

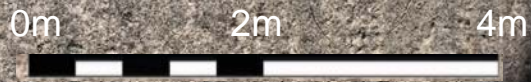


Spotlight ai

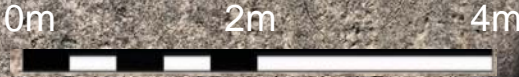
Enhancing the land release process with drone-based AI Landmine detection

Jasper Baur, Carl Case, Gabriel Steinberg

Find the PFM-1



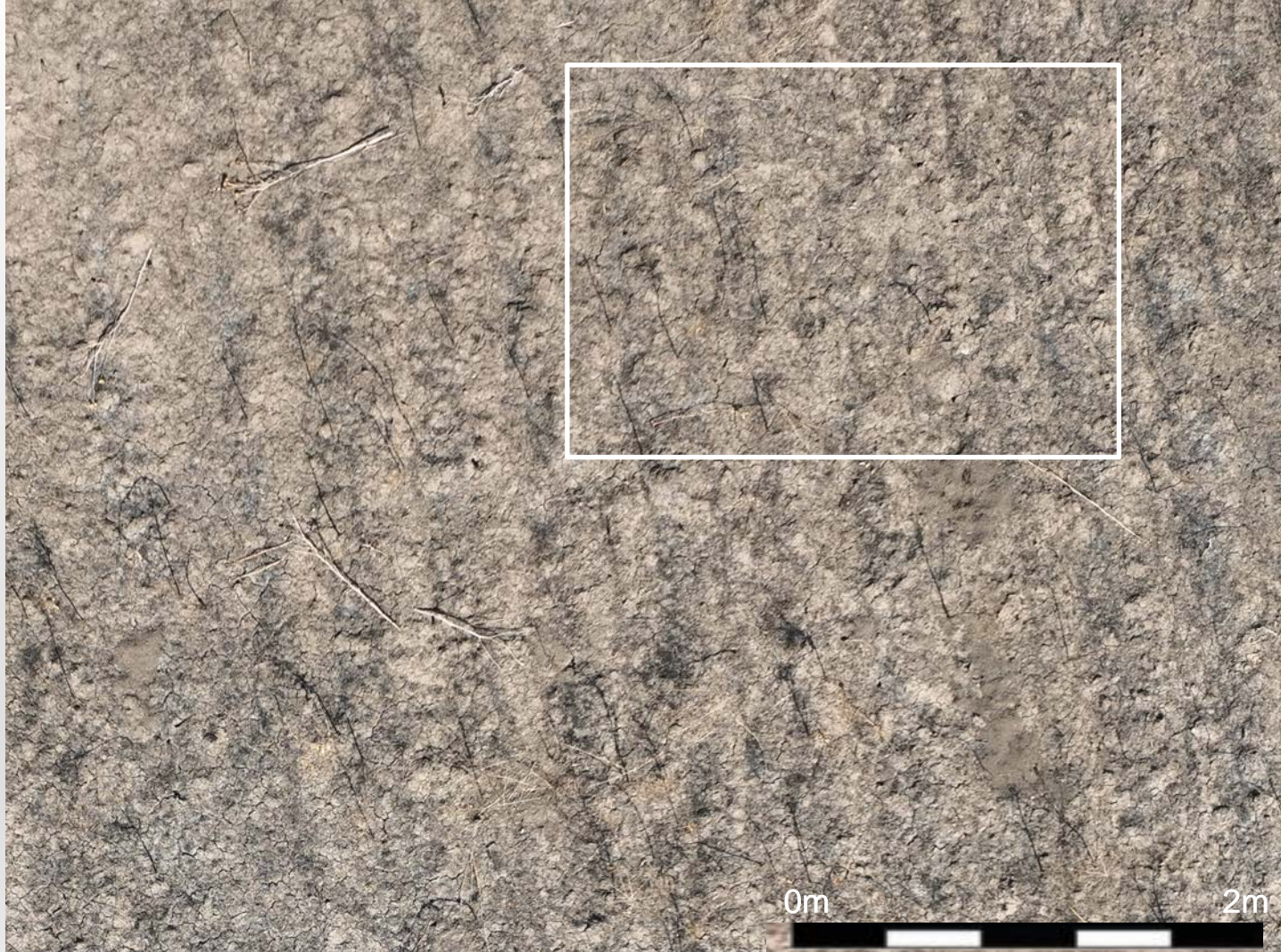
Find the PFM-1



Find the PFM-1



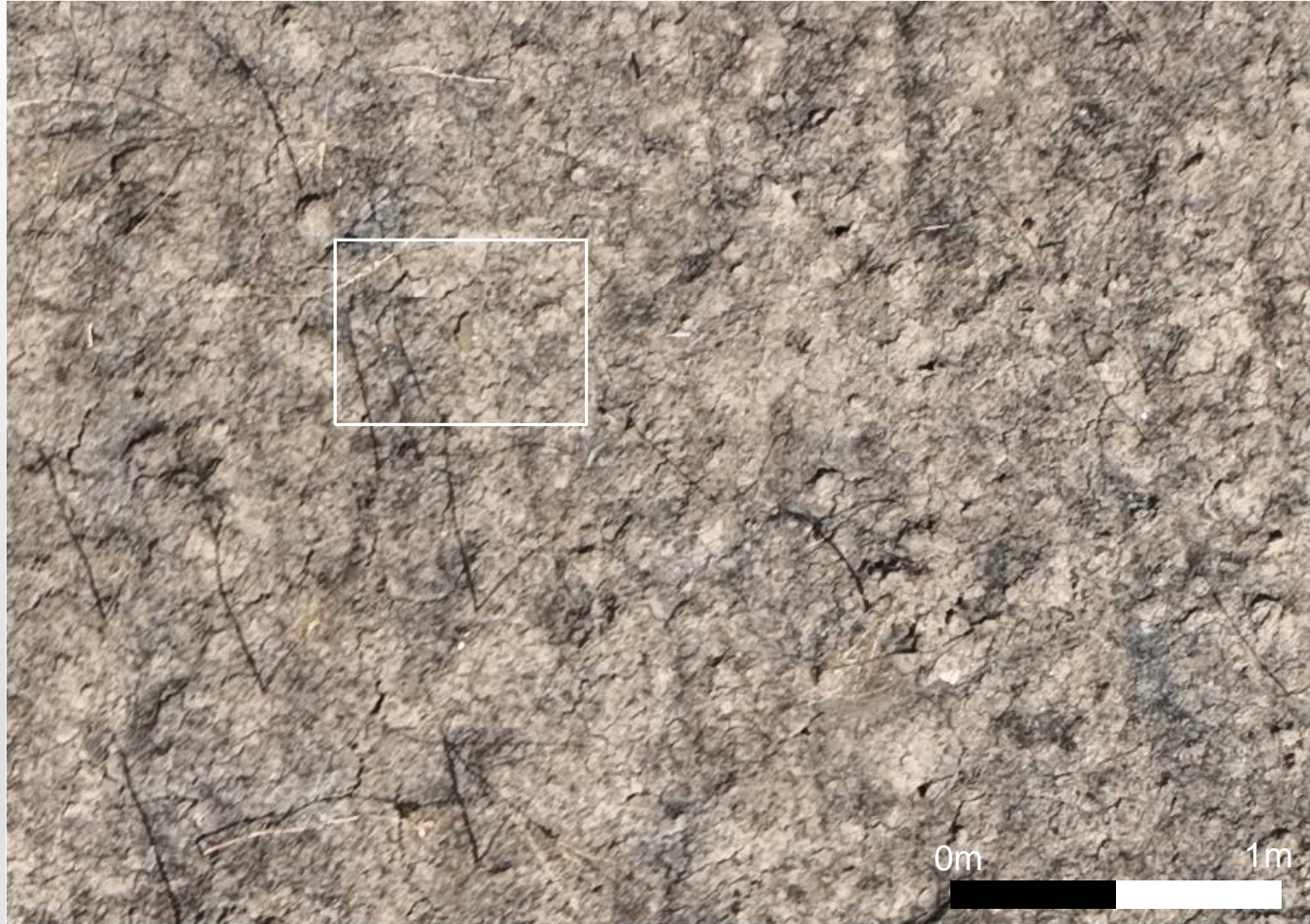
Find the PFM-1



Find the PFM-1



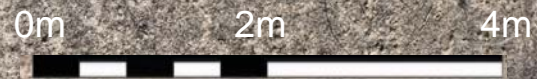
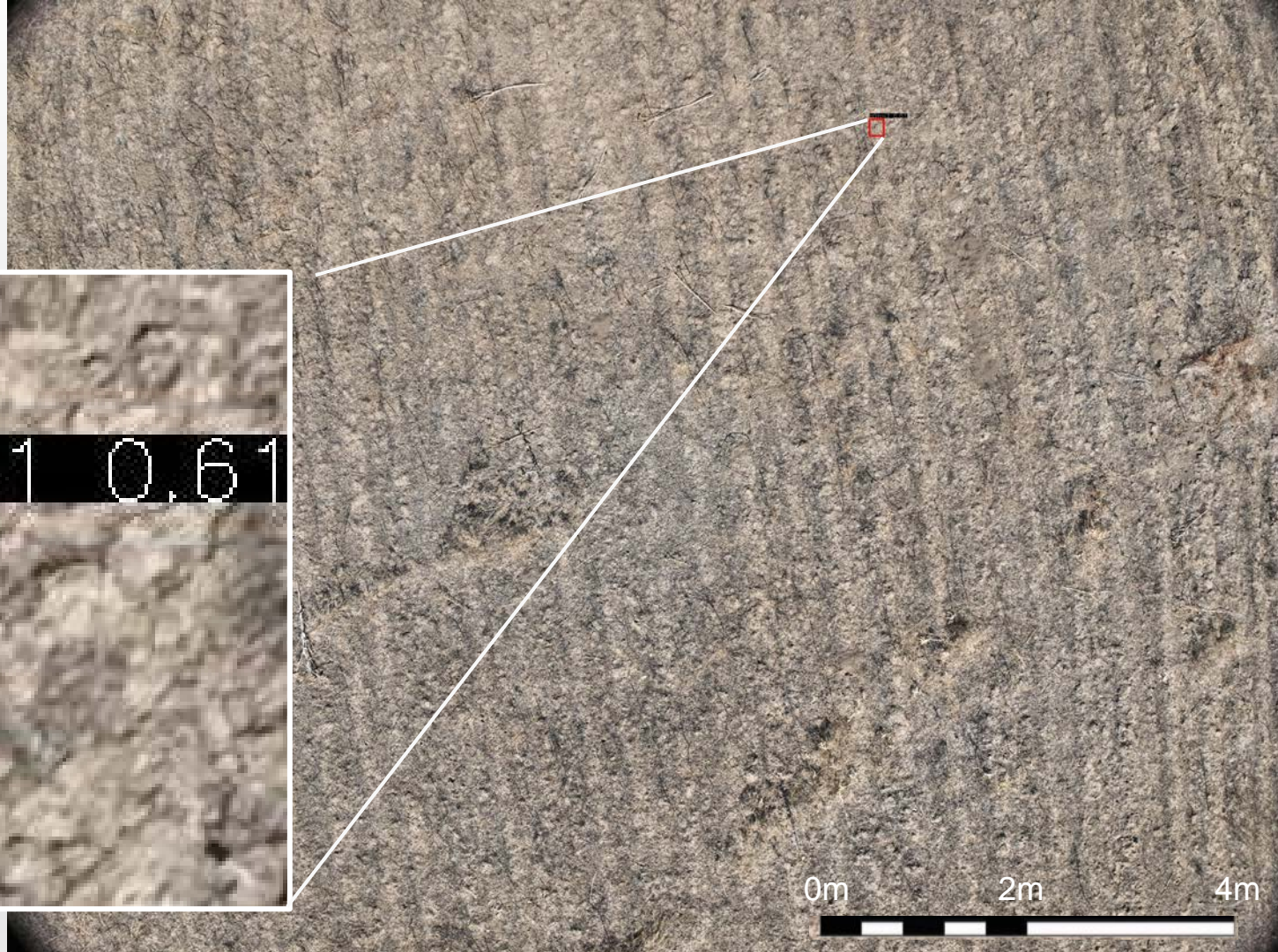
Find the PFM-1



Find the PFM-1



Zooming out



1150 Image survey

2 hectares or
0.02 km²
mapped



Image 458



Detection in image 458

pfm-1 0.61



A problem of scale

- Estimated 170,000 sq km of contaminated land in Ukraine
- Requires a range of solutions
- UAVs – large area mapping ability
 - Analyzing imagery of this scale would take years by humans
- Detection speed of surface EO:
 - AI:** *0.2 second* per image
 - Human:** *~3 minutes* per image



ABC News graphic: Jarrod Fankhauser

Spotlight AI

A web-application: Access at: safepro.ai

- A software for demining organizations to plan, process, and analyze drone imagery
- For operation managers, GIS analysts, pilots, donors
- **AWS** powered **cloud-based web** application
- User friendly, secure, scalable
- Compatible with COTS UAVS



AI Detection + Map Generation

- Trained on 100,000+ samples of mines and UXO
- Automatically **identify 150+** types of UXO and EO
- Process **sub-cm resolution** maps from drone survey
- GIS + IMSMA Core Compatible

The screenshot displays the Spotlight AI web application interface. The top navigation bar shows the user profile 'Spotlight AI' with the email 'jasperbaur@gma...' and a balance of '383.38 Credits'. The main content area is titled 'Surveys > March 31 - Mykolaiv'. A sidebar on the left contains navigation options: Search, Surveys, Archive, Navigator, Video Tutorial, FAQs, and Flight Instructions. The main content area shows the survey details for 'March 31 - Mykolaiv'. It includes an 'Initial Assessment' section with 'Potential Contamination' and a 'Review Predictions Coming Soon' button. Below that is a 'Hazard Mapping' section with 'Requires: 2.36 Credits' and a 'Review Predictions' button with a checkmark. A 'Map' section shows a map with red dots indicating detected hazards, with status indicators for 'Drone Images mapped' and 'Orthomosaics Mapped'. At the bottom, there is a 'Download' button.

Operational **Utility**


Augment **Non-Technical Survey**, Pre-clearance assessment, Quality assurance

- Survey suspected and confirmed hazardous areas, Map out surface contamination, Prioritize areas of clearance, *increase* efficiency and capability of NTS, safety of mechanical assets

NTS UAV Survey



Upload imagery



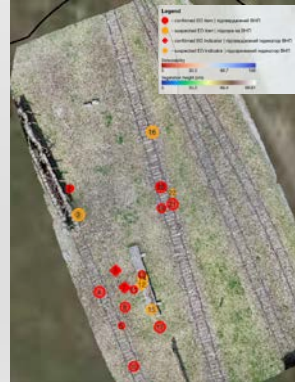
Upload Drone Survey
Minimum images count is 1
Maximum images count is 3000

Drop files here or [browse files](#)

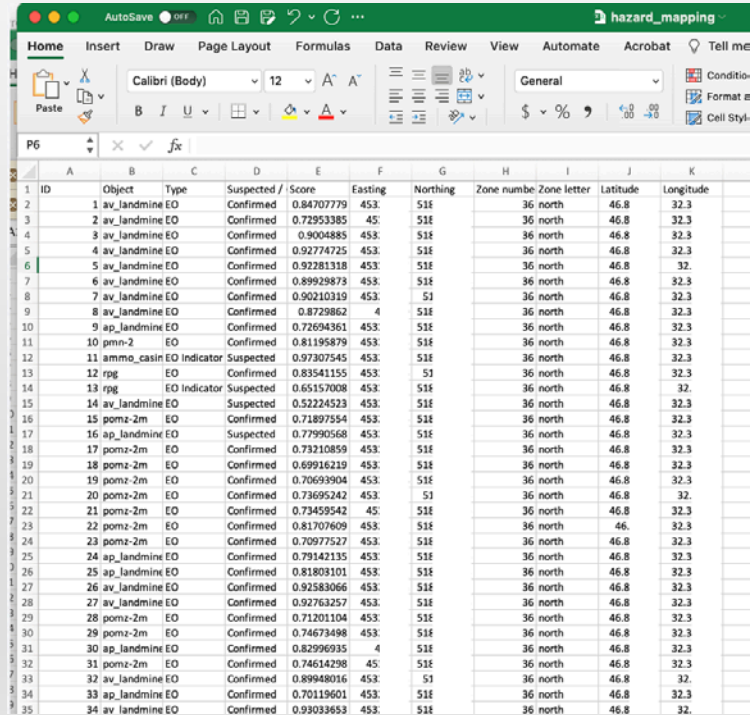


Actionable intelligence

- 1) KML and CSV files with EO locations
- 2) Polygon of surveyed area
- 3) Orthomosaic
- 4) Vegetation height map
- 5) Detection rate map
- 6) Automated NTS report
- 7) Printable field map

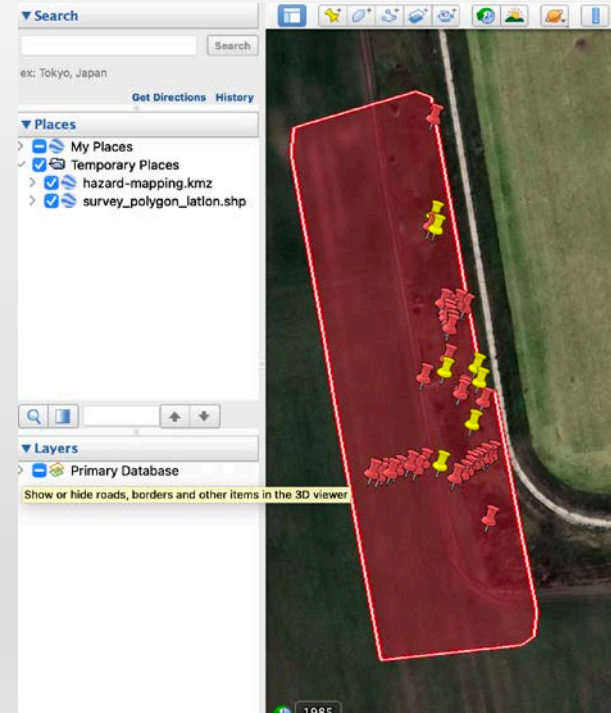


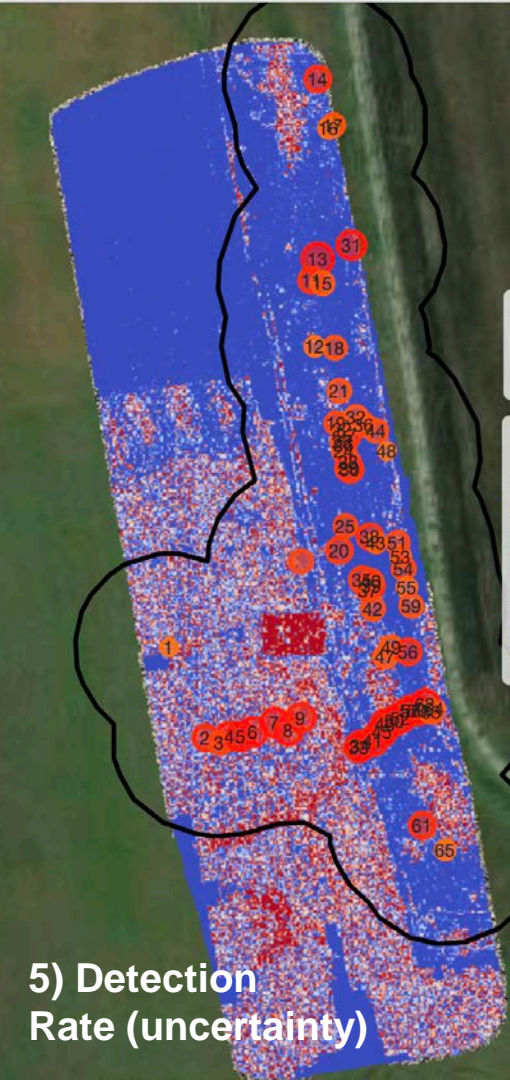
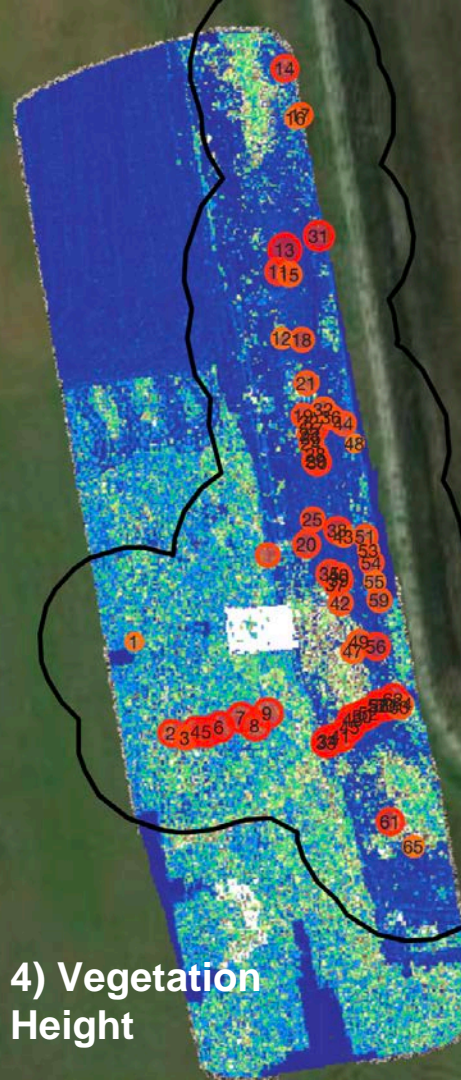
1) CSV and KML file with EO Locations



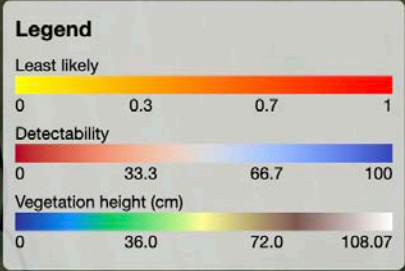
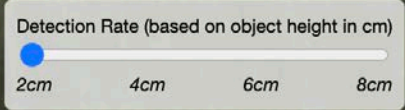
ID	Object	Type	Suspected / Score	Easting	Northing	Zone number	Zone letter	Latitude	Longitude
1	av_landmine	EO	Confirmed	0.84707779	453	51E	36 north	46.8	32.3
2	av_landmine	EO	Confirmed	0.72553385	45	51E	36 north	46.8	32.3
3	av_landmine	EO	Confirmed	0.90044885	453	51E	36 north	46.8	32.3
4	av_landmine	EO	Confirmed	0.92774725	453	51E	36 north	46.8	32.3
5	av_landmine	EO	Confirmed	0.92281318	453	51E	36 north	46.8	32
6	av_landmine	EO	Confirmed	0.89929873	453	51E	36 north	46.8	32.3
7	av_landmine	EO	Confirmed	0.90210319	453	51	36 north	46.8	32.3
8	av_landmine	EO	Confirmed	0.8729862	4	51E	36 north	46.8	32.3
9	ap_landmine	EO	Confirmed	0.72694361	453	51E	36 north	46.8	32.3
10	pmn-2	EO	Confirmed	0.81195879	453	51E	36 north	46.8	32.3
11	ammo_casin	EO Indicator	Suspected	0.97307545	453	51E	36 north	46.8	32.3
12	rpg	EO	Confirmed	0.83541155	453	51	36 north	46.8	32.3
13	rpg	EO Indicator	Suspected	0.65157008	453	51E	36 north	46.8	32
14	av_landmine	EO	Suspected	0.5224523	453	51E	36 north	46.8	32.3
15	pomz-2m	EO	Confirmed	0.71897554	453	51E	36 north	46.8	32.3
16	ap_landmine	EO	Suspected	0.77990568	453	51E	36 north	46.8	32.3
17	pomz-2m	EO	Confirmed	0.73210859	453	51E	36 north	46.8	32.3
18	pomz-2m	EO	Confirmed	0.69916219	453	51E	36 north	46.8	32.3
19	pomz-2m	EO	Confirmed	0.70693904	453	51E	36 north	46.8	32.3
20	pomz-2m	EO	Confirmed	0.73695242	453	51	36 north	46.8	32
21	pomz-2m	EO	Confirmed	0.73459542	45	51E	36 north	46.8	32.3
22	pomz-2m	EO	Confirmed	0.81707609	453	51E	36 north	46	32.3
23	pomz-2m	EO	Confirmed	0.70977527	453	51E	36 north	46.8	32.3
24	ap_landmine	EO	Confirmed	0.79142135	453	51E	36 north	46.8	32.3
25	ap_landmine	EO	Confirmed	0.81803101	453	51E	36 north	46.8	32.3
26	av_landmine	EO	Confirmed	0.92583066	453	51E	36 north	46.8	32.3
27	av_landmine	EO	Confirmed	0.92763257	453	51E	36 north	46.8	32.3
28	av_landmine	EO	Confirmed	0.92763257	453	51E	36 north	46.8	32.3
29	pomz-2m	EO	Confirmed	0.71201104	453	51E	36 north	46.8	32.3
29	pomz-2m	EO	Confirmed	0.74673498	453	51E	36 north	46.8	32.3
30	ap_landmine	EO	Confirmed	0.82996935	4	51E	36 north	46.8	32.3
31	pomz-2m	EO	Confirmed	0.74614298	45	51E	36 north	46.8	32.3
32	av_landmine	EO	Confirmed	0.89948016	453	51	36 north	46.8	32
33	ap_landmine	EO	Confirmed	0.70119601	453	51E	36 north	46.8	32.3
34	av_landmine	EO	Confirmed	0.93033653	453	51E	36 north	46.8	32

2) Survey Polygon





- openstreetmap
- Orthomosaic 1
- Vegetation Height
- Detectability
- Confirmed Hazardous Area
- ERW Predictions
- Drone Images



6) Automated NTS report

Hazard Area Report

1. General Information

Internal Report ID	
IMDMA ID	
Report Name	March 28 - TM-62 minefield
Date of Report	03/04/2024 15:48 UTC
Reporting Organization	Demining Organization
Reporter Name	User 2
Reporter Position	
NTS Team ID	
Date of NTS (drone survey)	07/11/2023 13:53 UTC
Classification (CHA, SHA, No EO Evidence Identified)	Confirmed Hazardous Area
Hazard Type (Minefield or BAC)	

2. Location

Region (Oblast)	Mykolaiv Oblast
District	Mykolaiv Raion
Council	
Settlement	
Settlement ID	
UTM of first image	36T 45: E 51 5N
Surveyed Area	20593 m ²

3. Type of Contamination

INITIAL ASSESSMENT (Unreviewed)	
Potential Contamination	RRG Grenade, hand grenade, anti-personnel mine, submunition, RPG, projectile, POMZ-2M, anti-vehicle mine, small projectile, ammo casing, PMN-2
HAZARD MAPPING	
Explosive Ordnance (EO)	
Types of Confirmed EO (count)	anti-vehicle mine (16), RPG (1), PMN-2 (1), POMZ-2M (11), anti-personnel mine (6), TM-62 fuze (2), submunition (1)
Total Confirmed EO	38

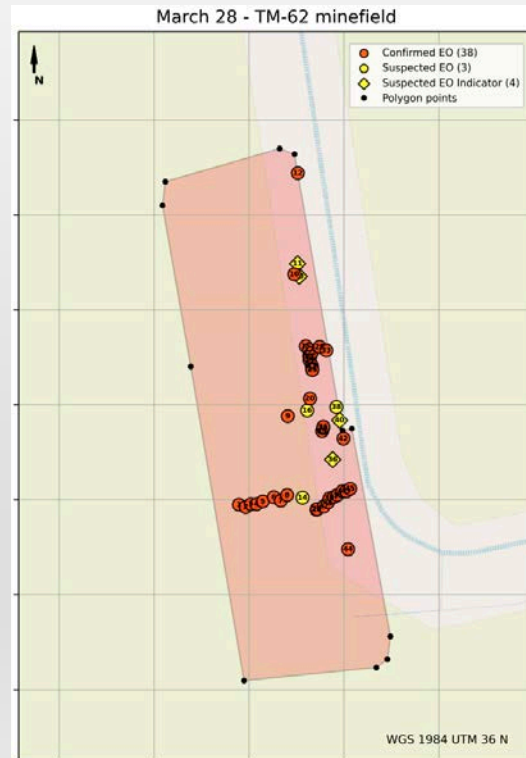
Types of Suspect EO	anti-vehicle mine (1), anti-personnel mine (1), POMZ-2M (1)
Total Suspect EO	3
Total Confirmed and Suspect EO	41
EO Indicators	
Types of Confirmed EO Indicators (count)	
Total Confirmed EO Indicators	0
Types of Suspect EO Indicators	ammo casing (2), RPG (1), anti-personnel mine (1)
Total Suspect EO Indicators	4
Total Confirmed and Suspect EO Indicators	4
TOTAL CONFIRMED and SUSPECT EO & EO INDICATORS	45

Check List	
1.1 Протипіхотні міни	Anti-personnel mine <input type="checkbox"/>
1.2 Протитранспортні міни	Anti-vehicle mine <input type="checkbox"/>
1.3 ВВП, що не вибухнули (II категорія)	Unexploded Ordnance <input type="checkbox"/>
1.4 Залишені ВВП (I категорія)	Abandoned Explosive Ordnance <input type="checkbox"/>
1.5 Касетні боєприпаси	Cluster Munition <input type="checkbox"/>
1.1 Саморобні вибухові пристрої	Improvised Explosive Device <input type="checkbox"/>
1.7 Боєприпаси до стрілецької зброї (<20мм)	Small Arms Ammunition (<20mm) <input type="checkbox"/>
1.8 Вибухові речовини, порох	Explosives <input type="checkbox"/>

4. Evidence

Direct Evidence		Yes	
Direct Evidence Coordinates			
Type of Evidence	UTM XY	Description	Photo
EO	36T 45: 51: N E	Type: anti-vehicle mine Confidence: Confirmed Method: Detected from drone survey using SpotlightAI ID: 1	

7) Field Map



Actual user survey

Location:
Mykolaiv

Detections:
100 confirmed
& suspected EO

TM-62 (93), AP mine
(2), detonator (3),
POMZ-2M(1)

Detections with coordinates

Drone Image



Processed Orthomosaic,
detections,
surveyed area polygon

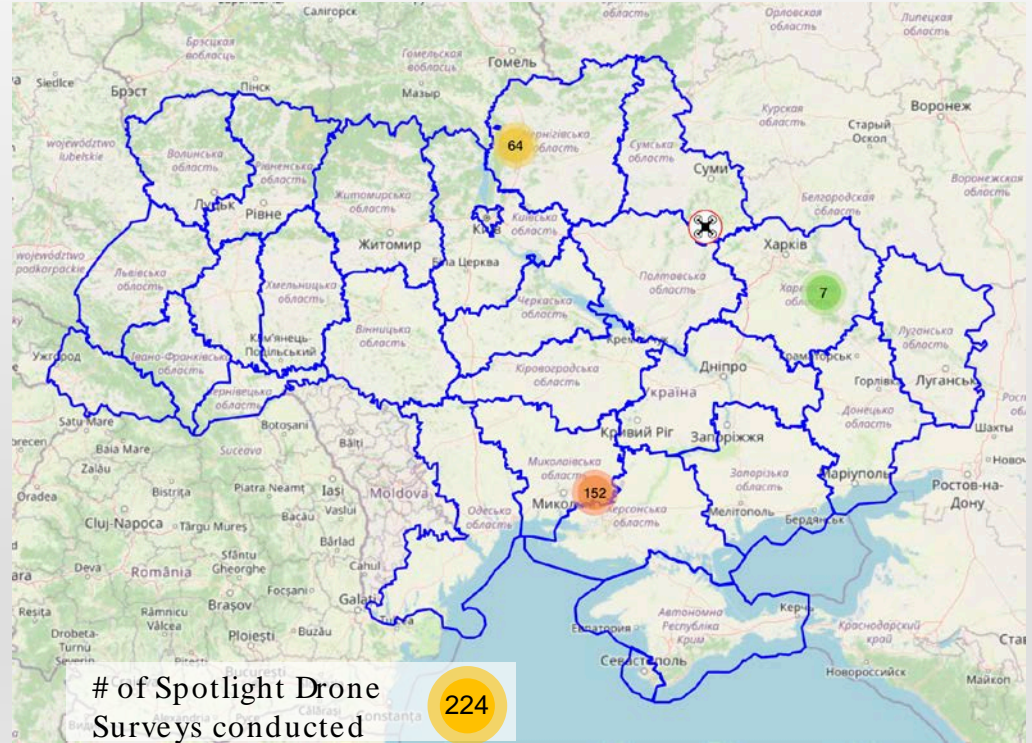


Actively used in Ukraine

- Used by Norwegian Peoples Aid, the SSTS, and other demining organizations
- 200+ drone surveys uploaded and processed across Mykolaiv, Chernihiv, Kharkiv, and Kherson.
- **Thousands** of real-world detections

Summary

- Tool for processing drone surveys and mapping out contamination to enhance the land release process



Thank You



Contact: jbaur@safeprogroup.com for trial of SpotlightAI