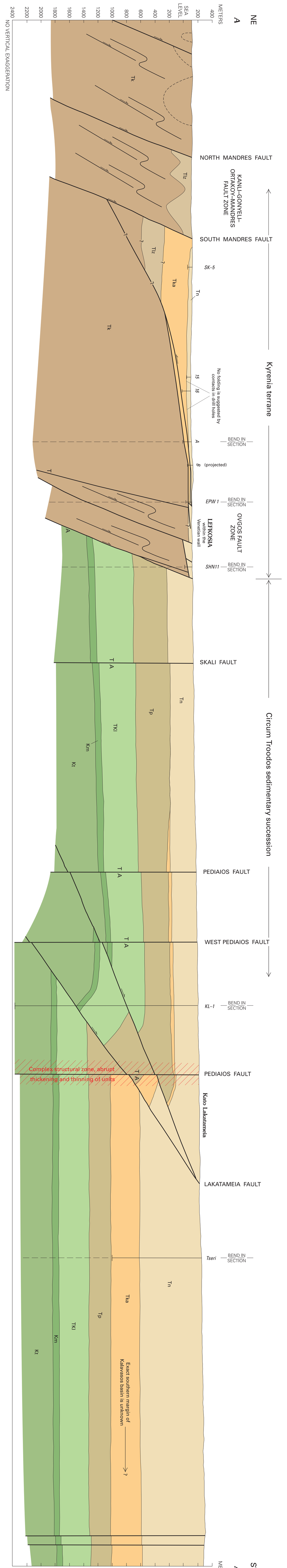
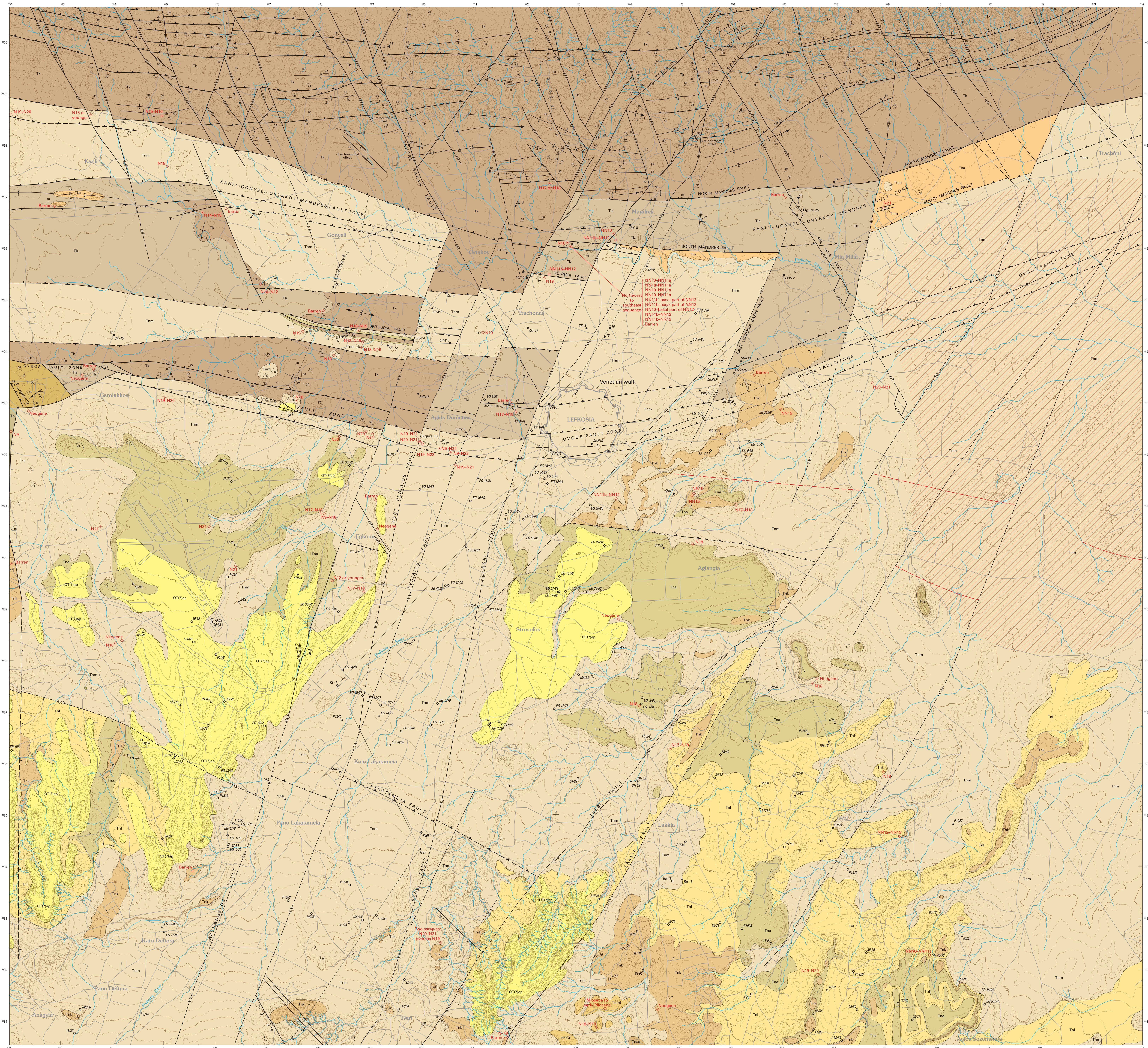
Prepared in cooperation with the
CYPRUS GEOLOGICAL SURVEY DEPARTMENT

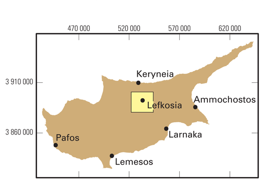




Transverse Mercator projection, 1984 WGS datum; Scale factor 0.9996; longtitude of central meridian 33°00′ E.; latitude of origin equator
1000-meter Universal Transverse Mercator grid ticks, zone 36

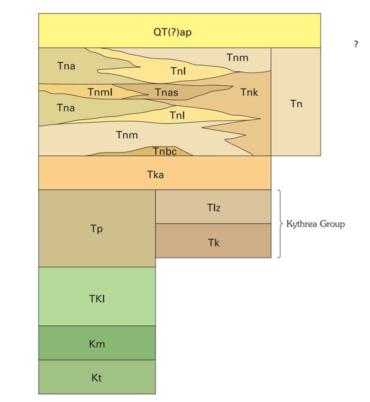
SCALE 1:25 000
1 .5 0 1 2 3 4 KILOMETERS
1 1/2 0 1 2 MILES

CONTOUR INTERVAL
Two topographic contour intervals are used on the map. A 5-m contour interval is used in the northern one-third and along the eastern edge of the map; a 4-m contour interval is used for the rest of the map. 20-m index contours are consistent throughout the map.



The digital data for this map were compiled by Zomenia Zomeni, Ahmet Alemdar, Stavros Charalambides, Ergin Ercoban, George Kaimakliotis, Okan Berksoy, and Sevket Ozmatyatli with the use of a Geographic Information System.
Digital cartography by I. Iosif-Stylianou, Will Stettner, Zomenia Zomeni, and Allen Crider.

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

(Extensive areas of Pleistocene and Holocene surficial deposits are not shown on this map; these deposits will be shown on a surficial geologic map of the same area)

QT(?)ap — **Apalos Formation (Pleistocene and Pliocene?)**—Gravel, sand, silt, and clay. Clasts are derived predominantly from the Troodos ophiolite with less abundant clasts from Tertiary carbonate deposits. Multiple fining-upward sequences of terrestrial alluvial-fan deposits, separated by paleosols. Finer grained beds are commonly red from weathering and source material. Paleoflow direction is northward. Unit is as much as 60 m thick

Tn — **Nicosia Formation (Pliocene and late Miocene)**—Undivided formation shown on cross section and in figure 8 (in pamphlet). On geologic map, individual members are separated. Intercalated marl, silty and sandy marl, calcarenite, and gravel; locally limestone beds (not mapped separately) occur in proximity to syndepositional faults and folds. Paleontological analyses of this formation indicate that the base is late Miocene in age in the study area; the age of the top is unknown and could be early Pleistocene. Drill-hole data (Tseri borehole) indicate that this unit is as much as 869 m thick

Tnml — Marine littoral member—Gravel, sand, and silt deposited in an intertidal zone. Contains material derived from reworking of older members of the Nicosia Formation. Typified by multidirectional crossbeds and flat, rounded "beach" pebbles. This unit includes interbeds of oolitic sand and is mostly time equivalent with the Aspropamboulos oolite member. Unit is up to 10 m thick

Tnas — Aspropamboulos oolite member—Fine-grained oolite. Unidirectional, planar crossbeds directed to the south. This unit is mostly time equivalent with the marine littoral member. Occurs only as one small outcrop on the south-central margin of the map area but is more extensive immediately to the south. Unit is approximately 7 m thick

Tnl — Lithic sand member—Predominantly lithic sand, but also includes lesser marl, silty marl, and calcarenite. Sand is fine to coarse grained and is derived predominantly from the Troodos ophiolite. This unit occurs at various stratigraphic intervals in the formation and is gradational with the marl member; the boundary between these members is approximately drawn. This unit is interpreted as a low-energy equivalent of the Kephales member. Unit is as much as 50 m thick

Tna — Athalassa member—Calcarenite and bioclastic calcarenite. Typified by large, unidirectional, planar crossbeds that extend from top to bottom of individual bar forms. Direction of transport is uniformly towards the south and southwest. Multiple beds occur intercalated with other members of the Nicosia Formation. Individual beds are as much as 15 to 20 m thick

Tnk — Kephales member—Marine gravel, cobbles, pebbles, and sand. Clasts are predominantly derived from the Troodos ophiolite and less from Tertiary carbonate deposits. Locally fossiliferous, containing both marine fossils and terrestrial plant fossils. In the south, this unit occurs as a "Gilbert-type" delta sequence with large foreset beds (thickness in excess of 8 m). In the middle of the map area, this unit occurs as channelized, matrix-supported submarine debris-flow deposits. Interpreted as a high-energy equivalent to the lithic sand member. Unit is as much as 20 m thick

Tnm — Marl member—Marl, silty marl, and lesser sandy marl. Fossiliferous and typically khaki-green in color; weathered surfaces are yellow-brown in color. Predominant facies of the Nicosia Formation. Most of the lower part of the formation consists of this facies, but significant intervals also occur high in the formation. Drill-hole data (Tseri borehole) indicate that this unit is many hundreds of meters thick in the map area

Tnbc — Basal conglomerate member—Gravel, cobbles, and coarse sand. Clasts are predominantly derived from the Troodos ophiolite; disseminations of unoxidized pyrite are common. This unit is typically matrix supported and medium to dark green in color. Unit crops out only in the west-central part of the map area within the Ovgos fault zone. Unit is at least 15 m thick

Tka — **Kalavasos Formation (late Miocene (Messinian))**—Gypsum, anhydrite, chalky marl, and marly chalk; most commonly occurs as massive gypsum. This unit occurs within structurally controlled basins in the study area and is absent outside the basins. Deposited during the "Messinian salinity crisis." Drill-hole data indicate that this unit is more than 377 m thick just north of Tseri and is as much as 70 m thick in northern metropolitan Lefkosia

Tlz — **Lapatza Formation of the Kythrea Group (late Miocene)**—Siltstone, marl, chalky marl, marly chalk, and limestone. Commonly contains thin selvages and disseminations of gypsum in its upper units; locally silicified near faults. This formation is mapped only in and north of the Ovgos fault zone. It is time equivalent to the upper part of the Pakhna Formation, from which it is indistinguishable. Unit is as much as 300 m thick

Tk — **Kythrea Group, excluding the Lapatza Formation (middle Miocene)**—Graywacke, marl, sandstone, and siltstone; predominantly flysch. Unit occurs only north of the Ovgos fault zone. Time equivalent to much of the Pakhna Formation, which occurs south of the Ovgos fault zone. Because of intense deformation, the full thickness of this unit is unknown, but it is at least a few thousands of meters thick

Tp — **Pakhna Formation (Miocene)**—Predominantly chalk with lesser chalky marl and marly chalk. Shallow-water platform carbonate deposits that occur only south of the Ovgos fault zone. In the map area, this unit crops out only in a narrow strip along the west-central margin. Drill-hole data indicate that this unit is more than 120 m thick

TKl — **Lefkara Formation (Paleogene and Cretaceous)**—Shown on cross section only. Chalk, marl, marly chalk, and chalky marl; locally includes bands or nodules of chert. Thickness estimated at 400 to 500 m from outcrops outside the western boundary of the study area

Km — **Moni Formation (Cretaceous)**—Shown on cross section only. Mélange of older (Triassic-Cretaceous) blocks of yellow quartz sandstone, gray siltstone, serpentinite, and other lithologies entrained in a matrix of silt and bentonitic clay. Thickness estimated to be 80 to 100 m

Kt — **Troodos ophiolite (Late Cretaceous)**—Shown on cross section only. Mafic and ultramafic ophiolitic rocks

EXPLANATION OF MAP SYMBOLS

Contact

Lineament

FAULTS
(Dashed where inferred; dotted where concealed)

Normal fault—Bar and ball on downthrown side, dip values where observed

Thrust fault—Sawteeth on upper plate; dip and rake values, where observed

Strike-slip fault—Arrows show relative movement. Tick indicates dip of fault surface, where known; stratigraphic displacement unknown. T, toward; A, away in cross section only

Strike-slip fault—With scissor-like displacement; bar and ball on downthrown side

FOLDS
(Folds show trace of axial surface)

Syncline

Overturned syncline

Anticline—Arrow indicates direction of plunge, where known

Monocline

PLANAR FEATURES

Strike and dip of bed
- Inclined
- Vertical
- Horizontal
- Overturned

OTHER FEATURES

EG 8/95 **Drill hole**—Preexisting geotechnical, hydrologic, or exploration drill hole; all data for these drill holes are on file at the Cyprus Geological Survey Department, Nicosia, Cyprus

SHN3 **Drill hole**—Drilled in 2001 and 2002 for the United Nations Office for Project Services (UNOPS) who sponsored the Seismic Hazard and Risk Assessment of the Greater Nicosia [Lefkosia] Area Project

NN15 **Surface fossil locality**—Paleontological zonations shown in red; see Neogene time scale at right for approximate ages. Fossils present are bracketed by the age range shown. "Barren" indicates no fossils were found

Foreset beds—Direction of dip indicates paleoflow direction, measured at tip of arrow

Fault-propagation fold and thrust fault—Schematic showing style of deformation that typifies structures found in the Kythrea Group. Shown on cross section only

Site of photograph—Tip of arrow at point of observation; arrow shows direction of view; number keyed to figure in pamphlet

Area not investigated—On the basis of sparse water well data, area is assumed to be marl member of the Nicosia Formation

INDEX OF 1:5,000–SCALE TOPOGRAPHIC MAPS

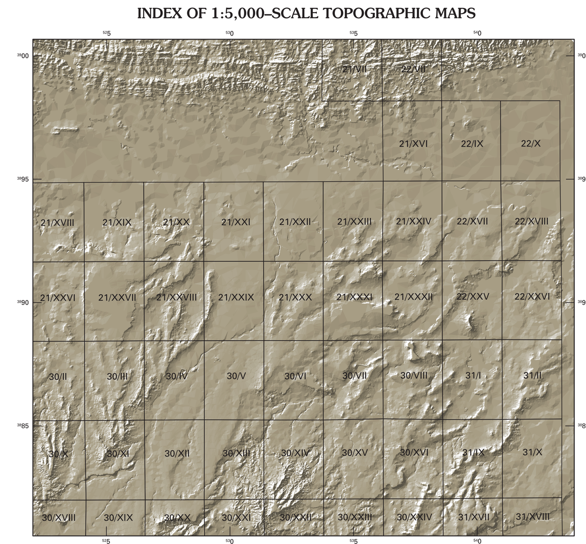


Table 1.—Summary of drill-hole data acquired for map preparation (see DeCoster and others, 2004 for detailed geologic logs and geotechnical properties).
[Abbreviations are as follows: Fm., Formation; Gp., Group; N, planktonic foraminifera zone; NN, calcareous nannoplankton zone]

Drill-hole no.	UTM coord. (m)	Collar elevation (m)	Geologic unit	Lower contact elevation (m)	Bottom elevation (m)	Fossil zone determined at elevation (m)
EPW 1	532473	145.0	Peat	144.5		Neogene at 121.0
	3892979		Artificial fill	140.0		N17–18 at 107.0
			Alluvial sand, silt, and sandy gravel	123.0		N9–N11 at 56.0
			Yellow marl of Nicosia Fm.	118.5		N9–N11 at 49.0
			Gray marl of Nicosia Fm.	110.0		
			Shear zone	109.5		
			Marly chalk of Nicosia Fm.	91.0		
			Chalky gypsum of Nicosia Fm.	87.0		
			Gypsum with clay layers of Kalavasos Fm.	70.5		
			Fault zone	70.0		
			Turbidite rhythmic layers of Kythrea Gp.		45.0	
EPW 2	537024	106.5	Alluvial sandy gravel	102.5		N17 at 100.0
	3895478		Gray marl of Lapatza Fm.	100.0		
			Marl and gravel of Lapatza Fm.	99.3		
			Gray marl of Lapatza Fm.		95.0	
EPW 3	530216	129.5	Alluvial sandy gravel	125.6		N18 at 124.0
	3894831		Brown clay and silt layers of Nicosia Fm.	122.1		N18 at 121.5
			Gray marl of Nicosia Fm.		119.5	
EPW 4	529843	144.0	Peat	143.8		N16–N18 at 136.5
	3894225		Brown marl of Nicosia Fm.	135.8		N17 at 133.0
			Brown clay and silt of Lapatza Fm.	132.0		N17 at 131.0
			Marl of Lapatza Fm.		129.0	
EPW 5	530559	141.0	Peat	140.8		N18 at 132.5–132.0
	3894159		Alluvial sandy gravel	135.6		N16–N18 at 127.0
			Yellow marl of Nicosia Fm.	130.8		
			Gray marl of Lapatza Fm.		126.0	
SHN1	531629	161.0	Alluvial sandy gravel	154.5		N19–N20 at 132.0
	3890749		Yellow marl of Nicosia Fm.	142.5		N19 at 128.0
			Gray marl of Nicosia Fm.		127.0	
SHN2	534890	140.0	Alluvial sandy gravel	137.5		N19 at 120.5
	3891234		Yellow marl of Nicosia Fm.	123.7		
			Gray marl of Nicosia Fm.		106	
SHN3	534695	172.0	Caliche	171.1		
	3890186		Calcarenite of Nicosia Fm.	156.5		
			Gray marl of Nicosia Fm.		137.5	
SHN4	531340	219.0	Sandy gravel of Apalos Fm.	213.7		
	3886794		Brown silty clay of Apalos Fm.	202.0		
			Gray marl of Nicosia Fm.	191.0		
			Calcarenite of Nicosia Fm.	188.0		
			Gray marl of Nicosia Fm.		179.0	
SHN5	527607	204.0	Sand and gravel of Apalos Fm.	198.0		
	3889671		Oxidized sandy marl of Nicosia Fm.	179.5		
			Calcarenite of Nicosia Fm.	172.2		
			Gray marl of Nicosia Fm.		164.0	
SHN6	528422	219.0	Sand, silt, and gravel alluvium of the Pediaios River.	200.0		N19 at 189.2
	3885851		Marl and sandy marl of Nicosia Fm.		185.0	
SHN7	525227	254.0	Oxidized sand, gravel, and hard silty clay of Apalos Fm.	229.5		
	3886146		Oxidized marl of Nicosia Fm.	218.5		
			Calcarenite, gravels with Troodos clasts, sand, and silt of Nicosia Fm.		202.0	
SHN8	533452	211.0	Deltaic gravels, Troodos clasts of Nicosia Fm.	210.0		N12–N14 at 189.0[1]
	3883386		Sand, silt, and minor clay of Nicosia Fm.	197.2		
			Gray fossiliferous marl of Nicosia Fm.		177.0	
SHN9	537972	180.0	Calcarenite of Nicosia Fm.	169.4		Neogene at 158.0
	3884761		Layered marl and calcarenite of Nicosia Fm.	158.0		
			Calcarenite of Nicosia Fm.	149.0		
			Layered marl and calcarenite of Nicosia Fm.	144.0		
			Sand and calcarenite of Nicosia Fm.		139.5	
SHN10	533302	142.0	Artificial fill	135.0		N19 at 88.5
	3892206		Alluvial sandy gravel	128.8		N19 at 63.6
			Gray and green marl of Nicosia Fm.	86.0		N19 at 62.0
			Marl with fragments of flysch-like sandstone and siltstone of Nicosia Fm.	80.4		Barren at 49.2; Barren at 48.2
			Strongly rotated and faulted marl of the Nicosia Fm.	80.0		
			Fault	60.6		
			Flysch of Kythrea Gp.		42.0	
SHN11	532502	151.0	Artificial fill with artifact fragments	146.0		N18 at 136.0
	3892077		Alluvial gravel and sand	143.8		N18 at 131.0
			Oxidized marl of Nicosia Fm.	137.7		N17–N18 at 116.0
			Dense gray marl of Nicosia Fm.	135.0		N17–N18 at 101.0
			Fault	78.0		N9–N14 at 76.0
			Flysch of Kythrea Gp.		48.0	N7–N9 at 51.0
SHN12	535741	120.0	Artificial fill	119.0		
	3893510		Alluvial sand and silt	113.0		
			Alluvial gravel	109.2		
			Oxidized marl of Nicosia Fm.	105.7		
			Gray marl of Nicosia Fm.		104.6	
SHN13	536193	116.0	Alluvial sand, silt, and clay	109.5		Barren at 100.0
	3893805		Alluvial gravel and sand	103.1		N7–N8 at 96.0
			Conglomerate or breccia, mixed fragments of marl and hard cobbles.	101.1		
			Limestone and sandy limestone of Lapatza Fm.	99.1		
			Shelly mudstone and siltstone of Kythrea Gp.		94.6	
SHN14	535390	123.0	Alluvium: Much caliche	118.0		
	3893241		Fractured marl of Nicosia Fm.		107.8	
SHN15	530864	155.0	Artificial fill	152.0		
	3892428		Alluvial sand and silt	149.7		
			Alluvial sand and gravel	147.7		
			Oxidized marl of Lapatza Fm.		140.0	
SHN16	529940	151.0	Alluvial sand and silt	149.5		Barren at 142.0
	3893179		Steeply dipping flysch—Sandstone, siltstone, and marl of Kythrea Gp.		136.0	N9–N14 at 137.0–136.0
SHN17	529547	159.0	Alluvial sand, clay, and hardpacked silt.	149.0		N18 at 146.0
	3892071		Alluvial sand and gravel	146.1		N18 at 139.0
			Steeply dipping, oxidized marl of Nicosia Fm.		138.6	
SK–1	529795	149.0	Alluvial and aolian sand	148.0		N9 at 138.0
	3898175		Steeply dipping flysch of Kythrea Gp.		115.0	
SK–4	530320	125.0	Alluvial and aolian sand	121.0		N19–N20 at 103.5
	3895790		Flysch of Kythrea Gp.		81.0	
SK–5	534399	120.0	Alluvial fine sand	116.1		
	3895825		Alluvial gravel and sand	112.5		
			Gray marl of Nicosia Fm.	104.5		
			Gypsum of Kalavasos Fm.		85.0	
SK–7	538025	123.0	Alluvial and aolian sand	121.0		N14 at 94
	3897590		Alluvial cemented sand	119.0		
			Alluvial gravel and sand, uncemented	115.8		
			Steeply dipping flysch of Kythrea Gp.		89.0	
SK–8	528326	134.0	Alluvial and aolian sand	132.2		N19 at 125.5
	3895427		Steeply dipping marl of Nicosia Fm.		101.0	
SK–9	530505	130.0	Alluvial and aolian sand	127.8		N8 at 111.0
	3895314		Alluvial gravel and sand	125.8		
			Steeply dipping flysch of Kythrea Gp.		96.0	
SK–10	531682	121.0	Alluvial and aolian sand	117.8		
	3896086		Flysch of Kythrea Gp.		88.0	
SK–12	529375	140.0	Alluvial and aolian sand	136.1		
	3894250		Flysch of Kythrea Gp.		105.5	
SK–13	526430	185.0	Alluvial and aolian sand, uncemented	183.0		Neogene at 161.3
	3899060		Alluvial sand, cemented	181.1		
			Flysch of Kythrea Gp.		151.5	
SK–14	526737	145.0	Alluvial and aolian sand	143.2		N19 at 138.5
	3896492		Marl of Nicosia Fm.		112.0	
SK–15	524077	156.0	Alluvial and aolian sand	154.0		N19 at 127.5
	3894492		Marl of Nicosia Fm.		117.0	

[1]Collected sample is anomalous in planktonic to benthic foraminifera ratios, whereas most marl in the Nicosia Formation is dominated by planktonic species. This one contains 95 percent benthic fossils and is interpreted as reworked material from erosion of older formations from the flank of the Troodos Range.

Neogene Time Scale
(from Gradstein and others, 2004)

Age (Ma)	Epoch	Stage	Planktonic foraminifera zone	Calcareous nanno-plankton zone
	Holocene		N22	NN21
.011	Pleistocene			NN20; NN19
1.81	Pliocene	Gelasian	N21/N20	NN18
		Piacenzian		NN17; NN16
		Zanclean	N19	NN15/NN13
5; 5.33	late Miocene	Messinian	N18; N17	NN12; NN11 b, a
10		Tortonian	N16; N15; N14; N13	NN10; NN9; NN8; NN7
	middle Miocene	Serravallian	N12; N11; N10	NN6
15		Langhian	N9; N8	NN5
	early Miocene	Burdigalian	N7; N6; N5	NN4; NN3; NN2
20		Aquitanian	N4	NN1

BEDROCK GEOLOGIC MAP OF THE GREATER LEFKOSIA AREA, CYPRUS

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2008

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