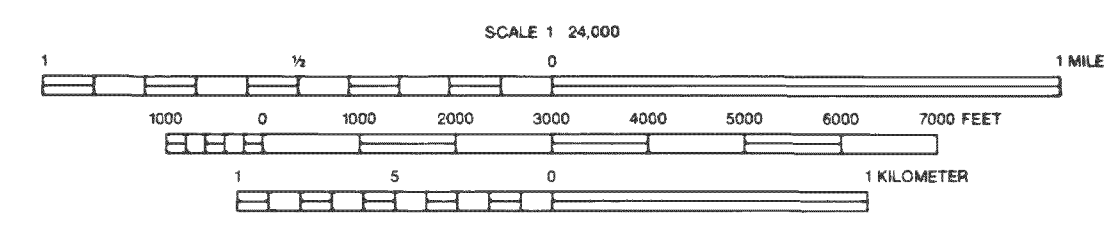


**COASTAL MARINE GEOLOGIC ENVIRONMENTS**  
OF THE  
**BRISTOL QUADRANGLE, MAINE**

By  
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**SUPRATIDAL ENVIRONMENTS**

Environments just above the highest high water datum, but under the partial influence of marine processes and forces.

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|--|---|---|--|-------------------------|--|
| <b>Sd</b> Dunes and Vegetated Beach Ridges | Unconsolidated sand or gravel deposits capping beach environments. Dunes are subject to storm waves and winds, while gravel beach ridges are subject only to storm wash. Each may be vegetated with salt-tolerant vegetation.     | <b>Sm</b> Fresh-Brackish Marsh              | Water-saturated, organic-rich sediments characterized by broad-leaved vegetation tolerant of constant submergence in fresh water. Salinity of interstitial water is less than 5 ppt. | <b>Se</b> Eolian Flat   | Partially vegetated sand flats adjacent to dune fields. Subject to generally northwest winds and occasional storm flooding.  |
| <b>Sw</b> Fresh-Brackish Water             | Ponded water behind beach ridges, man-made constrictions on former tidal embayments, or on marsh surfaces transitional between upland and salt marsh environments. Salinity of the water is less than 5 parts per thousand (ppt). | <b>Sz</b> Man-Made Land                     | Structures or fill emplaced by man in the nearshore environment.   | <b>Sf</b> Washover Flat | Sand deposits covering salt marshes behind inlet mouths which originate from storm washover or inlet delta deposits on salt marshes. Subject to storm washover and spring tide flooding.   |
|  |   | <b>Sx</b> Landslide Excavation and Deposits | Natural excavation into shoreline upland slopes created by large-scale slumping or sliding of bank material and the resulting deposits at the base of the slopes.                    | <b>Sr</b> Fluvial Marsh | Vegetated river floodplain and bank environments. Characterized by fresh-water pond vegetation such as pond lilies, reeds, and wild rice. Subject to daily tidal flooding as well as inundation during high river discharge periods. |

**INTERTIDAL ENVIRONMENTS**

Environments between the highest high water datum and the lowest low water datum subject to twice daily tidal flooding and all other marine forces.

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|---------------------------------------|--|---------------------------------------|--|-------------------------------------|---|
| <b>M1</b> High Salt Marsh             | Organic-rich sediments densely vegetated primarily with the salt marsh grass <i>Spartina patens</i> (salt-meadow grass). High salt marshes are at the same level as mean high water.   | <b>B5</b> Low-Energy Beach            | Beaches consisting of a wide variety of sediment sizes which are protected from high wave energy. Sediment characteristics are dependent upon sediment source, which is usually from upland scarps immediately shoreward of the beach. Low-energy beaches may exhibit growth of salt marsh grass when there is little sediment movement. | <b>F3</b> Mussel Bar                | Low mounds of living mussels, <i>Mytilus edulis</i> , and/or disarticulated and broken mussel shells accumulated by wave shoaling. Mussel bars generally occur at the mouths of estuaries or embayments at tidal channel margins where nutrient-laden oceanic waters first flood flat environments. Mussel bars accumulate on intertidal flats. |
| <b>M2</b> Low Salt Marsh              | Mud or silty sand embankments sparsely to densely vegetated by the salt marsh grass <i>Spartina alterniflora</i> (salt cord-grass). Low salt marsh exists between mean tide level and mean high water.   | <b>Br</b> Boulder Ramp                | Sloping surfaces in the lower intertidal zone veneered by large boulders. This environment is seaward of gravel or boulder beaches on high wave energy shorelines. Boulders are remnant lag deposits of eroded glacial tills. Boulder movement is limited to periods of intense storm wave activity.                                     | <b>F4</b> Channel Levee             | Linear accumulations of sediment along margins of tidal channels built several tens of centimeters above the surrounding intertidal flats. Channel levees are constructed from sediment deposited on the flat as the tide rises above the channel margins.  |
| <b>M3</b> Marsh Levee                 | Channel-margin sediments vegetated with salt-meadow grass which exist up to several tens of centimeters above the salt marsh surface. The marsh levee consists of sandy silt or silt-size sediment deposited from flood waters rising above channel margins, either from high river discharge into estuarine embayments or from storm-surge influenced flood tides from the ocean. | <b>Bw</b> Washover Fan                | Fan-shaped deposits of gravel located behind gravel beach ridges and covering portions of marshes. Few washovers have been recognized as mappable units on sand beaches. Washover fans are deposited by storm waves. Fan sediment is derived from the beach itself.  | <b>F5</b> Algal Flats               | High, coarse and fine-grained intertidal flats covered with the green algae, <i>Enteromorpha erecta</i> .   |
| <b>M4</b> Salt Pannes and Salt Ponds  | Salt-water filled, non-vegetated depressions on the high salt marsh surface (salt pannes) or salt-water filled depressions anywhere in the intertidal zone (i.e. tidal pools). Salt pannes may be dry and covered with algae during late summer months.  | <b>Ba</b> Spits                       | Partially-submerged beach ridges which extend offshore into open water. This category includes tombolos (spits joining an island with the mainland).   | <b>F6</b> Veneered Ramp             | Former boulder ramps presently covered by fine-grained sediment settling out of the water column.   |
| <b>B1</b> Sand Beach                  | Beaches consisting of sand-size sediment which are subject to high or moderate wave energy (waves generated in the Gulf of Maine).   | <b>Flat Environments</b>              | Gently sloping or level environments composed primarily of fine sand, silt, and clay accumulated in relatively quiet water. Flats are depositional areas controlled primarily by tidal currents and sediment settling from the water column. Flat environments may be eroded temporarily by storm waves.                                 | <b>Miscellaneous Environment</b>    |   |
| <b>B2</b> Mixed Sand and Gravel Beach | Beaches consisting of sand and gravel-size sediment which are subject to high or moderate wave energy.   | <b>F</b> Mud Flats                    | Flats comprised of sediment finer than sand.   | <b>M</b> Ledge                      | Subaerially or subaqueously exposed bedrock.  |
| <b>B3</b> Gravel Beach                | Beaches consisting of gravel-size sediment which are subject to high or moderate wave energy.  | <b>F1</b> Coarse-Grained Flat         | Intertidal flats where sand or larger-size material comprises most of the sediments. Coarse-grained flats are subject to higher tidal-current velocities than mud flats.   | <b>Mc</b> Fluvial-Estuarine Channel | Transitional channel between river and estuarine channels. The fluvial, tidal fluvial, or estuarine state depends upon the volume of river discharge entering the estuarine basin.  |
| <b>B4</b> Boulder Beach               | Beaches consisting of boulder-size sediment which are subject to high or moderate wave energy.   | <b>F2</b> Seaweed-Covered Coarse Flat | Coarse-grained, shallow subtidal and low intertidal flats which act as a stable substrate for seaweeds such as <i>Ulva</i> , <i>Enteromorpha</i> , <i>Ascophyllum</i> , and <i>Laminaria</i> .   | <b>Mp</b> Point or Lateral Bars     | Accumulations of sediment adjacent to intertidal channel margins at channel bends (point bars) or along straight segments (lateral bars).   |
| <b>Flat Environments</b>              | Submerged, gently sloping, or level environments composed primarily of fine sand, silt, and clay. Includes subaqueous exposures of coarse-grained, Pleistocene glacial sediments.  |                                       |  | <b>Ms</b> Swash Bars                | Accumulations of sediment which occur where waves shoal onto intertidal flats.  |
| <b>Fm</b> Mud Flat                    | Fine-grained subtidal flats.   |                                       |  | <b>Mf</b> Flood-Tidal Delta         | Lobe bars of sediment which accumulate landward of an inlet separating a back-barrier estuary or lagoon from open-ocean water.  |
| <b>Fc</b> Coarse-Grained Flat         | Coarse-grained subtidal flats.   |                                       |  | <b>Me</b> Ebb-Tidal Delta           | Lobe bars of sediment which accumulate seaward of an inlet separating a back-barrier estuary or lagoon from open-ocean water.   |
| <b>Fe</b> Eelgrass Flat               | Fine-grained and coarse-grained, shallow subtidal (low intertidal) flats which support dense stands of eelgrass ( <i>Zostera marina</i> ).   |                                       |  | <b>Md</b> Fan Delta                 | Coarse-grained, fan-shaped deposits which accumulate on intertidal flats where upland streams drain onto high tidal-range shorelines.   |
| <b>Fa</b> Seaweed Community           | Coarse-grained subtidal flats and bedrock ledges which support seaweed growth.   |                                       |  | <b>Ml</b> Spillover Lobes           | Lobe bars of sediment which extend from flood-tidal deltas into estuarine or tidal channel areas.   |
| <b>Fb</b> Upper Shoreface             | The inner subtidal slope which extends seaward from large exposed sand beaches where sediments are actively transported by bottom currents generated by storm waves. The upper shoreface is a sandy environment of constant wave shoaling under normal wave conditions.  |                                       |  |                                     |   |
| <b>Fp</b> Lower Shoreface             | The outer subtidal slope which extends seaward from the upper shoreface. The lower shoreface is affected only by currents generated by storm waves. Lower shoreface sediments grade from sand to mud in a seaward direction.   |                                       |  |                                     |   |

**SUBTIDAL ENVIRONMENTS**

Environments existing below lowest low water and subject to tidal current forces and wave-generated current forces.

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|---|--|--|--|
| <b>C1</b> High-Velocity Tidal Channel   | Tidal channels where maximum flow velocities probably exceed 2 meters per second (mps).  | <b>Cs</b> Channel Slope  | Gently to moderately sloping wall margins of large tidal channels. Channel slopes are confined to channel wall margins composed of sediment.   |
| <b>C2</b> Medium-Velocity Tidal Channel | Tidal channels where maximum flow velocities probably attain values between 1 and 2 mps.   | <b>Cd</b> Abandoned Tidal Channel  | Former tidal channel no longer carrying flow sufficient to erode the channel floor or margin walls. Abandoned channels usually occur in salt marsh tracts where meandering of the central drainage channel cuts off former channel segments. |
| <b>C3</b> Low-Velocity Tidal Channel    | Tidal channels where maximum flow velocities probably do not exceed 1 mps.   | <b>Cf</b> Tidal Fluvial Channel  | Lower portions of river channels under tidal influence but not carrying estuarine waters.  |
| <b>C4</b> Estuarine Channel             | Tidal channels where ocean and river waters mix. Estuarine water salinities range between 0.5 ppt and 30 ppt.                    | <b>T</b> Tidal Creeks  | Small tidal channels draining salt marshes or intertidal mud flats.  |
| <b>C5</b> Estuarine Flood Channel       | Estuarine tidal channels where flood-tide current velocities greatly exceed velocities attained during ebb tide.                 | <b>F</b> Marsh Drainage Ditch  | Man-made, rectilinear ditches dug into marshes to facilitate marsh surface drainage.   |
| <b>C6</b> Estuarine Ebb Channel         | Estuarine tidal channels where ebb-tide current velocities greatly exceed velocities attained during flood tide.                 | <b>U</b> Unit boundary.  |  |
| <b>C7</b> Inlet Channel                 | High current-velocity channels cut through barrier beaches and connecting back barrier estuaries or lagoons with the open ocean. | <b>D</b> Approximate transition boundary between estuarine and marine (30 ppt salinity) waters and between estuarine and river (0.5 ppt) waters. |  |
| <b>C8</b> Dredged Channel               | Man-made, artificially-deepened or widened tidal channel.  | <b>U</b> Unit boundary.  |  |