Special Report: Human Security Alert

RSF Encirclement of 6th Infantry Division in El-Fasher, North Darfur

05 November 2024

Yale SCHOOL OF PUBLIC HEALTH
Humanitarian Research Lab

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I. Key Findings

The Yale School of Public Health's Humanitarian Research Lab (HRL) assesses Rapid Support Forces (RSF) is engaging in major, multidirectional combat action that threatens Sudan Armed Forces (SAF) control of the 6th Infantry Division Base in El-Fasher, North Darfur between 25 October and 3 November 2024. Yale HRL confirms that RSF has attacked the 6th Division Airbase from multiple directions, including from the west, during this time period. RSF has been observed closer to the center of the city than previously documented. There is evidence of apparent increased mortality among SAF-aligned forces. A rapid expansion of cemeteries in the SAF 6th Division Airbase and near SAF and Joint Forces military installations likely indicates significant SAF-aligned fatalities. Two schools, both which previously served as internally displaced persons (IDPs) camps, have damage from artillery shelling is visible in satellite imagery.

RSF Western Attack on 6th Infantry Division:

Damage visible at the 6th Division Base, specifically at the northern side, is consistent with an attack from the west-to-southwest of the 6th Division Base. Analysis of satellite imagery between 31 October and 3 November 2024 shows thermal scarring on the grounds of the 6th Division base and at its northern access point. These findings represent the first confirmation of an RSF attack on SAF's 6th Infantry Division coming from the west side of El-Fasher and show the first attack at scale on the 6th Infantry Division itself by RSF. Yale HRL assesses that SAF-aligned forces are currently encircled in close proximity by RSF.[1]

RSF Presence Observed in Central El-Fasher:

RSF has made significant gains into the center of the city of El-Fasher. Through analysis of satellite imagery and geolocation of open source content, Yale HRL observed RSF presence in the Tagro roundabout, as well as the Timbasi and Radeef neighborhoods in central El-Fasher between 25 and 31 October 2024.[2] This presence is indicative of significant area control within the city of El-Fasher that stretches further west than previously known.

Analysis of satellite imagery shows thermal scarring approximately 250 meters away from the Tagro roundabout area in El-Fasher between 25 and 31 October 2024. The individuated signature of burns for these different sectors indicates intentional burning at this location. Yale HRL has assessed and geolocated RSF forces located in the Tagro area based on video content posted on 1 November 2024.[3]

Analysis of satellite imagery collected between 28 and 31 October 2024 shows approximately 16 newly present vehicles in the Timbasi neighborhood in El-Fasher. The majority of the vehicles are consistent with light technical-type vehicles, including one weapon-mounted light technical vehicle consistent with RSF armaments in El-Fasher previously documented by Yale HRL.[4] These findings are consistent with reports by local media outlets of clashes between RSF and SAF and aligned forces on 31 October 2024.

Yale HRL also identifies damage highly likely from artillery shelling to the roof of the State Police Compound in central El-Fasher through analysis of satellite imagery between 31 October and 03 November 2024. The State Police Command is located west of the B-26 road to Zamzam.

Cemetery Expansion of at SAF and Joint Forces

Satellite imagery analysis shows significant and rapid increase in graves inside multiple known SAF-aligned cemeteries. This change indicates significant recent fatalities amongst SAF-aligned forces. Imagery collected over a gravesite adjacent to the SAF 6th Division airstrip shows an increase of approximately 74 mounds of disturbed earth consistent with graves between 20 September and 17 October 2024. Imagery collected on 31 October shows an additional approximately 69 mounds. Another gravesite previously identified as near SAF and Joint Force military installations shows an increase of approximately 79 mounds between 20 September and 31 October 2024.[5]

Attacks on Schools

Yale HRL assesses through satellite imagery analysis that two schools in the center of El-Fasher, both which have at one point served as IDP shelters, were struck with artillery shells.[6] It is unknown if IDPs are currently present at these locations. Ibn Sina Primary School for Boys displays damage consistent with an artillery shelling to the roof of the school on satellite imagery between 28 and 31 October 2024. Additionally, the Al-Ittihad Secondary School for Girls, which has also been used as an IDP shelter, were struck with at least three artillery shells in the facility as identified on satellite imagery collected between 28 and 31 October 2024.

Outside El-Fasher

There are also multiple visual indicators consistent with attacks on communities surrounding El-Fasher. Yale HRL has identified significant fire-related damage between 17 and 27 October 2024 to Kanjara, Gimr, Kurkur, and two unidentified communities near Mount Kosa and Tawilah, west of El-Fasher. These fires likely lead to significant displacement and destruction of critical infrastructure and agriculture. While there are reports of fighting in this area, the pattern of thermal scarring is not assessed to be consistent with a targeted arson attack with the available data. Large areas inside these villages are scorched, including on the ground. Yale HRL does not know what caused this unique and expansive burn pattern. South of El-Fasher near Shingil Tobaya, Dar Al-Salaam locality, there is also significant movement of cattle that is atypical for traditional agricultural patterns as seen on satellite imagery collected between 23 October and 05 November 2024. The large movement of cattle is of great concern because it could indicate that villages to the south of Zamzam may have been raided. Yale HRL cannot determine whether the herds are accompanied.

Emergency rooms and local media outlets reported that waves of displaced people from El-Fasher are heading toward the Golo, Tawila, and Jebel Marra areas.[7] There are also reports of significant displacement to Zamzam IDP camp as well as high levels of vehicle presence in the camp visible in satellite imagery.[8] Yale HRL is closely monitoring Zamzam IDP Camp to determine if the risk of attack increases imminently.

II. Methodology

Yale HRL utilizes data fusion methodologies of open source and remote sensing data analysis. Yale HRL produced this report through the cross-corroboration of open source data, including social media, local news reporting, multimedia, and other reports, and remote sensing data, including satellite imagery and thermal sensor data. Researchers analyzed open source data across social media, news reports, and other publicly available sources to identify, chrono- and geolocate, and verify incidents. Analysts assess the credibility and reliability of open source data based on a source's level of detail, past credibility, and the corroboration of other independent sources. Remote sensing and satellite imagery analysis relies on multi-temporal change detection, which involves the comparison of two or more satellite images of the same area captured at different times to detect differences in coloration, visual properties, and presence, absence, or positional change of objects across the images.

Analysts used remote sensing thermal anomaly data from NASA, Visible Infrared Imaging Radiometer Suite (VIIRS) to identify thermal anomalies that were co-located at settlements to assess possible destruction. Additionally, VIIRS thermal anomaly data was used to narrow down the possible dates that an event may have occurred. Sentinel-2 low resolution satellite imagery was used in conjunction with high resolution imagery for baseline comparison to observe thermal scarring patterns and their effect on communities in the areas of observation. Analysts used Sentinel-2 false color composite, which uses near-infrared data to better assess damage and thermal scarring. Visual indicators of intentional damage include discoloration to the analyzed structures, including indicators of possible burning or charring; observable difference in structural texture compared to pre-event dates. As regional dry season is under way at the start of October, wildfire can be a common observation. Analysts assess burning intent, versus incidental burning or wildfire, using indicators such as unaffected ground between observed burned structures, and lack of thermal scarring on ground outside individual community areas.[9]

Place names were identified using UN P-codes obtained via the United Nations Humanitarian Data Exchange (HDX) and International Organization for Migration (IOM)'s Displacement Tracking Matrix (DTM) Sudan. This baseline was then verified and informed through open source analysis by Yale HRL's analysts with relevant cultural and linguistic skills.

Limitations

There are significant limitations to the data fusion methodology. The information environment in Sudan does not have the breadth of data available in other locations and there is likely a significant reporting bias for those who provide open source reporting. The tools and techniques present significant challenges to assess activities such as extrajudicial detention, conflict-related sexual violence (CRSV), and conflict-related casualties, particularly in environments with limited data. Satellite imagery analysis is limited by available imagery over time and space. Available nadir angles of

satellite imagery can produce challenges to assess structural damage, until multiple angles and ground-level photographic and video materials emerge to help inform the analysis. Image resolution level can also limit the analyst's ability to perceive the full extent of damage present.

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[1] HRL_MMC_057 ;
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[2] Darfur24 " "قتلى وجرحى في قصف مدفعي لـ"الدعم السريع" على مخيم ابوشوك شمال دارفور, October 29, 2024, https://www.darfur24.com/2024/10/29/%d9%82%d8%aa%d9%84%d9%89-%d9%88%d8%ac%d8%b1%d8%ad%d9%89-%d9%81%d9%8a-%d9%82%d8%b5%d9%81-%d9%85%d8%af%d9%81%d8%b9%d9%8a-%d9%84%d9%80%d8%a7%d9%84%d8%af%d8%b9%d9%85-%d8%a7%d9%84%d8%b3%d8%b1%d9%8a%d8%b9-2/, archived at https://perma.cc/9XX5-UWX9

[3] HRL_MMC_056 ;
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[4] Howarth, Caitlin N., Kaveh Khoshnood, Nathaniel A. Raymond et al. "El-Fasher: Recent Hospital Bombardment and Current Areas of Control," 29 August 2024. Humanitarian Research Lab at Yale School of Public Health: New Haven. Available at https://medicine.yale.edu/lab/khoshnood/publications/reports.
[5] Caitlin N. Howarth, Kaveh Khoshnood, Nathaniel A. Raymond et al. "New Phase: RSF and SAF Clash in El Fasher, Civilians Flee and Casualties Mount," 20 September 2024. Humanitarian Research Lab at Yale School of Public Health: New Haven.
[6] Darfur24, " "الفارين من القصف المدفعي على الفاشر يفترشون العراء في مخيم زمزم October 21, 2024, https://www.darfur24.com/2024/10/21/%D8%A7%D9%84%D9%81%D8%A7%D8%B1%D9%8A%D9%86-%D9%85%D9%86-%D8%A7%D9%84%D9%82%D8%B5%D9%81-%D8%A7%D9%84%D9%85%D8%AF%D9%81%D8%B9%D9%8A-%D8%B9%D9%84%D9%89-%D8%A7%D9%84%D9%81%D8%A7%D8%B4%D8%B1-%D9%8A%D9%81/, archived at https://perma.cc/3495-TL3C;

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[7] @AyinSudan on X (formerly known as Twitter), "وصول نازحين جدد", November 5, 2024, https://x.com/AyinSudan/status/1853777639942860950 , archived at https://perma.cc/DAB2-W2R7 ; HRL_MMC_058

[8] United Nations Office for the Coordination of Humanitarian Affairs, "Sudan: Humanitarian Update (01 November 2024)," November 3,2024, archived at https://perma.cc/64YV-D3K3 https://reports.unocha.org/en/country/sudan/card/3FObQ8Aaoi/, archived at https://perma.cc/64YV-D3K3

[9] Brittany Card, Ziad Al Achkar, Isaac L. Baker, and Nathaniel A. Raymond. 9/2015. Satellite Imagery Interpretation Guide: Intentional Burning of Tukuls, https://hhi.harvard.edu/publications/satellite-imagery-interpretation-guideintentional-burning, archived at https://perma.cc/87WA-QW4Y

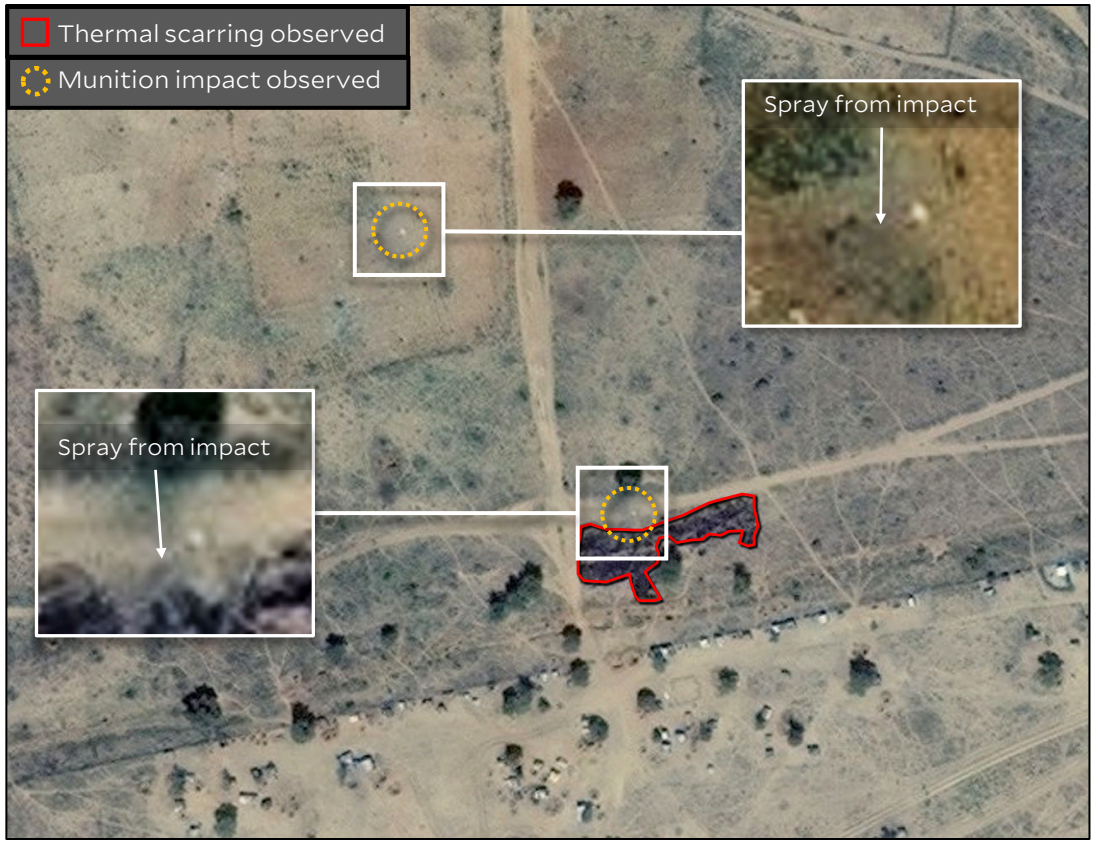
SAF 6th Division Airbase, El-Fasher

MUNITION IMPACTS AND THERMAL SCARRING OBSERVED BETWEEN 31 OCTOBER-03 NOVEMBER 2024

Analysis of satellite imagery collected between 31 October and 03 November 2024 shows munition impacts from shelling and thermal scarring on the ground at the northern access of the 6th Division base in El-Fasher.

Crater analysis reveals that the size and explosive blast spray characteristics are consistent with approximately 60mm-80mm shells fired from a mortar. The impact are on the west-to-southwestern side, indicating that the shells were launched from a mortar positioned west-to-southwest of the 6th Division Base.

31 October 2024 © 2024 Maxar, USG-Plus



03 November 2024 © 2024 Maxar, USG-Plus

SAF 6th Division Airbase, El-Fasher

Analysis of satellite imagery collected between 31 October and 03 November 2024 shows thermal scarring next to the runway of the 6th Division airbase in El-Fasher.

THERMAL SCARRING OBSERVED BETWEEN 31 OCTOBER-03 NOVEMBER 2024

31 October 2024 © 2024 Maxar, USG-Plus

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SAF 6th Division Airbase, El-Fasher

Analysis of satellite imagery collected between 31 October and 03 November 2024 shows thermal scarring on surrounding storage containers on the grounds of the 6th Division base in El-Fasher.

THERMAL SCARRING OBSERVED BETWEEN 31 OCTOBER-03 NOVEMBER 2024

31 October 2024 © 2024 Maxar, USG-Plus

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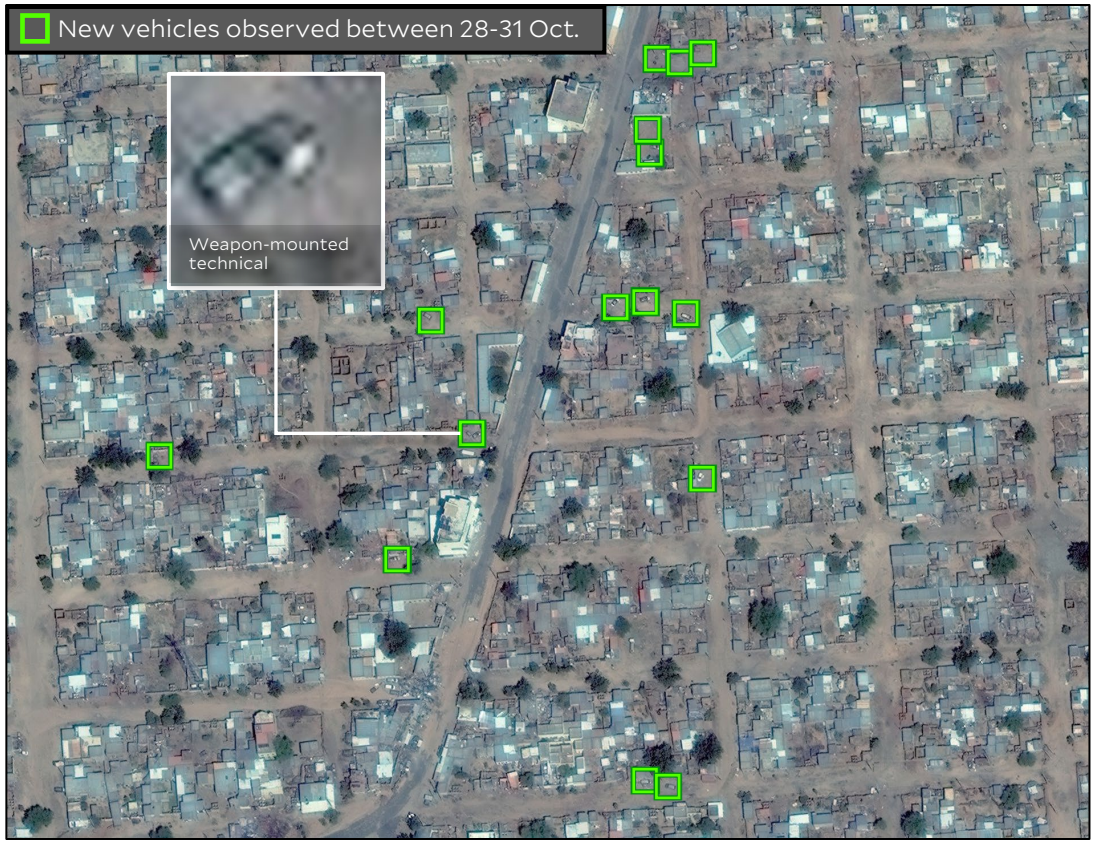
Timbasi Neighborhood, El-Fasher

NEW VEHICLE PRESENCE OBSERVED BETWEEN 28-31 OCTOBER 2024

Analysis of satellite imagery collected between 28 and 31 October 2024 shows approximately 16 new vehicles in the Timbasi Neighborhood in El-Fasher.

The majority of the vehicles are consistent with light technical-type vehicles, including a weapon-mounted light technical vehicle consistent with one previously observed in the RSF territory in eastern El-Fasher on 13 and 31 July 2024.

28 October 2024 © 2024 Maxar, USG-Plus



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El-Fasher

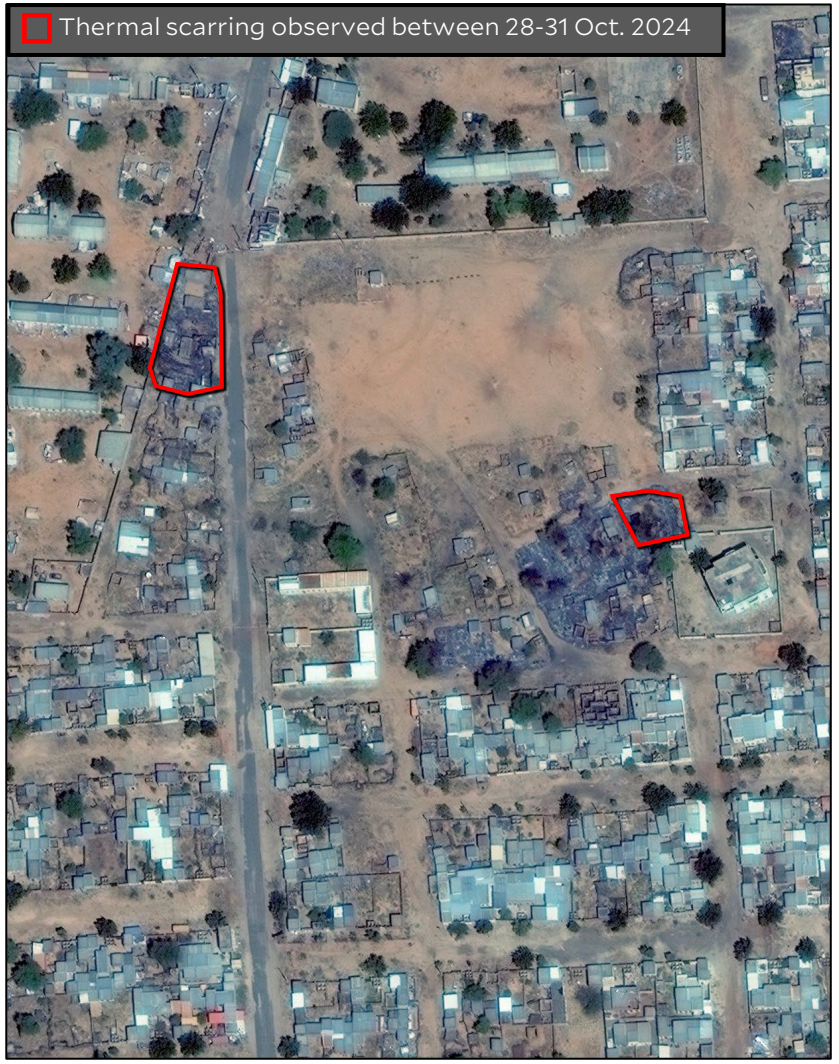
THERMAL SCARRING AND DESTRUCTION TO STRUCTURES OBSERVED 25-31 OCTOBER 2024

Analysis of satellite imagery collected over central El-Fasher shows thermal scarring affecting several structures. This first occurred between 25 and 28 October 2024; additional burning in the area occurred between 28 and 31 October 2024.

The individuated signature of burns for these different sectors indicates intentional burning at this location.

25 October 2024 © 2024 Maxar, USG-Plus

28 October 2024 © 2024 Maxar, USG-Plus



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State Police, El-Fasher

Analysis of satellite imagery collected between 31 October and 03 November 2024 shows damage from artillery shelling to the roof of a building in the State Police compound in El-Fasher.

CONFLICT-RELATED DAMAGE OBSERVED 31 OCTOBER-03 NOVEMBER 2024

31 October 2024 © 2024 Maxar Technologies

Image enhanced by Maxar MGP Pro HD Enhancement

03 November 2024 © 2024 Maxar Technologies

Image enhanced by Maxar MGP Pro HD Enhancement

SAF 6th Division Airbase, El-Fasher

GRAVESITE ACTIVITY OBSERVED
20 SEPTEMBER-31 OCTOBER 2024

Imagery collected over a previously identified gravesite at the SAF 6th Division Airstrip shows an increase of approximately 74 mounds between 20 September and 17 October 2024. This includes the creation of a second gravesite in this location consisting of approximately 4 mounds.

Imagery collected on 31 October shows significant increases to both sites. The first site increased by approximately 23 mounds; the second site, where an ongoing burial and gun-mounted light technical vehicle are observed, has increased by approximately 46 mounds.

20 September © 2024 Maxar, USG Plus

17 October 2024 © 2024 Maxar, USG Plus

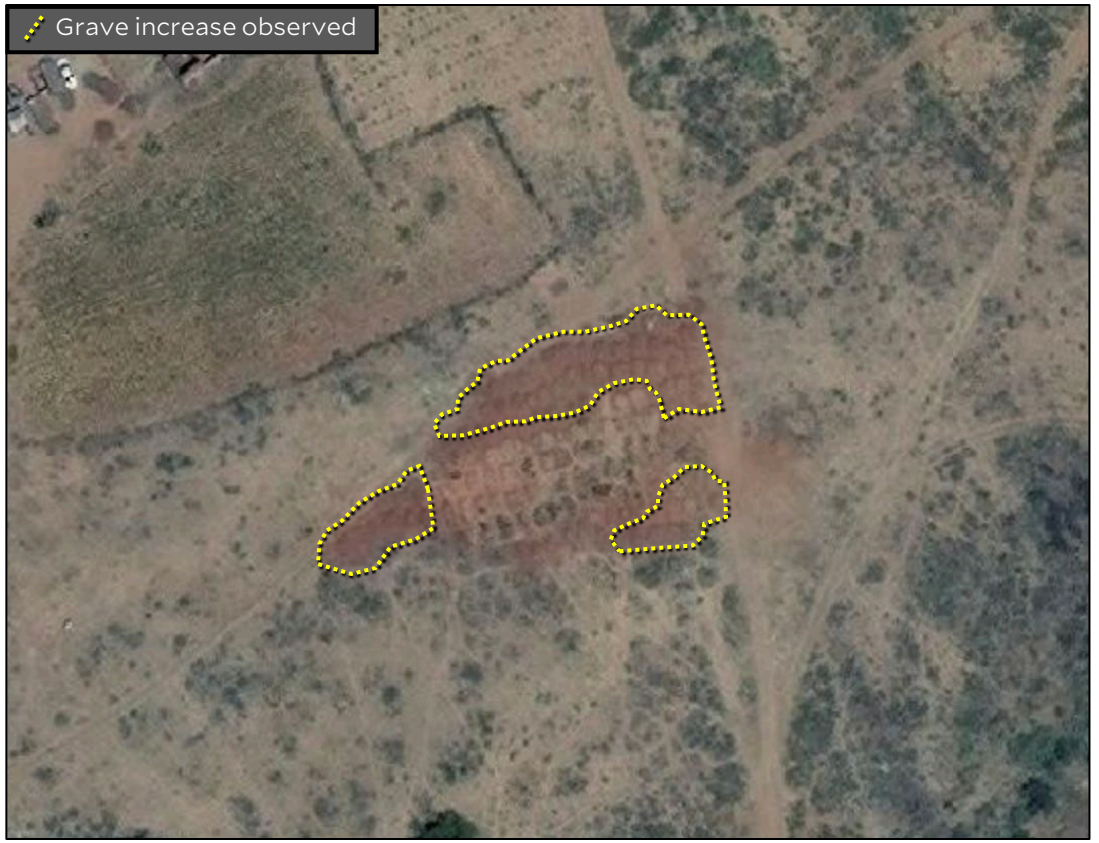
31 October 2024 © 2024 Maxar, USG Plus

Western El-Fasher

GRAVESITE ACTIVITY OBSERVED
20 SEPTEMBER-31 OCTOBER 2024

Imagery collected over a previously identified gravesite in SAF territory in western El-Fasher shows an increase of approximately 79 mounds between 20 September and 31 October 2024.

20 September 2024 © 2024 Maxar, USG-Plus



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Ibn Sina Primary School for Boys, El-Fasher

CONFLICT-RELATED DAMAGE OBSERVED
28-31 OCTOBER 2024

Analysis of satellite imagery collected between 28 and 31 October 2024 shows damage from artillery shelling to a roof of the Ibn Sina Primary School for Boys in El-Fasher.

28 October 2024 © 2024 Maxar Technologies

Image enhanced by Maxar MGP Pro HD Enhancement

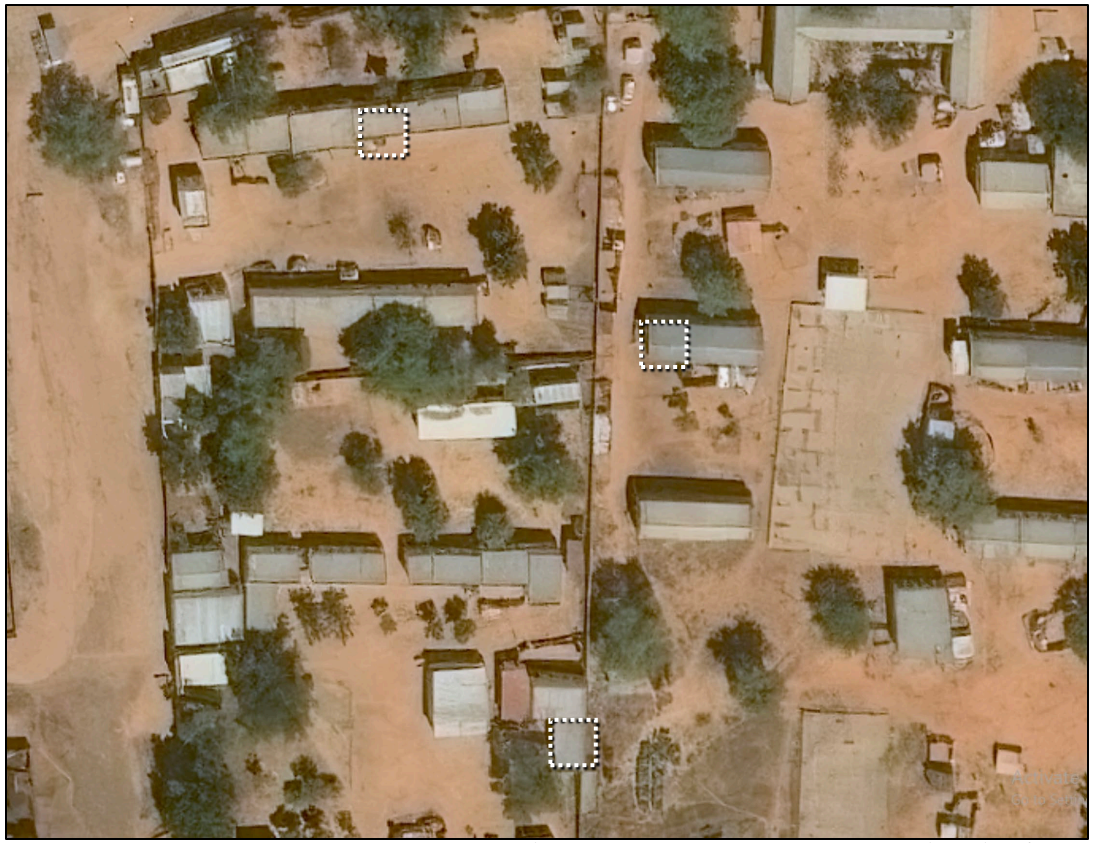
31 October 2024 © 2024 Maxar Technologies

Image enhanced by Maxar MGP Pro HD Enhancement

Al-Ittihad Secondary School for Girls, El-Fasher

Analysis of satellite imagery collected between 28 and 31 October 2024 shows to damage from artillery shelling to the roofs of three structures including at the Al-Ittihad Secondary School for Girls in El-Fasher.

CONFLICT-RELATED DAMAGE OBSERVED
28-31 OCTOBER 2024



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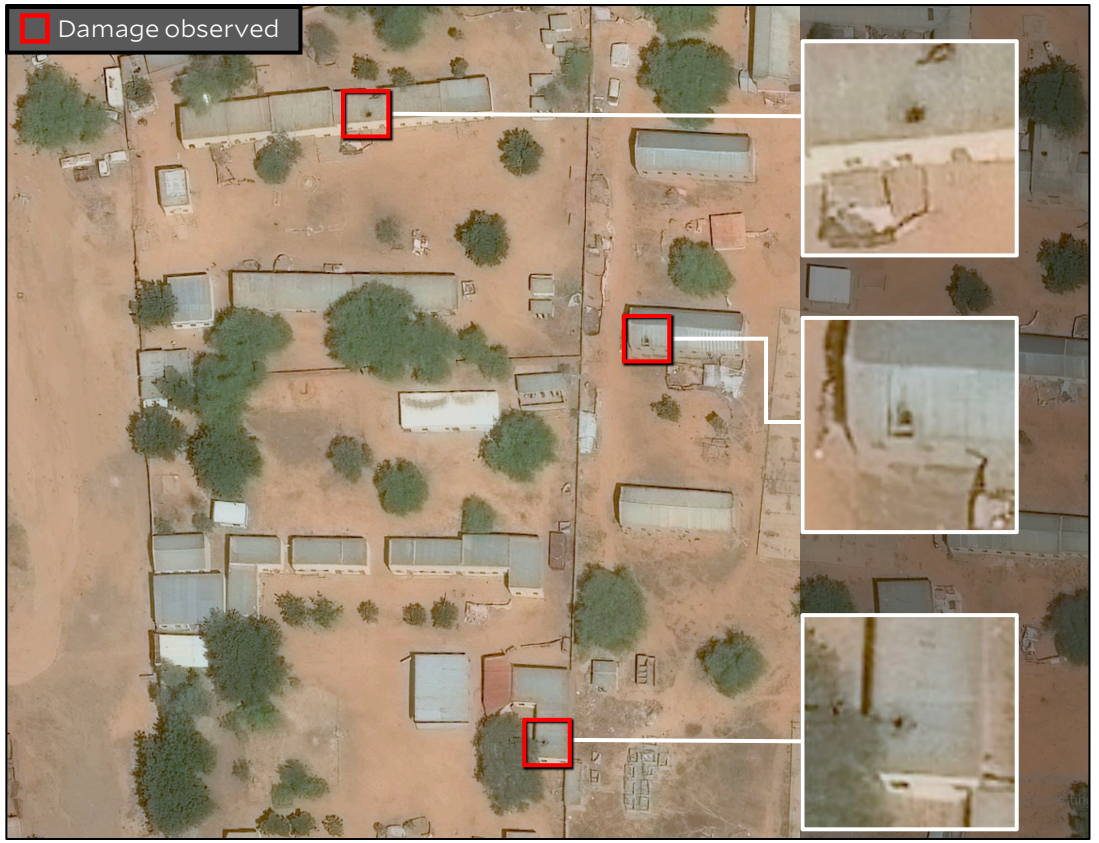

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Dar As Salam, North Darfur

Analysis of satellite imagery collected between 23 October and 05 November 2024 shows the presence of livestock in Dar As Salam area.

PRESENCE OF LIVESTOCK OBSERVED
23 OCTOBER-05 NOVEMBER 2024

23 October 2024 © 2024 Maxar Technologies
Image enhanced by Maxar MGP Pro HD Enhancement

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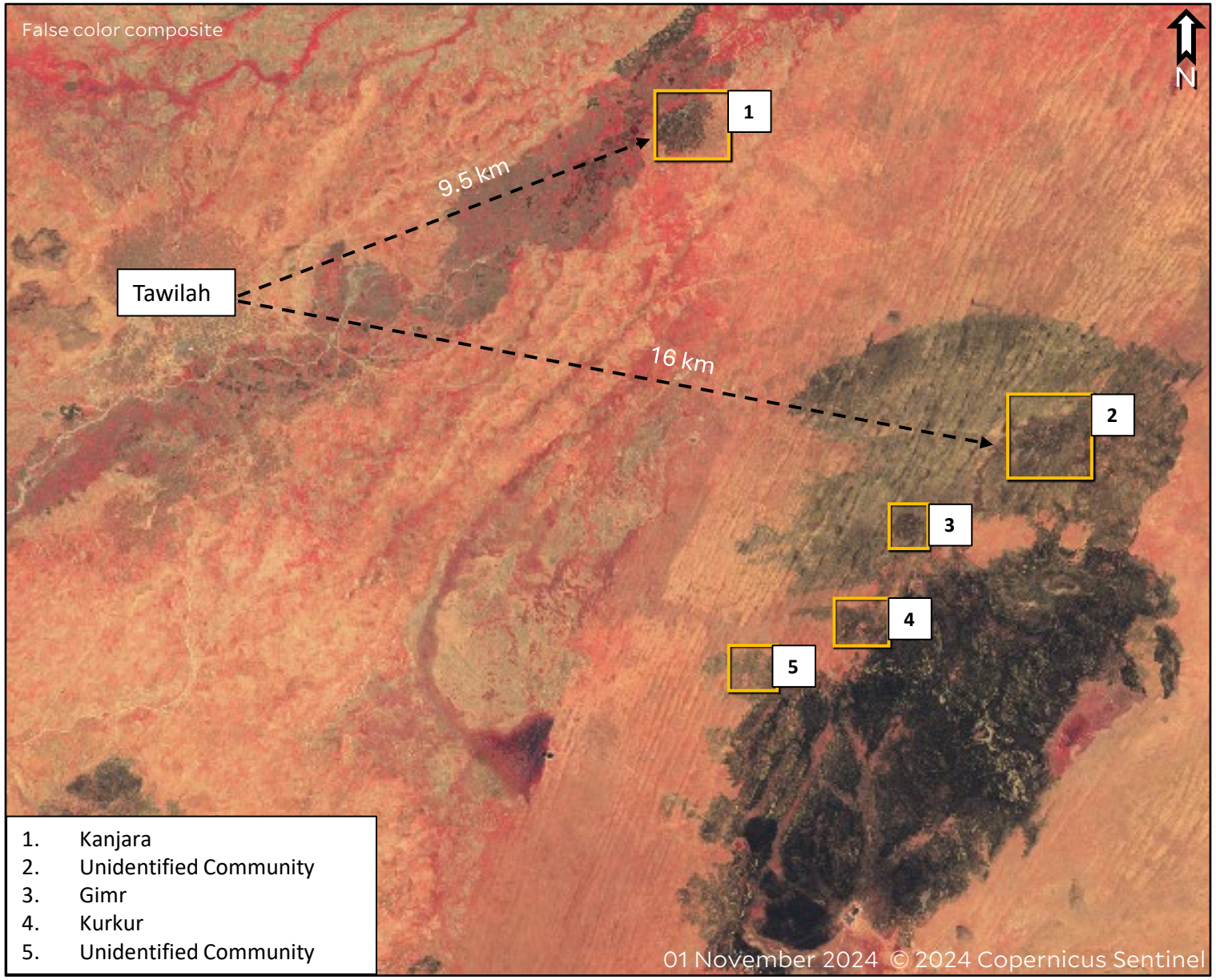
Thermal scarring at communities near Tawilah



Source https://browser.dataspace.copernicus.eu; https://firms.modaps.eosdis.nasa.gov

Analysis of satellite imagery shows thermal scarring in the area close to Tawilah between 17 and 27 October 2024.

Five communities appear affected by the thermal scarring: Kanjara between 17 and 22 October 2024; and two unidentified communities, Gimr, and Kurkur between 22 and 27 October 2024.

All communities appear not individually targeted but affected as part of larger fires in the area.

The time of thermal scarring can be narrowed down to the 21 and 22 October 2024 based on thermal anomalies detected on NASA FIRMS.

The thermal scarring around these communities is not consistent with individuated arson attacks.. Instead, this fire damage is consistent with larger fires in the neighborhood. Yale HRL does not assess whether those fires are unintentional, conflict-related, or other.

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https://medicine.yale.edu/lab/khoshnood/