BITAL

DATA PRESCIENCE FOR DISASTER PREVENTION

BITAL Product Guide

AI that finds slope failure risk from imagery alone

Start with a tablet, scale with drones, collaborate on the same 3D



DPRE Co., Ltd.
dpre.co.kr

01

Smart Face Mapping

Survey app for rock slopes and tunnel faces

02

Construction Management

Slope safety with drone photogrammetry

03

Maintenance

Slope management with drone LiDAR

Hidden ground surface, data that never accumulates



Visual inspection Ground surface hidden by vegetation



Drone survey Ends at file delivery; hard to compare surveys



Conventional

Manual rock survey

Measured one face at a time, up close on the rock

Conventional-method photo: generated image for illustration

BITAL

3D built from imagery, data that grows with every inspection

Start with a tablet, scale with drones, collaborate on the same 3D



During construction

01 Smart Face Mapping
02 Construction Management

Rock survey of excavated faces,
stage-by-stage stability checks on drone 3D



After completion

03 Maintenance

Change detection against
the 3D built during construction



When failure occurs

Accumulated 3D data

Basis for cause review and
repair / reinforcement design

3 site illustrations: generated images for illustration

One 3D dataset

One view shared by contractors, agencies and owners

Start on a tablet › Scale with drones › Collaborate in 3D

Photos from multiple angles, turned into a 3D rock face

01 Capture Overlapping shots from multiple angles



AR true scale, GPS and compass recorded together (Android app)



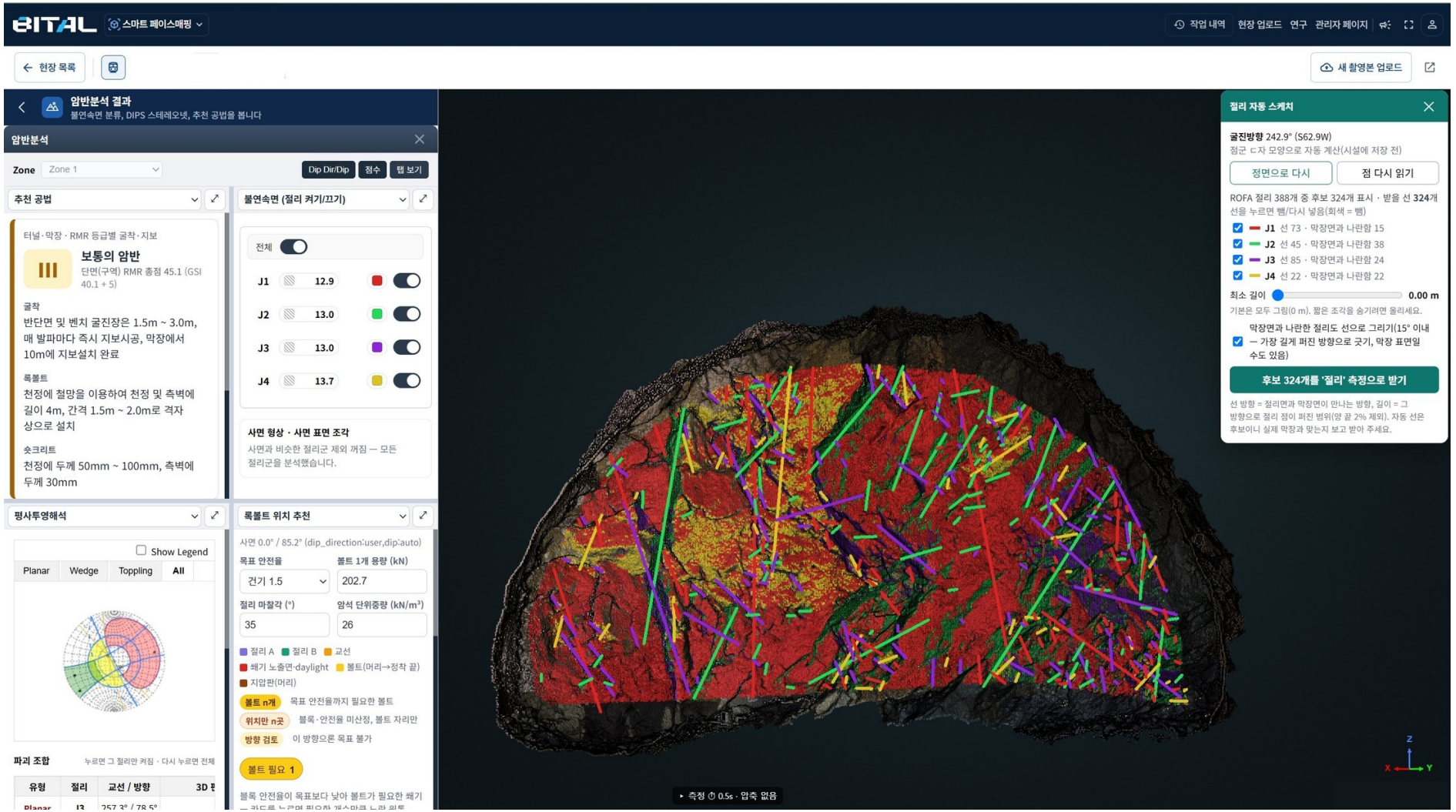


02 3D reconstruction Actual screen



AI 1 **Multiple photos into 3D** AI 3D model from multi-angle photos

Joint analysis for rock slopes and tunnel faces



AI 3

Automatic joint-set classification

Density-based clustering (ML)

02

Orientation

Dip / dip direction per joint set

03

Stereonet

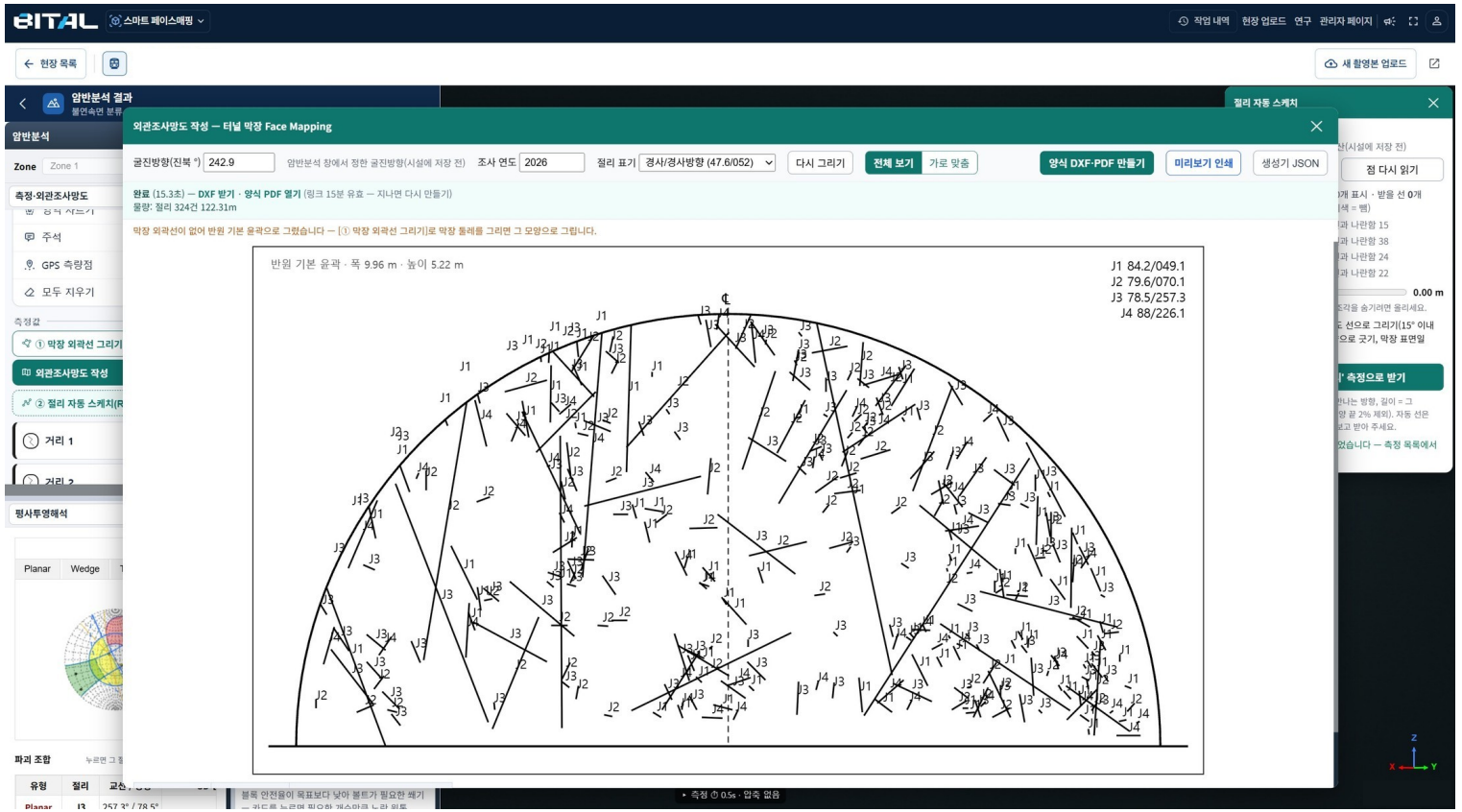
Joint-set distribution check

04

Rock bolt placement

Linked to joint analysis results

Face mapping and visual inspection maps from 3D data and CAD



01 **Lines drawn on the 3D model become drawings**
3D data · CAD link

02 **Slope visual inspection map**
Survey record drawing for rock slopes

03 **Tunnel face mapping**
Survey record drawing for tunnel faces

※ Custom report formats require a separate development discussion



Conventional

Photo: generated image for illustration

Clinometer survey

Measured one face at a time, up close on the rock

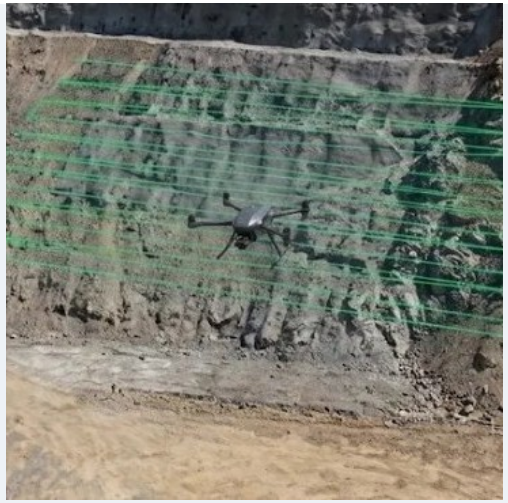
Surveys once done by experts on the rock, now a photo shoot by junior engineers

Drone 3D for construction management, with rock analysis on top

Today On-site construction management Already in practice



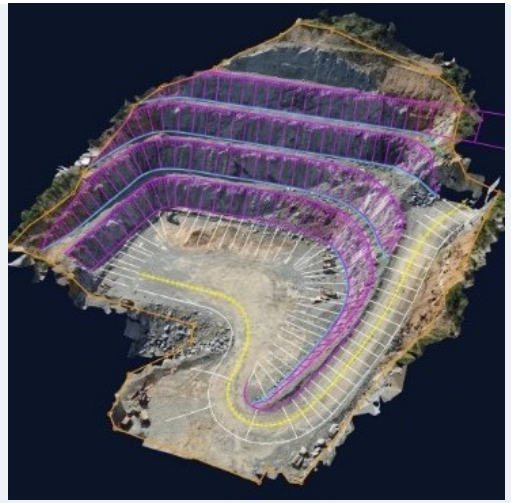
Drone station Scheduled flights



Automatic capture
Photogrammetry



3D site model Photo-based 3D



Design overlay As-built check

Concept images: generated for illustration



Conventional

Manual survey

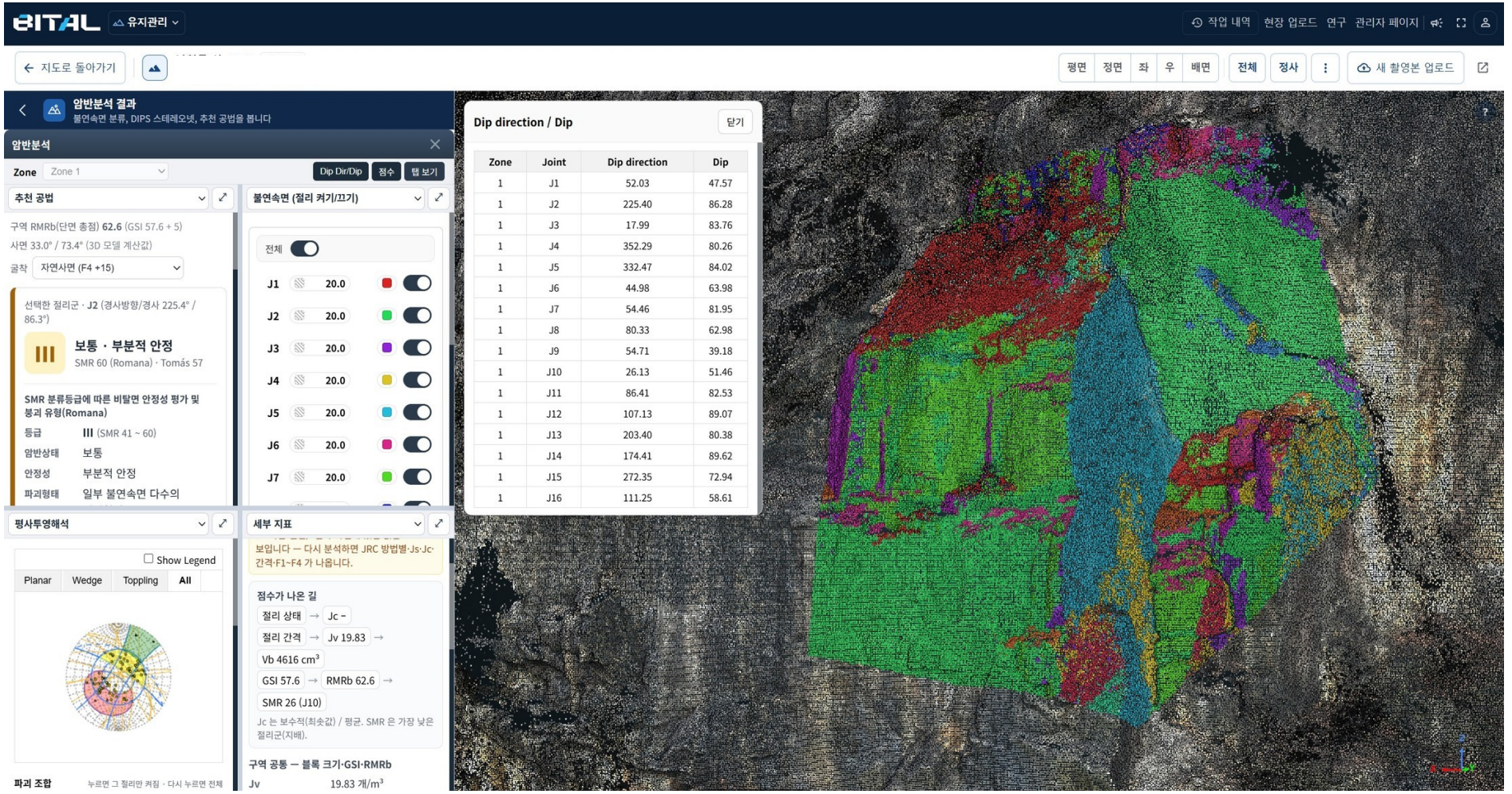
Measured one face at a time, up close on the slope

Conventional-method photo: generated image for illustration

Added · Rock mass analysis

Surveys once measured by hand, now on drone 3D

Rock mass analysis directly on the same 3D model



Actual screen · Rock mass analysis results

AI 3

Discontinuity analysis

Extracted from the drone 3D model

02

Failure mode analysis

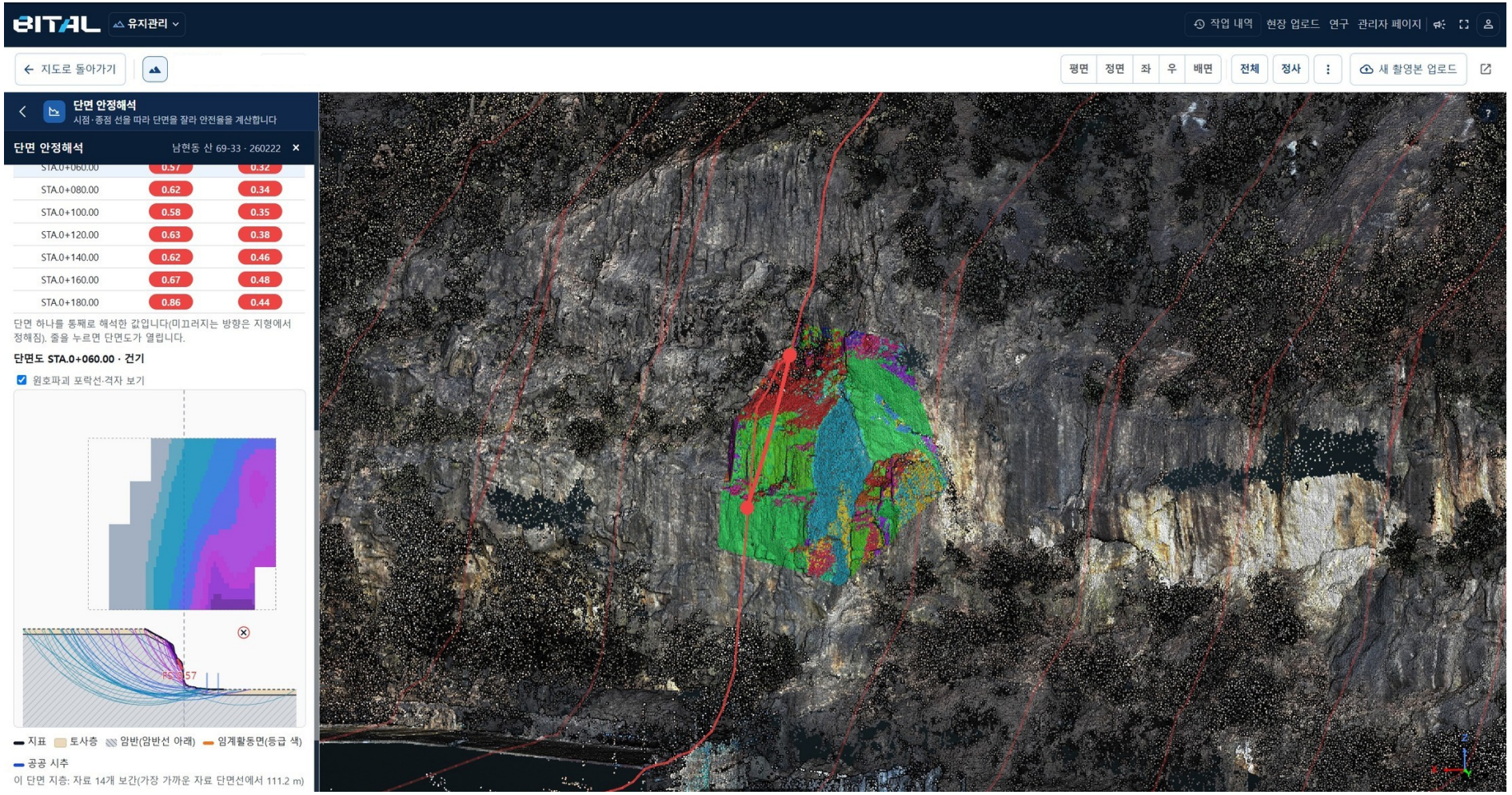
Planar · wedge · toppling

03

No extra flights or equipment

Uses the construction drone 3D as is

Slope stability: section safety factor and critical slip surface



Actual screen · Section stability analysis

01

Pick sections on 3D

Choose the analysis location with a section line

02

Section safety factor

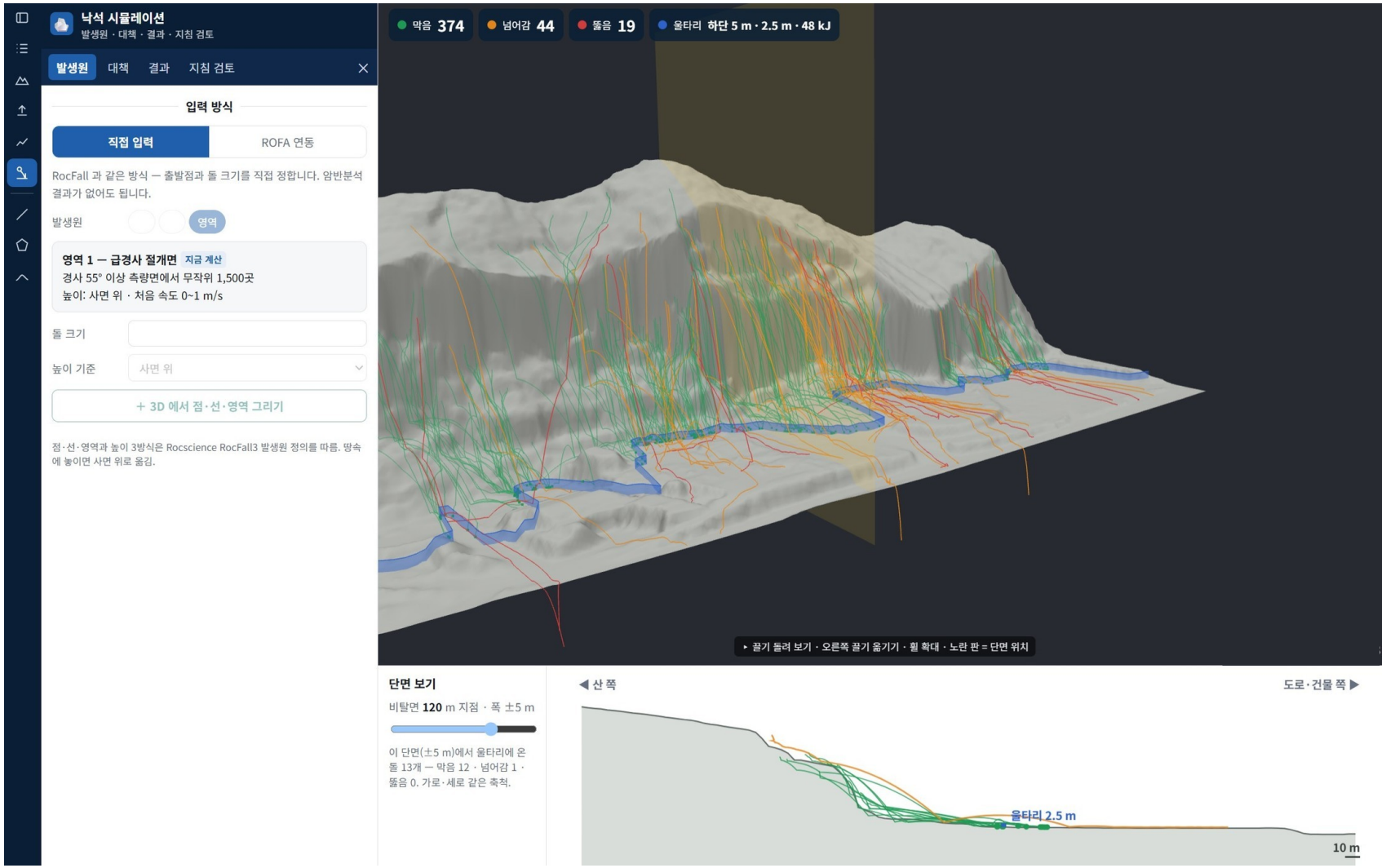
Safety factor table by section

03

Critical slip surface

Shows the least favorable slip surface

3D rockfall simulation linked to rock analysis (in validation)



01

Rockfall simulation linked to rock analysis

Sources entered directly or linked from rock analysis (ROFA)

02

Rockfall nets and fences included

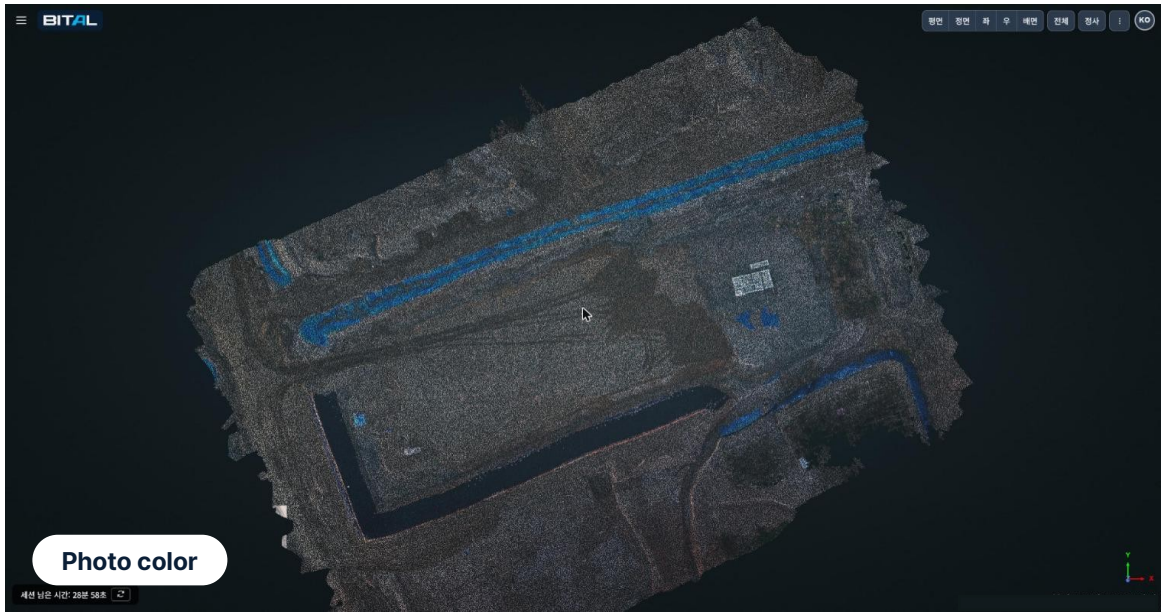
Calculated with protection structures in place

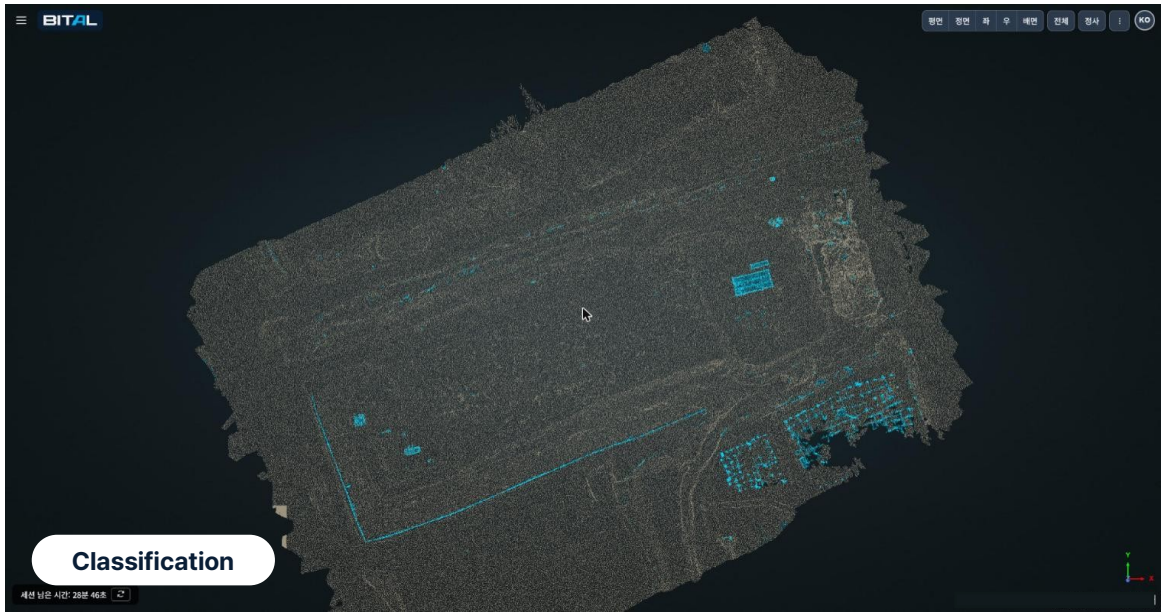
03

Results · section view

Counts of stopped · overtopped · passed

Keeps fill and cut surfaces, removes only materials, fences and brush





Kept as ground Removed (non-ground)

Actual screen · Test site, survey 1 · 52.5M points

① Cloth simulation (CSF)

Cloth draped over the points; touched points count as ground

② Cut-bench restoration

Bench edges of stepped terrain restored as ground

③ Color vegetation filter

Removes only green points (brush) rising more than 15 cm

1.6 % · 1.9 %

Points removed

After fill stages 2 · 3

38 s · 35 s

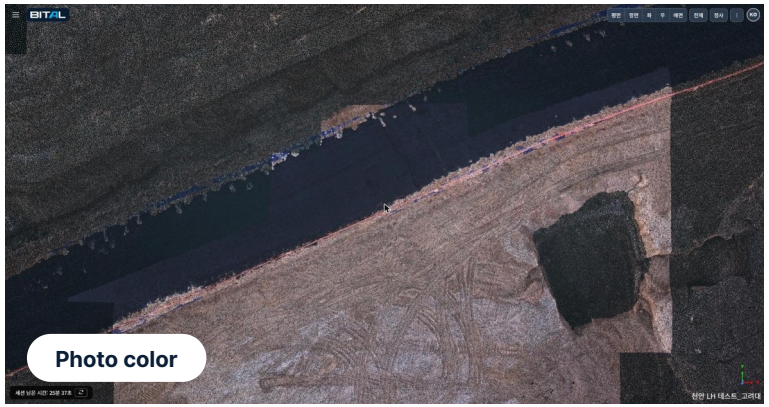
Engine run time

52.5M · 57.7M points

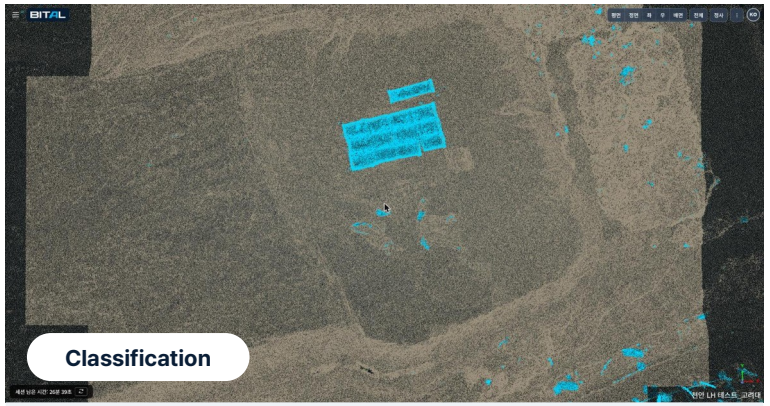
Results from two surveys at one test site. Quantitative accuracy comparison and equipment-removal validation are in progress · Refs: Zhang et al. (2016) Remote Sensing 8(6):501, Yilmaz et al. (2018) Int. J. Remote Sensing 39(15-16):5016–5042

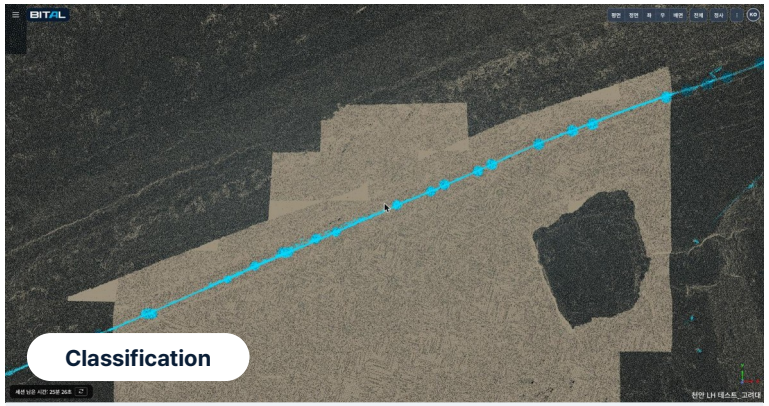
Three close-ups: what was removed and what was kept

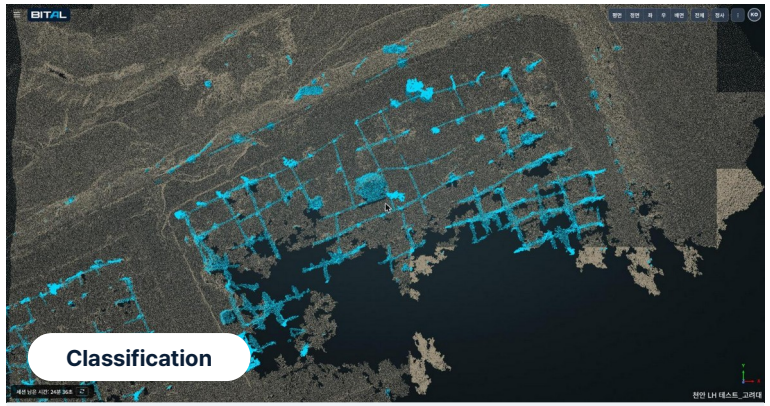












① Material bundles and tarp

Removed White material bundles (sacks, bulk bags)
Kept Blue tarp spread on the ground

② Perimeter fence

Removed Orange fence and posts
Kept Black-sheeted slope

③ Grid structure and brush

Removed Post-and-wire grid structure, brush
Fixed objects at the same spot in both surveys

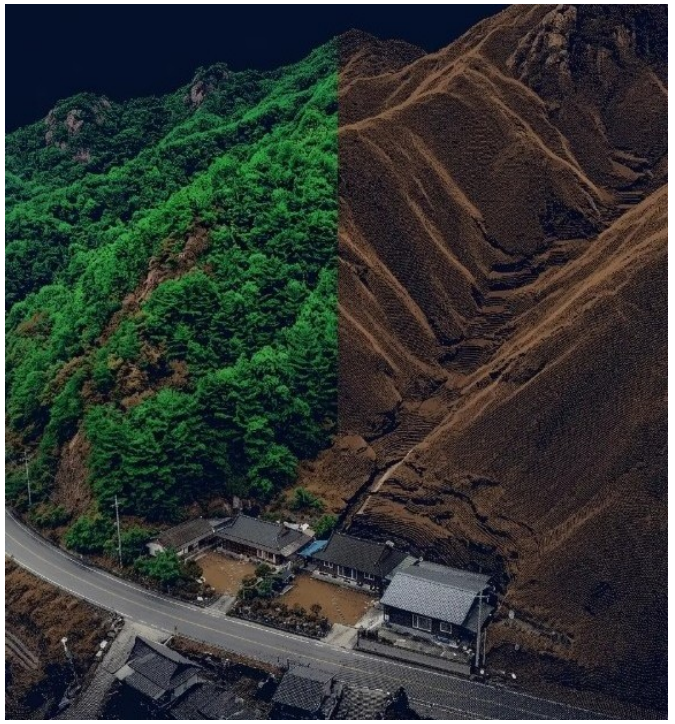
Colors: beige = kept as ground, sky blue = removed (non-ground) · Limitation: low materials under 0.5 m remain as ground · Based on on-screen review and sample measurements; quantitative accuracy comparison pending

Down to the ground beneath vegetation, with drone LiDAR



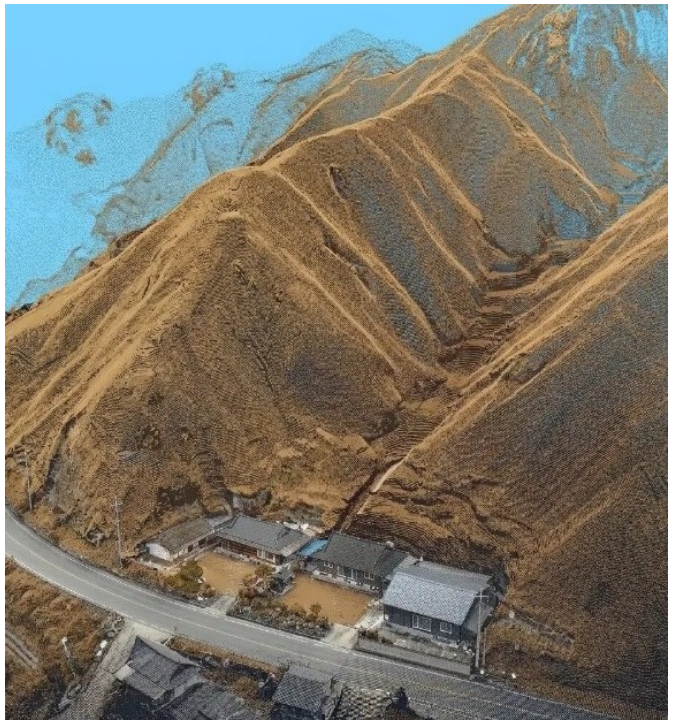
01 Drone LiDAR survey

Regular inspection of slopes near communities



02 Vegetation–ground separation

Automatic point cloud classification



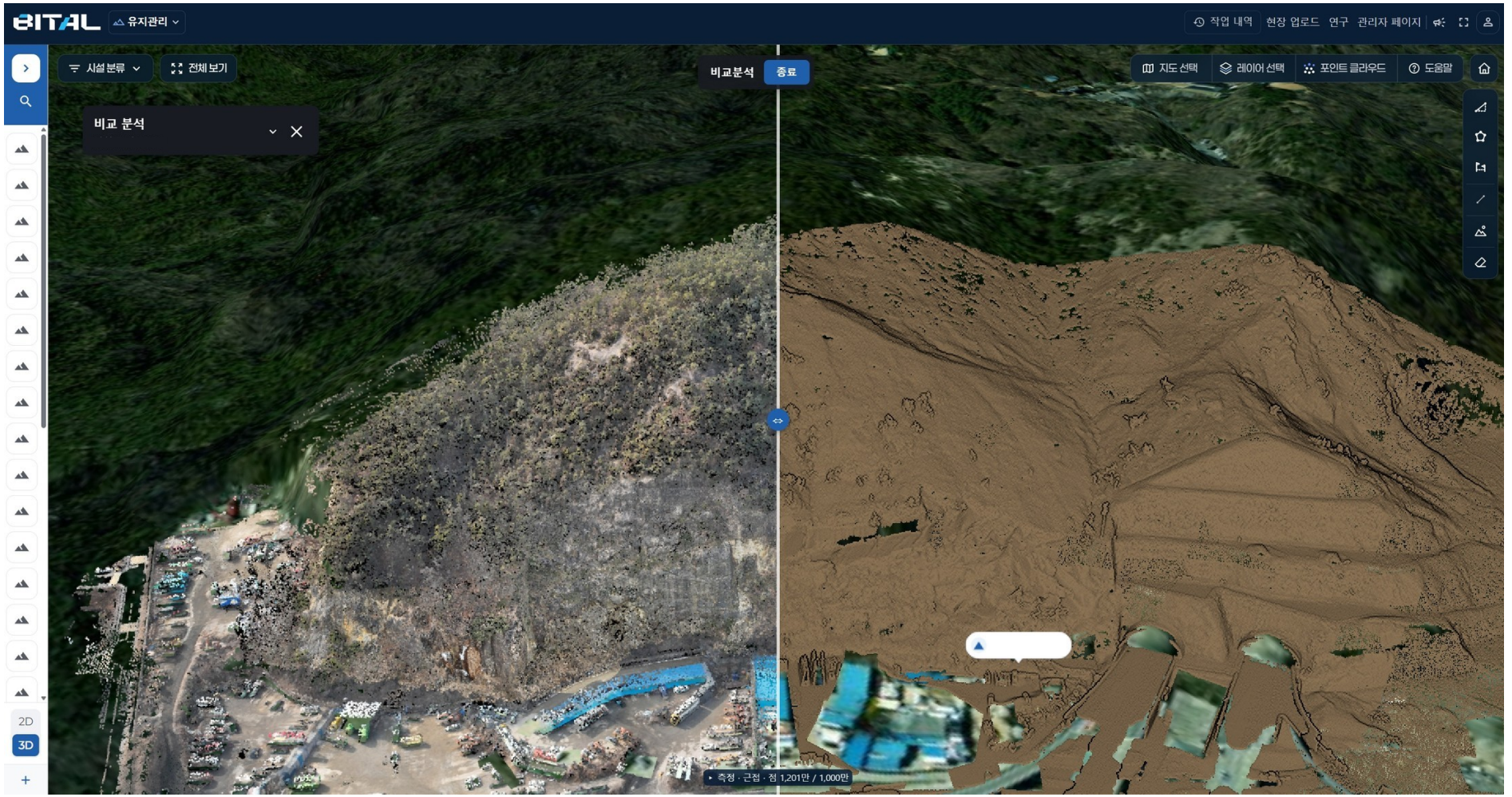
03 3D ground model

Baseline for later reviews

3 step illustrations: generated images for illustration

Statutory inspection	**At least twice a year:** safety inspections, 3D added each time	Steep Slope Act, Art. 5 (Korea)
Under canopy	Ground coverage (dense forest, leaf-off) **Photogrammetry 80.7% · LiDAR ~100%**	Eur. J. Remote Sens. 2023

Vegetation–ground separation, side by side with the full point cloud



Actual screen · Comparison (full point cloud | ground points)

AI 2

Vegetation–ground separation

Automatic point cloud classification

02

Side-by-side view

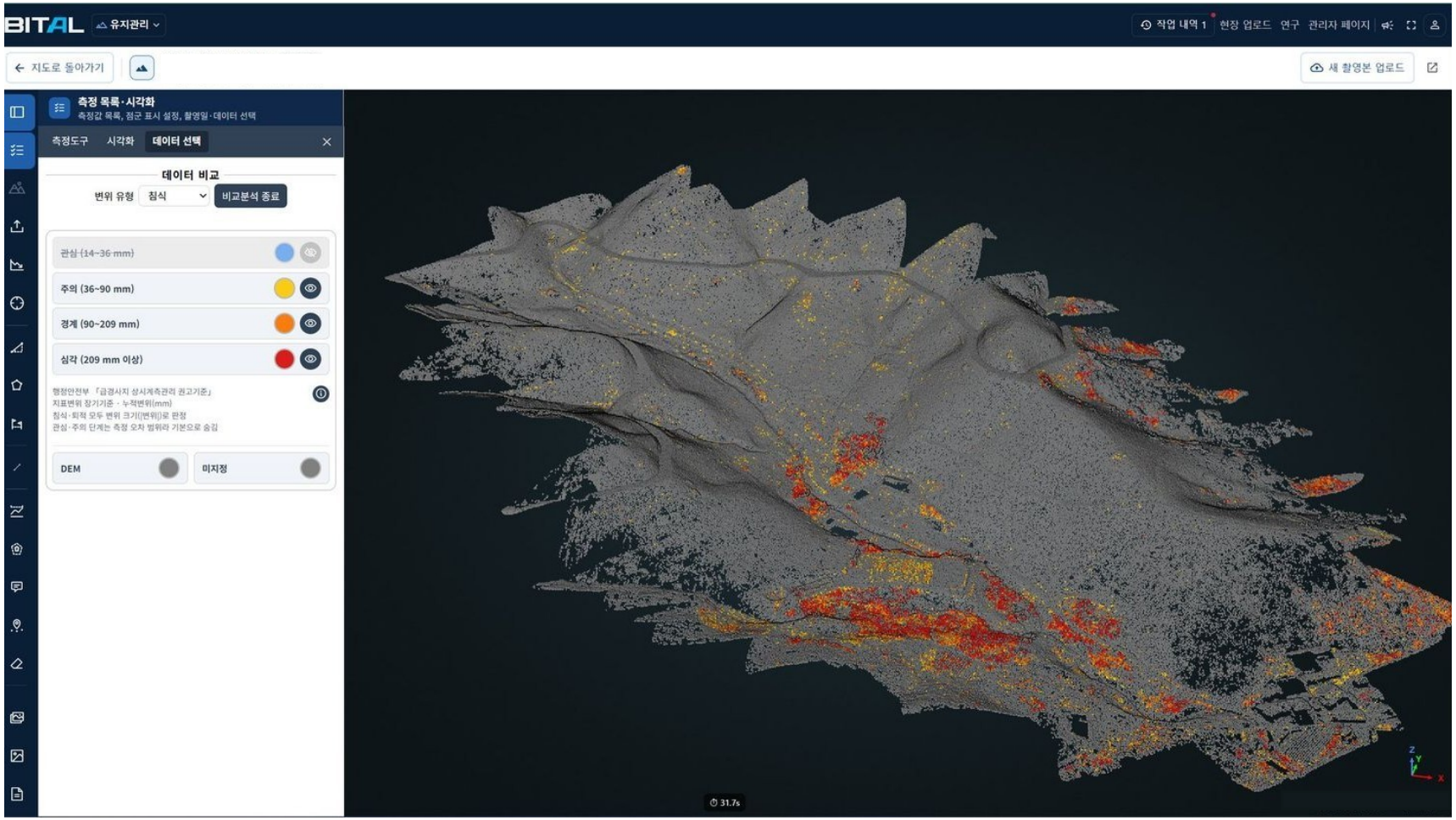
Full point cloud | ground points

03

Vertical cliff separation

Accurate ground separation even on vertical cliffs

Beyond what instruments see: integrated satellite, drone and instrument monitoring



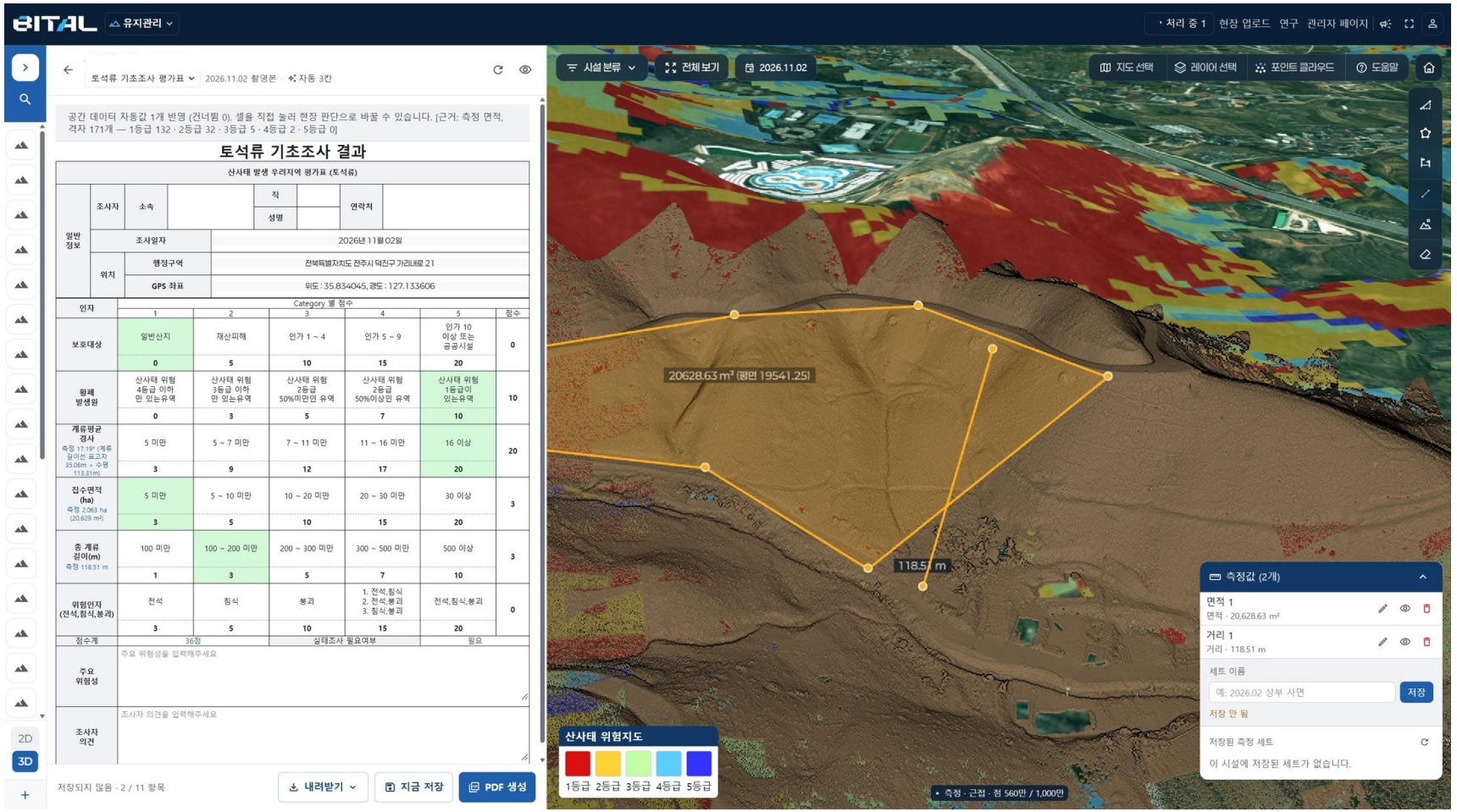
Whole-slope monitoring system with drone LiDAR

Attention	14 mm
Caution	36 mm
Alert	90 mm
Severe	209 mm

MOIS (Korea) resident evacuation advisory criteria
(cumulative extensometer displacement, soil slope monitoring data)

Satellite SAR	Wide-area displacement
Drone LiDAR	Whole slope, 5 cm class (quality-dependent)
Instruments	Attention · caution stages

Slope reports generated with linked public data



01

Public · spatial data

Queried by site location

02

Auto-filled report forms

Data values entered into form fields

03

Map measurements linked

Slope angle and area measurements applied

Reports	**Safety Act · Steep Slope Act · landslide · debris flow**
Linked data	**Borehole logs · hazard maps · forest maps, etc.**

5 field pilots and contracts



Seoul steep-slope safety inspection pilot site 2025



Wanju County slope pilot site 2024

Pilots · contracts

2024 GS E&C Open Innovation: automated tunnel rock mass assessment

2024 Wanju County: pilot adoption at 12 slopes

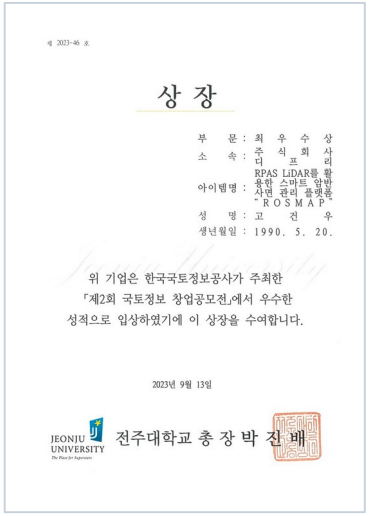
2025 Wanju County: drone digital-twin baseline survey of casualty-risk areas

2025 Smart City regulatory sandbox demonstration project

2025 Seoul: drone-based steep-slope safety inspection pilot

2022	2023	2024	2025	2026
Company founded Drone operator registration	R&D center established LX · Smart Construction awards	GS E&C Open Innovation 12 slopes piloted in Wanju	Seoul pilot project Regulatory sandbox demo	Selected for TIPS BITAL launched

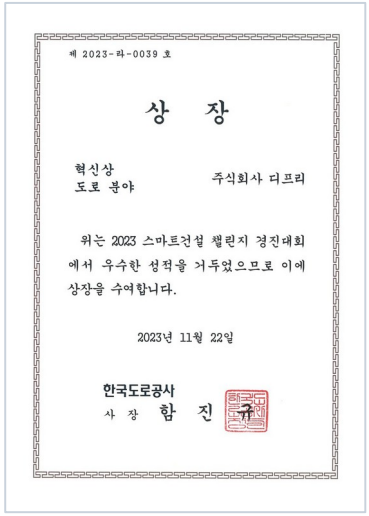
5 awards and regulatory exemption approval



Top Excellence Award

2nd LX Land Information Startup Contest
Hosted by LX Corporation

2023. 9.



Innovation Award (Roads)

2023 Smart Construction Challenge
CEO, Korea Expressway Corp.

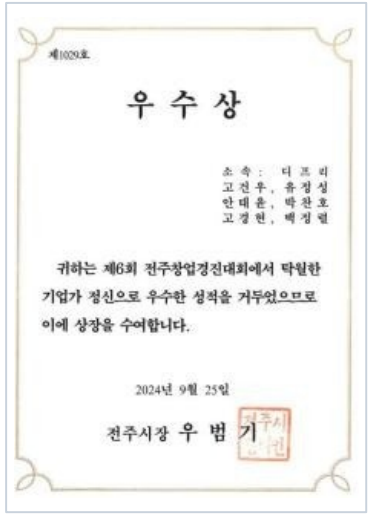
2023. 11.



Grand Prize

2nd Disaster & Safety Data Startup Competition
Minister of the Interior and Safety

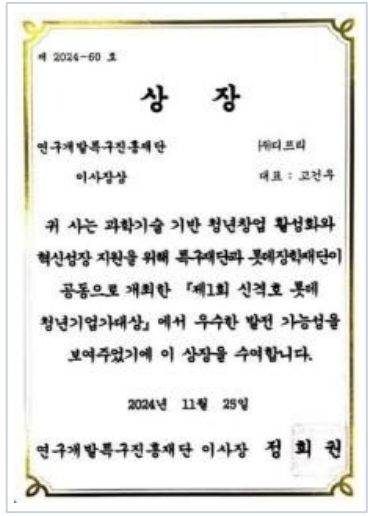
2024. 8.



Excellence Award

6th Jeonju Startup Competition
Mayor of Jeonju

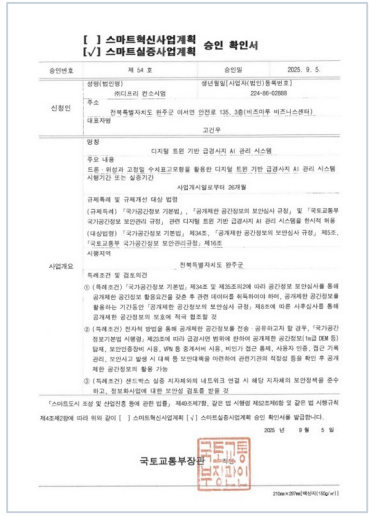
2024. 9.



Chairman's Award

1st Shin Kyuk-ho LOTTE Young Entrepreneur Awards
Korea Innovation Foundation

2024. 11.



Regulatory Exemption

Smart Demonstration Project Plan approval
Minister of Land, Infrastructure and Transport

2025. 9.

5 **Awards**
2023. 9. ~ 2024. 11.

Grand Prize
Minister of the Interior and Safety
2nd Disaster & Safety Data Startup Competition

Exemption
Smart City regulatory sandbox
Smart demonstration plan approved · MOLIT Minister · 2025. 9.

3 AI technology highlights

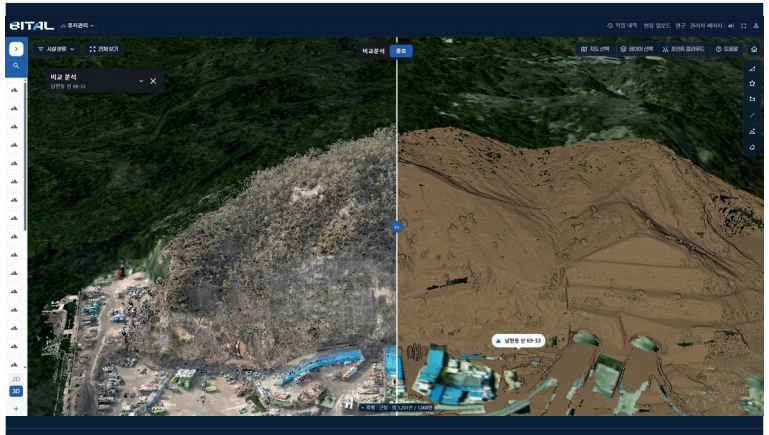


AI 1

Ultra-fast 3D modeling from imagery

Transformer-based model that estimates
3D point clouds directly from multiple photos

In use

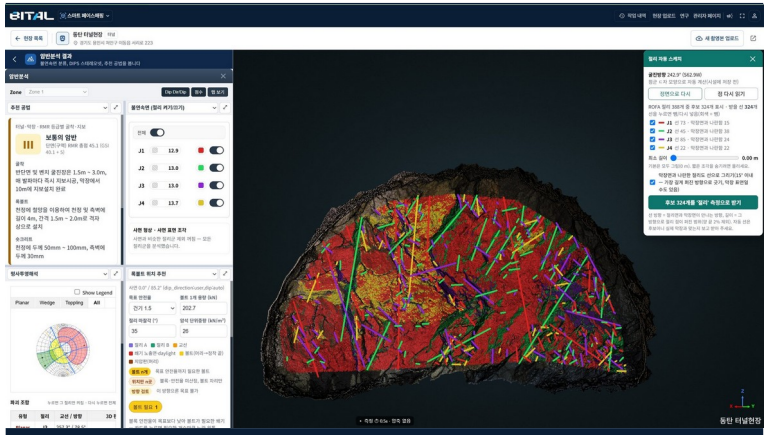


AI 2

Ground classification

Automatic separation of ground from vegetation and structures
In-house engine (learning-based model)

In use | Moving to transformer



AI 3

Rock mass analysis

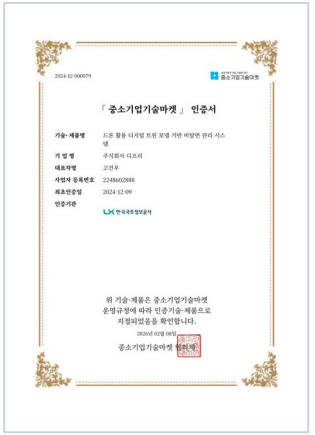
Joint classification by density-based clustering (ML)
Randomized 3D JRC generation and matching

Joint classification in use | Moving to transformer

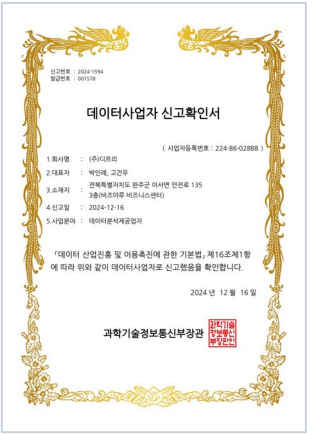
Youth-founded startup, 7 certifications, 9 registered patents



Corporate R&D Center Certificate
KOITA 2023. 10.



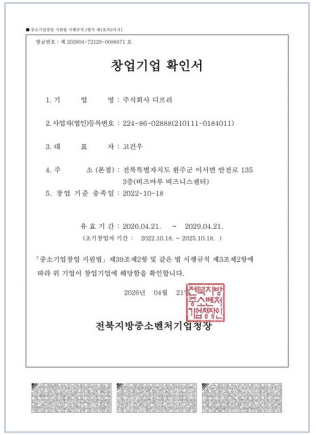
SME Technology Market Certificate
LX Corporation 2024. 12.



Data Business Registration
MSIT 2024. 12.



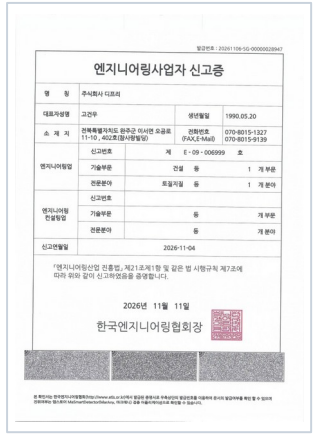
Specialized Research Business Registration
Engineering R&D 2026. 3.



Startup Company Certificate
Youth-founded startup 2026. 4.



Venture Company Certificate
Venture investment type 2026. 8.



Engineering Business Registration
KENCA 2026. 11.

IP rights

9 patents **1** PCT application **1** copyright

- **2017** Integrated management system using underground space information — Tech transfer
- **2021** SAR-based big-data method for classifying and analyzing disasters — Tech transfer
- **2023** Method and device for early prediction of soil slope failure — Held by CEO
- **2024** Early prediction system for reservoir embankment leakage and failure — Held by CEO
- **2024** Rock structure management system
- **2025** Rock structure management system and method
- **2025** Slope history management system and method
- **2025** Rock structure evaluation method and system
- **2026** Digital-twin slope monitoring and management method and system using drone remote-sensing data

Registrations

- **2022** Incorporation · business registration
- **2022** Ultralight UAV operator registration
- **2025** Smart City Association member
- **2026** Safety diagnosis agency (tunnel, bridge)

Programs · MOUs

- **2025** Kibo-Star Valley
- **2026** TIPS program
- **MOU** Steep Slope Safety Assoc.
- **MOU** Jeonbuk Nat'l Univ., Civil Eng.

Youth-founded startup

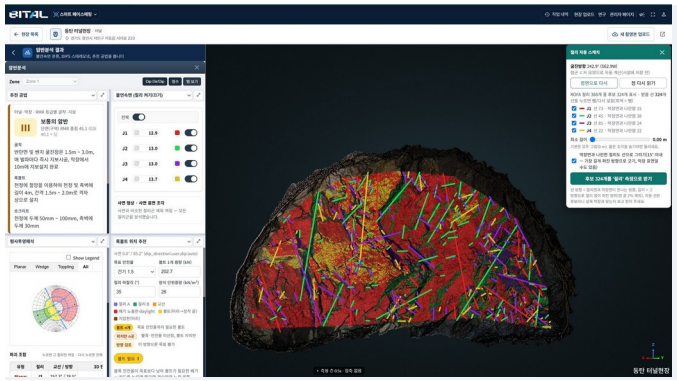
Startup Company Certificate
Ministry of SMEs and Startups · 2026. 4.

See it on your own site data first: 4 steps to adopt



1 Consultation

Review of site and inspection approach



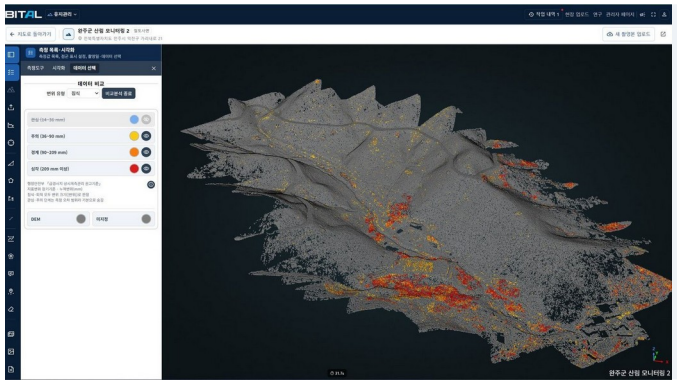
2 Demo

3D and analysis demo with your own data



3 Site setup

Capture guidance, first survey processed



4 Operation · training

Per-survey analysis, reports, staff training

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BITAL

DATA PRESCIENCE FOR DISASTER PREVENTION

From slope construction to maintenance, on a single dataset

dpre disaster prevention

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