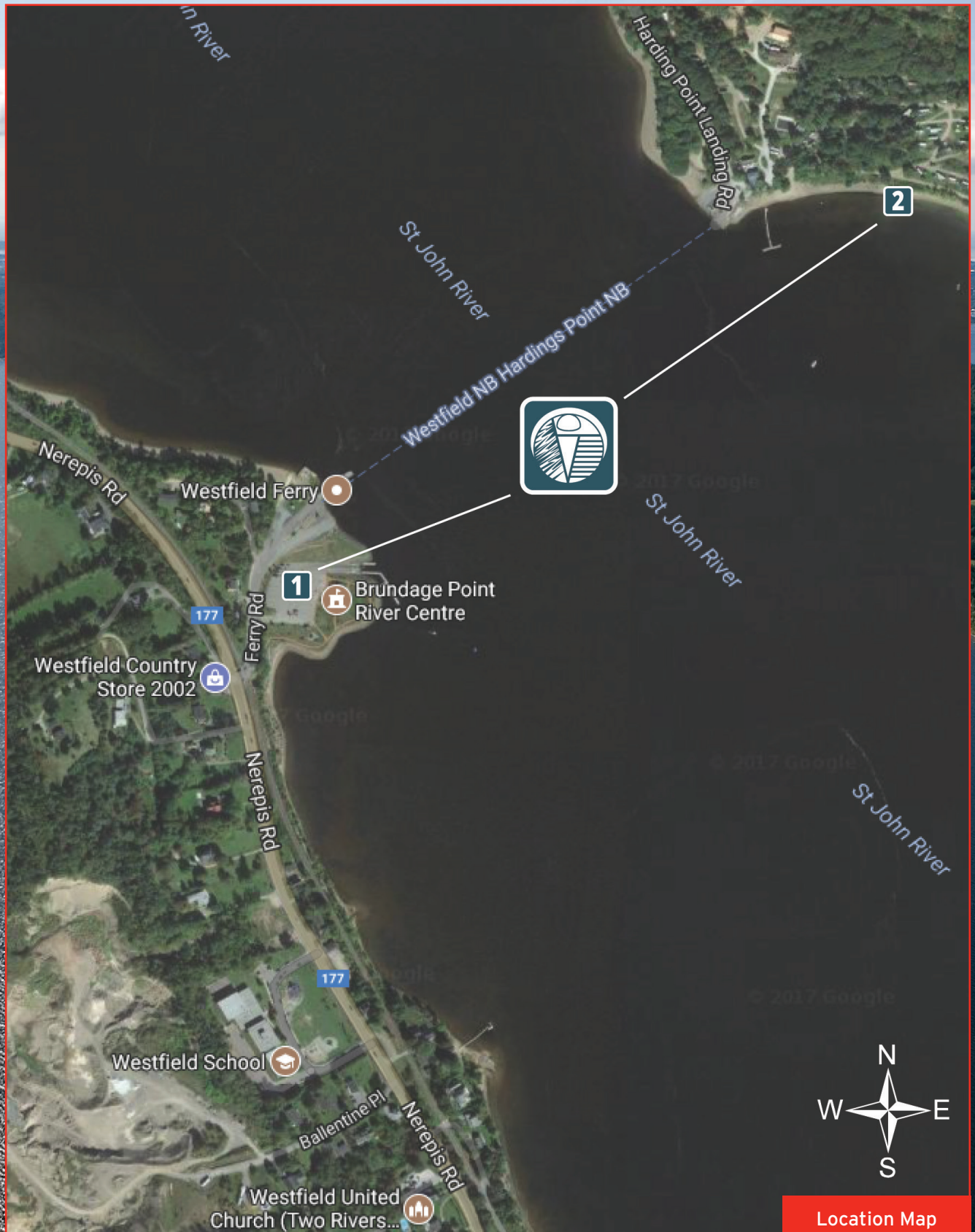


# Brundage Point

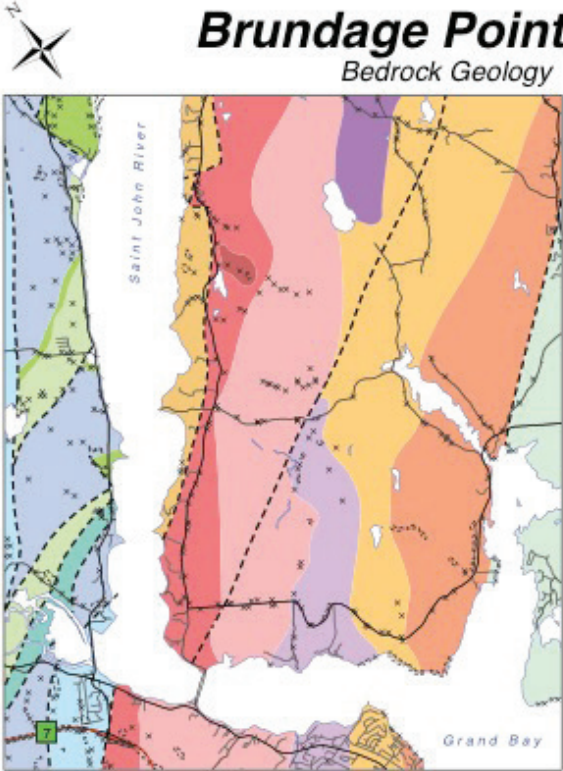
## Teacher's Sheet

Brundage Point River Centre is located on Ferry Road, off Highway 177 or from the Westfield Ferry (from Route 845, Harding's Point). Students can walk around the river centre site and if safe to do so, can cross the ferry. Water access is also available.





# Teacher's Notes

SUGGESTED STOPS	POINTS TO NOTE
Access:	Park at Brundage Point River Centre Parking Lot. Accessible dawn until dusk all year round. Wheelchair accessible parking, washrooms and pathways.
	<p>Access: GPS: 45°20'51.64"N / 66°13'25.20"W. Located along Highway 177, the Nerepis Road in Westfield, Stop 1. Brundage Point Interpretation Panel 45°20'53.52"N / 66°13'26.62"W.</p> <p>Park at Brundage Point River Centre Parking Lot. Accessible dawn until dusk all year round. Wheelchair accessible parking, washrooms and pathways.</p> <p>Amenities: Picnic and play area, sports, visitor centre (seasonal), WIFI, access to walking trails, public art sculptures, ferry crossings and boat launch. Black Loyalist Refugee information panels, river and historical interpretive panels and Stonehammer UNESCO Global Geopark panel. Check if seasonal washrooms, parking, gates, and other facilities are open at the time you plan to visit</p> <p>Equipment: 3-4 Oreos for each student, bedrock geology maps from GNB.ca or from Stonehammergeopark.com download: Learn Tab; civic map. Coloured pencils, Drifting Apart sites informationTeacher's Sheet</p> <p>Geological Age: Ordovician and Silurian (about 450 - 430 Ma)Teaching tips for the Student Tasks:</p> <div data-bbox="279 831 1380 1675">  <p><b>Brundage Point Bedrock Geology</b></p> <p><b>Bedrock Geology</b> Formation (GNB Abbreviation) Age, Rock Type</p> <ul style="list-style-type: none"> <li>Bayswater Formation (SBW) Silurian, Volcanic</li> <li>Beulah Camp Formation (ZBEt) Precambrian, Volcanic</li> <li>Brown's Flat Formation (ZBBf) Precambrian, Sedimentary</li> <li>Centreton Granite (SCTe) Silurian, Intrusive</li> <li>Kennebecasis Formation (CKoc) Devonian, Sedimentary</li> <li>Lingley Granitoids (ZLli) Precambrian, Intrusive</li> <li>Lobster Brook Formation (ZLBt) Precambrian, Volcanic</li> <li>Long Reach Formation (SLRmv) Silurian, Volcanic</li> <li>Saint John Gr. (COSJc) Cambrian-Ordovician, Sedimentary</li> <li>Sand Point Granite (SSPt) Silurian, Intrusive</li> <li>Waltons Lake Formation (SWLx) Silurian, Volcanic</li> <li>Westfield Formation (SWt) Silurian, Volcanic</li> <li>Williams Lake Formation (SWlfv) Silurian, Volcanic</li> <li>Williams Lake Formation (SWlmv) Silurian, Volcanic</li> </ul> <p>x Outcrop Point ----- Outcrop Area --- Faults Water</p> <p><b>STONEHAMMER</b> United Nations Educational, Scientific and Cultural Organization UNESCO Global Geopark</p> <p>Author: Andrew Pollock Date: July 2011 Scale: 1 : 75,000 Coordinate System: NAD83 New Brunswick Stereographic Double Projection Data Sources: Roads - Government of Canada, Natural Resources Canada, Earth Sciences Sector; Bedrock Geology - New Brunswick Department of Natural Resources, Minerals</p> <p>0 0.5 1 2 3 4 Miles 0 1 2 4 6 8 km</p> </div>



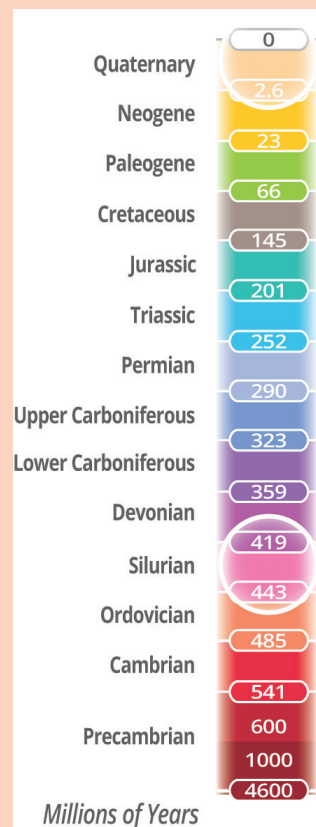
## Tasks

**Task A** The Bedrock geology maps emphasize different features from regular civic maps, so students will need to use observation skills to find features common to both maps to help them locate their desired address. The descriptions use very detailed geology terms so interested students may wish to delve into some vocabulary studies.

**Task B** The mountain range that formed through subduction as Pangea formed and the Iapetus Ocean closed continued to grow for 100 million years. You can extend the landscape sketching exercise in task B to draw the mountains at various stages over this long process.

**Task C** We find Oreos slither around nicely on their icing for this activity. Check whatever cookies you use beforehand to make sure they work well. Full instructions, videos, and images can be found at various sites online for this activity. We would love to see any videos the students might make or other subduction models you or your students invent. Please share using #stonehammerrocks. Note that the answer to which type of subduction happened here 430 million years ago is convergent, because the Iapetus Ocean was closing.

**Task D** In geology the present is the key to the past. As the Atlantic Ocean grows due to sea-floor spreading at the Mid-Atlantic Ridge the sites in the Drifting Apart area grow further apart and locations of subduction and ocean arc volcanic activity have shifted. Observing current earth processes helps geologists interpret the structures at this older site.



**TEACHER TIP:** If you are not visiting Reversing Falls Rapids, you could do the glacier experiment in task D from that student sheet here. The volcanic rocks here are relatively hard rocks responsible for the rolling hills seen in the distance. Glaciers that covered the entire area during the most recent glaciation have smoothed and scoured the hills and river valleys. The Saint John and Kennebecasis river valleys follow the bedrock structure along the Kingston Peninsula.

Although the bedrock geology is hard to see at the Brundage Point River Centre it still shapes the surrounding landscape. The rocks at Brundage Point and across the Saint John River on the Kingston Peninsula are mostly Silurian age volcanic rocks, about 435 million years old.

A terrane is a fragment of the earth's crust formed on, or broken off from, one piece of the Earth's crust (or tectonic plate) and attached to the crust on another plate during plate tectonic movement events. The fragment of crust preserves its own distinctive geologic history that is different from the crust it has become attached to. The transported fragments are often referred to as 'exotic terranes' since they have come from somewhere else. Some, like the Brookville and Caledonia terranes seen at the Reversing Falls and Rockwood Park have travelled halfway across the globe. New Brunswick is composed of a series of terranes stacked up against the older core of North America. Each slice has its own geological story and contributes to the complex history of how New Brunswick came together.

A terrane can also be created during the plate tectonic process. Brundage Point is located on the Kingston Terrane. As the Brookville (Ganderia) and Caledonia (Avalonia) terranes approached ancient North America, the Oceanic Plate below the Iapetus Ocean was being subducted (task D). As the ocean crust descended it melted and the lighter parts 'bubbled' back to the surface to create volcanoes. (task B) We see the remains of those volcanoes on the Kingston Peninsula (task C). The long straight river valleys here follow fault lines along the edges of the terranes.



The Saint John River flows past Brundage Point on its way to the sea. 15 kilometers south of here the river passes through the Reversing Falls Rapids gorge and into the Bay of Fundy. The view from the River Centre has changed dramatically over the years; 15,000 years ago this valley was completely covered by glaciers!

In the Quaternary Period, the glaciers retreated and the ocean flooded this valley past Fredericton to create an inland sea. Over thousands of years sea level dropped and the land rebounded as the weight of glacial ice was removed. This is called isostatic rebound. The connection to the sea was cut off and a series of waterfalls formed at the Reversing Falls Rapids in Saint John. The Saint John River became a large lake.

The two sculptures here were made during the Saint John Sculpture Symposia in 2012 (pictured) and 2016 by international artists Radoslov Sultov and Alessio Ranaldi from Hampstead Quarry stone.

Forming the northernmost boundary of Stonehammer UNESCO Global Geopark not far from Brundage Point, the Hampstead quarry (Spoon Island North Quarry) first produced dimension granodiorite in 1840. The stone is a fine-grained grey or pink granodiorite, the former marketed under the names Blue Mountain or Spoon Island Blue and the latter being called Gypsy Mountain, Spoon Island Pink or Coral Dawn. Over the years this granodiorite has been used in the construction of bridges, buildings, jails, and monuments in New Brunswick and elsewhere. The stone was also used for the Sir John A. MacDonald monument in Kingston, Ontario. Examples of Saint John structures containing Spoon Island stone include: the old Public Library, (current Saint John Arts Center) St. John the Baptist Church, the Champlain monument, Old Courthouse, Queens Square-Centenary Church.

