Plate 2: Geologic Map of the 27th Level East Drift, Soudan Mine

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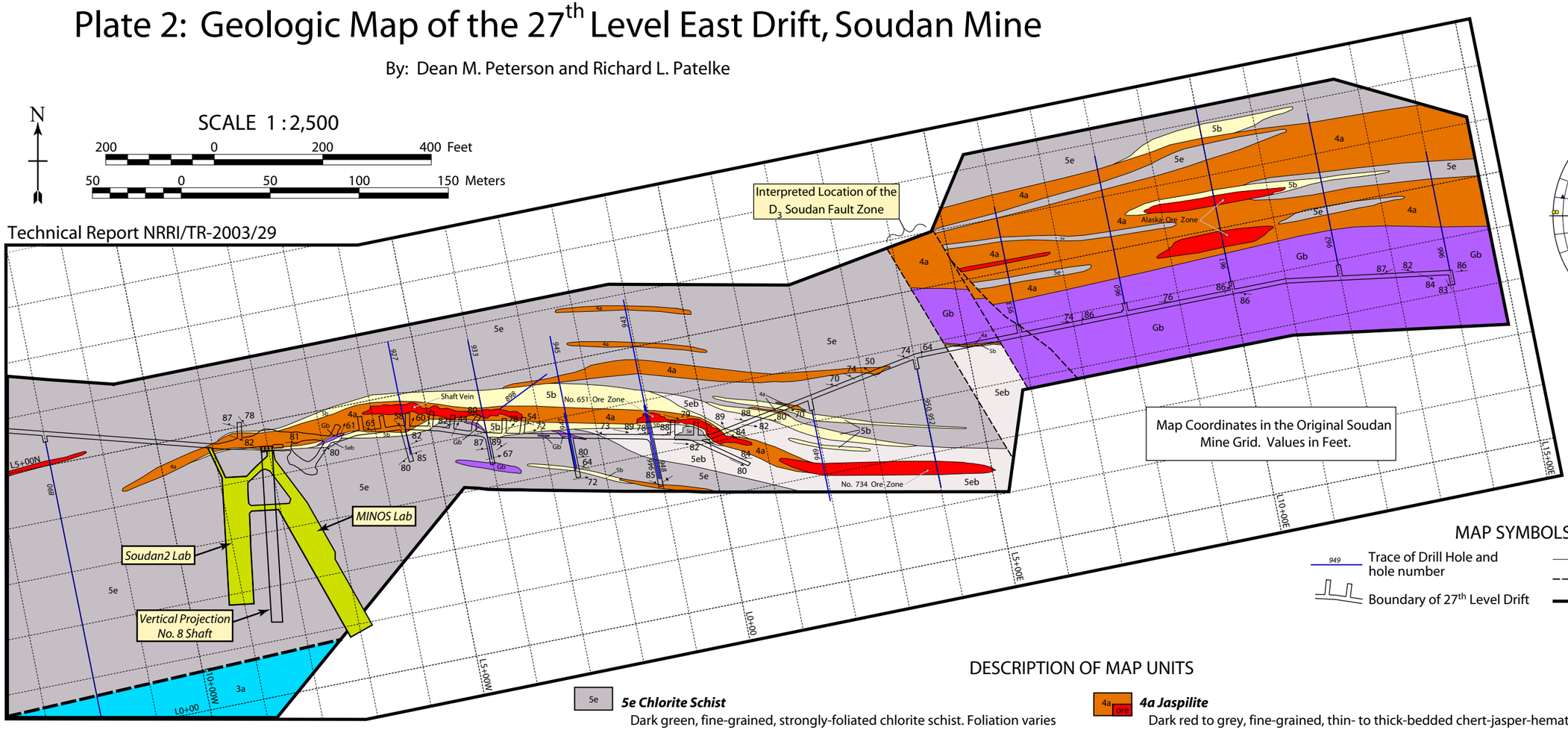
N

SCALE 1 : 2,500

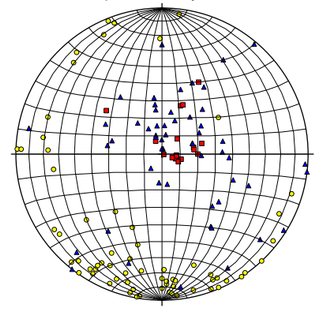
200 0 200 400 Feet

50 0 50 100 150 Meters



STRUCTURE STEREONET

Lower Hemisphere
Equal Area Projection



- Poles to Foliation Planes (n = 65)
- Poles to Joint Planes (n = 55)
- Trend and Plunge of Lineations (n = 17)

Note: Joint planes not depicted on the map.

MAP SYMBOLS

- 949 Trace of Drill Hole and hole number
- Boundary of 27th Level Drift
- Approximate Contact
- Inferred Fault
- Inferred Major Shear Zone
- 82 Inclined Foliation
- Vertical Foliation
- 84 Intersection Lineation

EXPLANATORY NOTES

The east drift of the 27th level of the Soudan Mine was mapped for two reasons: 1) to gain knowledge on the continuity of the geology exposed at the surface with that exposed at a depth of 710m (~2,400 ft.) below the surface; and 2) to get a handle on the geologic and structural complexity of the drift (because the tentative construction plan for the proposed Soudan Mine NUSEL begins with the extension of the drift to the east). The drift parallels the stratigraphic and structural grain of the rocks, and is located in the footwall of massive hematite ore bodies of the Soudan Mine. The geology of the level essentially mimics the rock units mapped on the surface south of the main iron-formation horizon in the Mine Trend shear zone, and includes chlorite schist, sericite-chlorite schist, sericite-quartz schist, iron-formation, and gabbro.

A team of three geologists (John Heine, Peter Jongewaard, and Mark Severson) mapped the drift over a period of four days. One geologist took measurements of structural data (cleavage, lineation, and joint orientations) and described the rocks present. A second recorded these notes and observations, and plotted them on the drift map. The third worked ahead of the others locating contacts between rock units, and collecting representative samples. Geologic information from drill holes were used to interpret the geology adjacent to the drift. Locations in the mine were determined by tape and compass methods; with origin points based on recent surveying and the original mine drawings by Oliver Iron Mining Division of United States Steel Corporation. Structural data were measured using a Brunton Pocket Transit, and there was no deviation of the local magnetic field observed.

DESCRIPTION OF MAP UNITS

5e

5e Chlorite Schist

Dark green, fine-grained, strongly-foliated chlorite schist. Foliation varies from moderate to intense. The unit commonly contains minor quartz and/or calcite veinlets, trace amounts of disseminated pyrite, and typically is in gradational contact with chlorite-sericite schists. The unit correlates with map unit 5e (chlorite schist) on the surface (Plate 1).

5eb

5eb Chlorite-Sericite Schist

Dark greenish-yellow, fine-grained, strongly-foliated, chlorite-sericite-quartz schist. Foliation in the rock varies in from strong to intense, may contain quartz and/or calcite stringers and veinlets parallel to the foliation. Disseminated pyrite occurs in trace amounts, and the unit is locally stained by dark red hematite. Interlayered lenses and/or boudin-trails of chert and/or banded iron-formation occur locally. Correlates with map units 5eb (chlorite-sericite schist), 5be (sericite-chlorite schist), and 5,4 (Schist 'n' Bif) on the surface (Plate 1).

5b

5b Sericite-Quartz Schist

Creamy-yellow, fine-grained, strongly foliated/sheared quartz-sericite schist. Unit locally includes minor chlorite, quartz phenocrysts, and thin chert lenses and/or boudins. Local strongly overprinted with deep-red hematite stain and foliation-parallel quartz veining. The sericite schists define the immediate footwall to the overlying jaspilite units and high-grade massive hematite ore zones. The unit does not directly correlate with any rock unit recently mapped on the surface, but probably correlates with sericite schist zones noted on Oliver Mining Company geologic maps of the mine pits.

4a ore

4a Jaspilite

Dark red to grey, fine-grained, thin- to thick-bedded chert-jasper-hematite ± magnetite banded iron-formation. Bedding is typically contorted and convoluted, with brecciation, quartz veining, and segregations of white quartz and minor amounts of disseminated pyrite common. Massive steel-grey hematite is common as matrix in breccia zones, and minor coarse-grained specular hematite occurs locally. The unit correlates with map unit US4a on the surface (Plate 1). The location of the depicted Soudan Mine ore zones (red) taken from historic mine maps.

Gb

Gb Gabbro

Dark green to black, fine- to medium-grained, equigranular homogeneous intrusive rock consisting of chlorite-feldspar ± quartz ± calcite and trace pyrite. The unit is unique underground in that it is typically blocky-fractured, and contains quartz veining and stringers in brittle gash veins. Locally strongly foliated along the margins, where adjacent to chloritic and sericitic schists, but generally only contains a weak east-west fabric. The unit is probably continuous with the gabbro (Gb on Plate 1) body exposed on the surface in the center of Section 27.

3a

3a Greywacke

Grey, thin-bedded greywacke sandstone. Unit not seen underground, but taken from drill hole 890 depiction on the Oliver Iron Mining plan map of the 27th Level drift. Unit interpreted to occur south of the Murray shear zone, and correlates with map unit US3a on Plate 1.