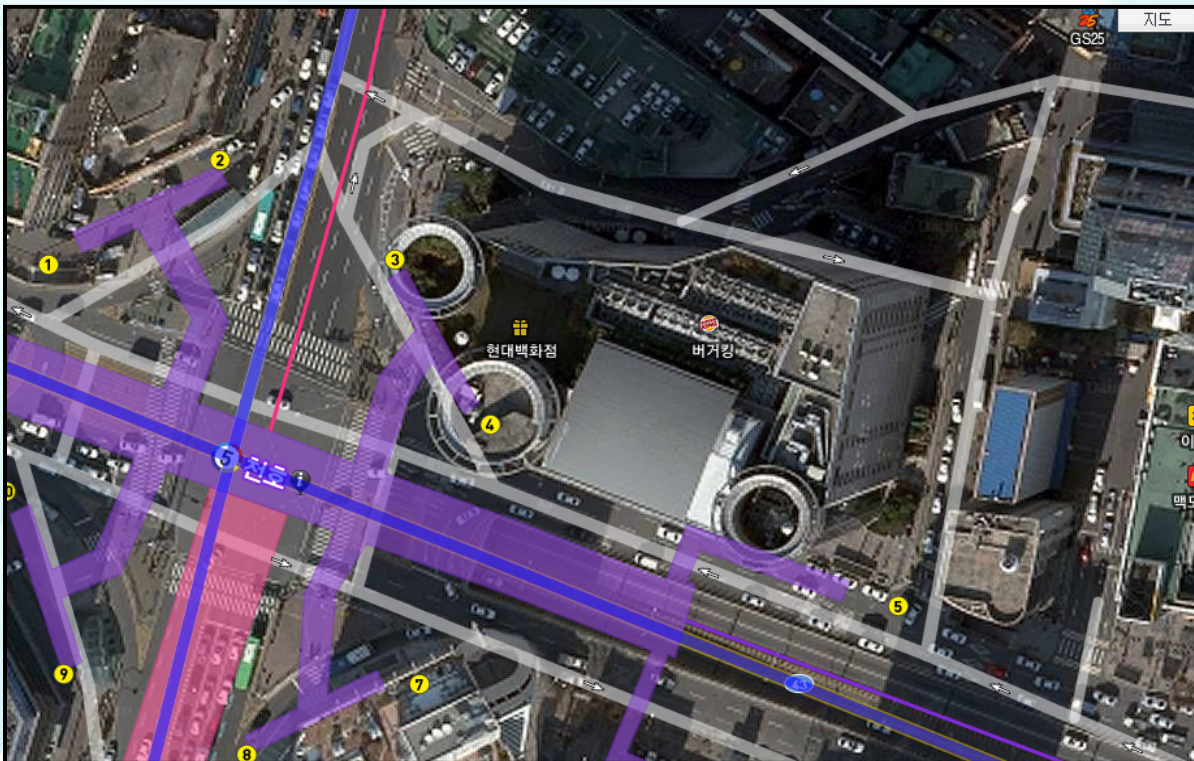
- @ Parcel no. 1422-43 , not established a condominium leasehold right
- @ Can find out accurate location and right range through 3D system



4.2 Site that Physical Model is Important

Environment

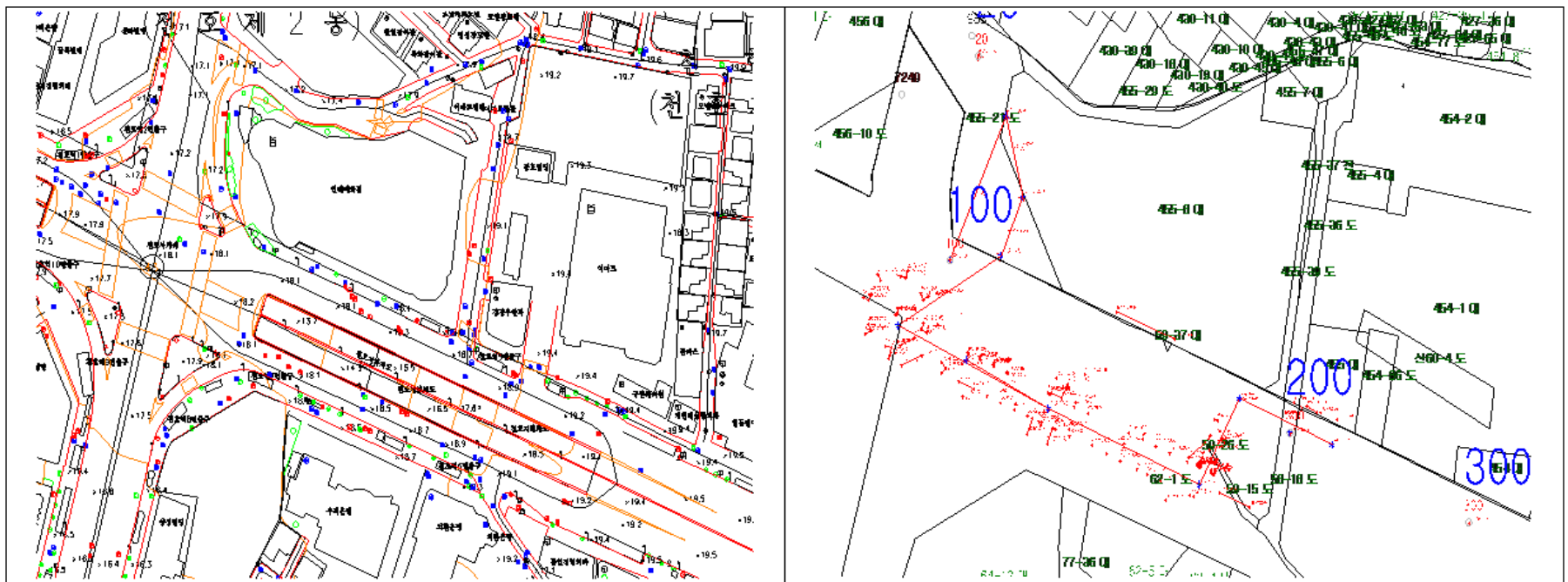
- ② Cheonho Station basement shopping mall is under a wide road
- ② Managed and operated by the Seoul Metropolitan Rapid Transit Co.



4.2 Site that Physical Model is Important

Maps

- Ⓢ Right of superficies are established at the entrance, which is connected to the department store



4.2 Site that Physical Model is Important

Simulation

- @ Physical registration objects :
- @ Subway stations (line No. 5 and 8), parking lot, **basement shopping mall**



5. Result and Application Strategy



5.1 Analysis

- Increase the management efficiency by 3D information system
- Improvement for the attached drawing is possible
 - Drawing based on 3D cadastral survey result should be attached to the registration book
- 3D cadastral prototype data should be integrated with the data of the current systems
- Support “Cadastral Reform Project”
 - Project will be performed during 20 years from 2012
 - Contains 3D cadastral surveys to specific basement facilities

5.2 Application Strategy

- **Seoul expect that**
 - Tax income by establishing rights of superficies
 - Define standards in the 3D space by the reform records.
- **Contribute to the development**
 - 3D survey technology
 - Expansion of the geo-spatial information market
- **Use to the managing and service task**
 - Management authorities of cadastre, building, facilities ...
 - Authorities of civil services, public institutions and Supreme Courts.

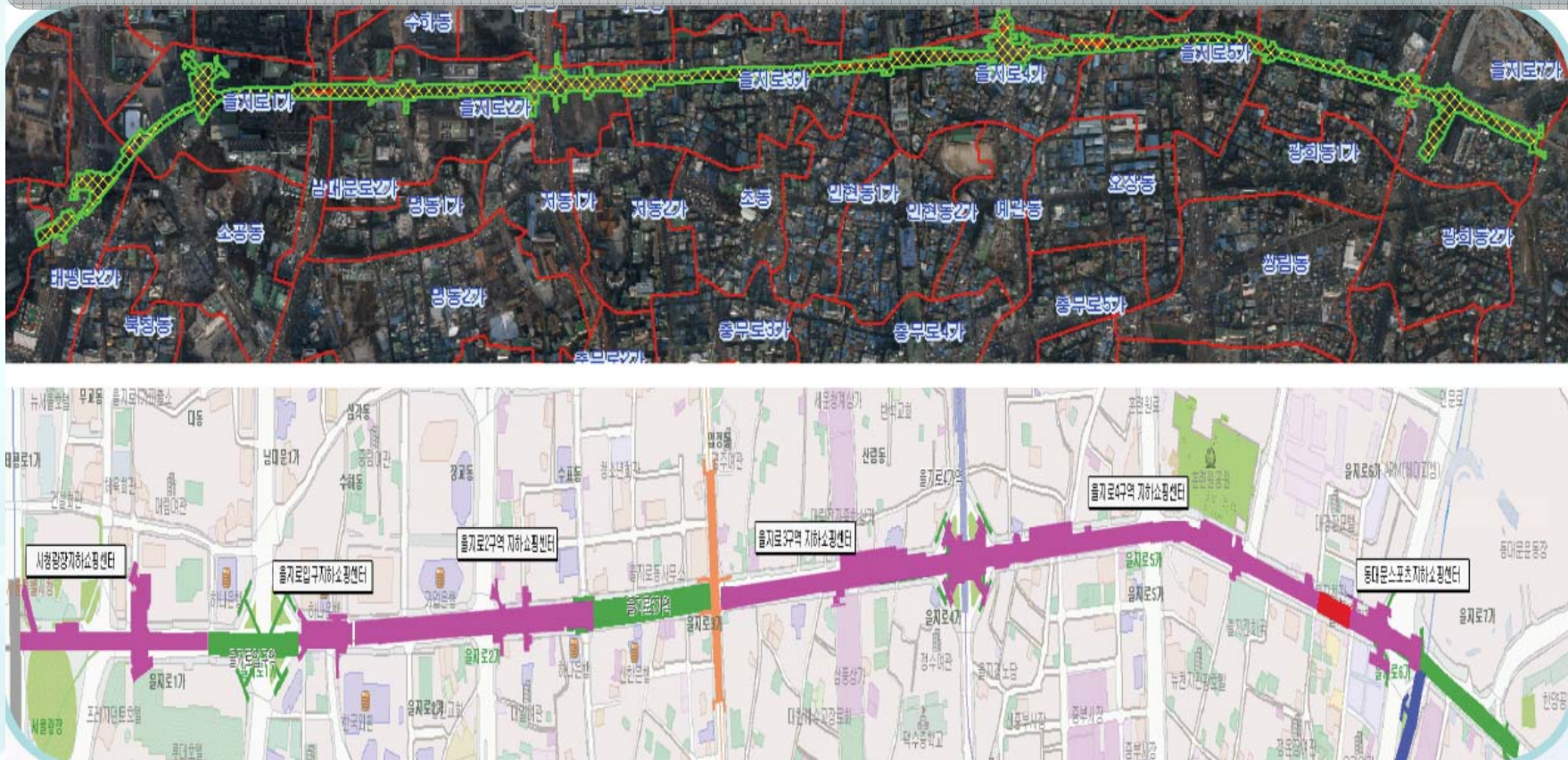
5.3 Future Action Plan

Era	Goal	Action
~ 2008	Research	- Raise necessity of introduction of 3D cadastre
1st step (2009-2010)	Create foundation	- Select pilot project sites and apply - Modeling 3D cadastre/construct DB/develop prototype system - Define terminology and concept
2nd step (2011 ~ 2012)	Construct foundation	- Suggest 3D cadastre application model - Suggest legal and systemic align strategy - Form a consultative board of related authorities - Hold a public hearing/public relations
3rd step (2013 ~ 2015)	Apply and use	- Apply to the Cadastre Reform Project - Construct nationwide 3D cadastral system

5.3 Future Action Plan

Project site of 2011

① Subway stations and shopping mall (about 3km)



6 . Conclusions



6.1 Policy of 3D Spatial Information

- **Planning to support creative ideas by using high quality of spatial information as follows**
 - **Expand open access to make an easier approach of spatial information possible**
 - **Spatial information open platform will be constructed**
 - **Planned to build up a global brand to power and enhance overseas expansion of the “3D Business”**
 - **Training human resources and cooperation and research and development**

6.2 Conclusions

- **Introduction of 3D cadastre is needed**
 - **For the management of public facility**
 - **For the preservation of people's ownership**
- **Through this project we could**
 - **Meet to ask by the land administration part to serve 3D cadastral map**
 - **Preserve people's property rights, and increase utilization of land information services.**

Thank you

