

# Map Unit Properties Table: Virgin Islands National Park

Gray-shaded units are not mapped within Virgin Islands National Park.

Age	Map Unit (Symbol)	Features and Description	Mineral Occurrence	Paleontological and Cultural Resources	Resistance to Erosion
QUATERNARY	Surficial deposits (Qs)	Alluvium, swamp deposits, beach deposits, beachrock, and artificial fill	None documented	Archaeological artifacts including Taino, Dutch, and African-slave cultural resources	Low—Coastal erosion will likely continue to damage anthropogenic structures and cultural artifacts located on various beaches
TERTIARY (PALEOGENE AND NEOGENE)	Red Hook Tonalite Porphyry (Tr)	Dikes and small hypabyssal intrusions of porphyritic tonalite with as much as 45% phenocrysts; characterized by quartz phenocrysts 1 cm (0.4 in) or larger; named for prominent dikes at Red Hook (Eastern St. Thomas quadrangle) where dikes are intruded along brittle faults	Quartz, biotite, hornblende, apatite, plagioclase, and vermiculite	None documented	High
	Explosion breccias (Te)	Mafic dike with 60% or more xenoliths; occurs only on east side of Dittlif Point where it spans about 20 m (66 ft) across an outcrop of Water Island Formation; cuts diabase dike that is interpreted to be unit Td but could be unit Kcm (gabbro) of Careen Hill Intrusive Suite; 15 to 20 cm (6 to 8 in) thick	Xenoliths include keratophyre, greenstone, gabbro, and tonalite	None documented	High
	Hornblende lamprophyre (Tl)	Dark, magnetite-bearing, aphanitic dikes with prominent hornblende phenocrysts; most Tl dikes are younger than dikes of unit Td, but some Td mafic dikes cut Tl	Hornblende, clinopyroxene, and plagioclase	None documented	High
	Biotite-hornblende tonalite (Tt)	Biotite-hornblende tonalite and minor gabbro, diorite, granite, and pegmatite; produces contact-metamorphic aureole as wide as 2 km (1.2 mi)	Quartz, plagioclase, biotite, chlorite, hornblende, orthoclase, zircon, clinopyroxene, apatite, pyrite, magnetite, diopside, sphene, allanite, and calcite	None documented	High
	Diabase, gabbro, and diorite (Td)	Nearly vertical dikes; chilled margins typical, columnar jointing not typical; dikes intrude all stratified units except surficial deposits and are intruded by tonalite (Tt); likely includes dikes of more than one age; some may be intrusive equivalents of extrusive rocks in enclosing or overlying stratified units, while others may be part of tonalite (Tt) intrusive cycle; a very few cut hornblende lamprophyre (Tl); most interpreted to be part of early Tertiary pre-tonalite (Tt) magmatic cycle (Donnelly et al. 1990)	Plagioclase, clinopyroxene, hornblende, magnetite, pyrite, quartz, amphibole, chlorite, and epidote	None documented	High
	Tutu Formation (Ktm, Ktmc, Ktml, Ktp, Ktpl)	Volcanic wacke, shale, sandstone, conglomerate, calcareous siltstone, limestone, marble, and rare basalt and andesite or their metamorphosed equivalents; all rocks are within contact aureole of tonalite (Tt); graded beds, slump folds, and disrupted slabs of metasandstone and metasilstone in metaconglomerate indicate deposition by turbidity currents on an unstable slope, perhaps a trench wall; basal contact not exposed, but it is in apparent conformity with underlying Outer Brass Limestone (Ko)  Includes Mandal Member (Ktm) with Congo Cay Limestone Lens (Ktmc) and marble, calc-silicate rock, and marble conglomerate (Ktml); as well as Picara Member (Ktp) with marble conglomerate and calc-silicate-rich beds north of Maho Point (Ktpl); overall the Mandal Member is finer grained than the Picara Member	Calc-silicate rocks contain combinations of calcite, quartz, plagioclase, tremolite, diopside, phlogopite, garnet, epidote, wollastonite, sphene, pyrite, and other sulfides	None documented	Moderate to high
CRETACEOUS	Outer Brass Limestone (Ko)	Thin-bedded (3-m [10-ft]) calc-silicate rock, with beds of white to blue-gray calcite marble (sulfurous odor when broken), and metamorphosed, matrix-supported cobble conglomerate with andesite clasts in carbonate matrix; total thickness about 100 m (330 ft)	Calcite, plagioclase, epidote, brown isotropic garnet, diopside, vesuvianite, and wollastonite	Possible Taino quarry source	Moderate to high
	Louisenhoj Formation (Kl)	Strongly cemented volcanic conglomerate, breccia, volcanic wacke, and shale in graded beds as thick as 6 m (20 ft); rare chert and limestone; minor pillow basalt and possible aa lava; basalt and andesite—both as the dominant clasts in the strata and as extrusive rocks—are characterized by about 20% prominent phenocrysts of stubby plagioclase and clinopyroxene; differences in clast populations suggest local sources; from central St. John to the north and east, most rocks are foliated; at least 1.5 km (0.9 mi) thick on west coast of St. John, and may be as thin as 0.5 km (0.3 mi) at Leinster Bay; overlies the Water Island Formation with apparent conformity  Includes porphyritic, locally vesicular andesite lava (Kla) and porphyritic, locally amygdaloidal basalt and pillow basalt (Klb)	Clinopyroxene and plagioclase; biotite, pale amphibole and epidote may appear in andesite; epidote, hornblende and biotite may appear in basalt	Limestone clasts, some fossiliferous, on Rata and Ramgoat Cays	Moderate to high

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CRETACEOUS	Lameshur Volcanic-Intrusive Complex (Klm)	Dominantly keratophyre and volcanoclastic rock derived from it; also includes basalt and basaltic andesite, trondhjemite, gabbro, and chert. Keratophyre occurs as lava flows, breccia, layered tuff, dikes, and small hypabyssal intrusive rock; several varieties of keratophyre are distinguished by the size and type of phenocrysts. Mafic rocks occur as pillow lava, pillow breccia, dikes, and rare small plutons. Local hydrothermal alteration may include boxwork texture and gossan. Named for Lameshur on the southern coast of St. John.	Quartz and plagioclase	None documented	Low to high	
	Lameshur Volcanic-Intrusive Complex	Careen Hill Intrusive Suite (Kct, Kcc, Kcp, Kca, Kcf, Kcm, Kcsd)	Trondhjemite, keratophyre (intrusive equivalents of all keratophyre units of the Water Island Formation), and gabbro; distinct columnar jointing present on Leduck Island and in many dikes and sills; no sequence of intrusion recognized. Named from Careen Hill in Charlotte Amalie.  Includes trondhjemite (Kct), coarsely porphyritic keratophyre (Kcc), porphyritic keratophyre (Kcp), phenocryst-poor keratophyre (Kca), plagioclase-phyric keratophyre (Kcf), gabbro (Kcm), and sheeted dike complex (Kcsd). Trondhjemite and keratophyre form sharp hills on the south coast of St. John.	None documented	None documented	Low to high
		Water Island Formation (Kwp, Kwa, Kwf, Kws, Kww, Kwr)	Dominantly extrusive keratophyres and volcanoclastic rocks derived from it; about 20% basaltic lava (mostly pillowed), breccia, and hyaloclastite; minor radiolarian chert; no through-going stratigraphic order recognized; extrusive equivalent of Careen Hill Intrusive Suite; ash-flow tuffs notably sparse; groundmass of keratophyre commonly spherulitic; excellent exposures of pillow breccias and hyaloclastites are found west of Ram Head Trail, on Harbor Point, and on the peninsulas of Turner and Dittlif points; base of the Water Island Formation not exposed but it was likely deposited on oceanic plateau crust  Includes porphyritic keratophyre (Kwp) (superbly exposed in a series of cascades along Battery Gut), phenocryst-poor keratophyre (Kwa) (dominant unit of the Water Island Formation on St. John and well exposed along Fish Gut Bay), plagioclase-phyric keratophyre (Kwf), basalt and basaltic andesite (Kws), volcanic wacke and bedded tuff (Kww), and radiolarian chert (Kwr)	None documented	Radiolaria within bedded chert at Kiddel Point and Saltpond Bay	Moderate to high