

Reclamation of the Irish Cove Limestone Quarry (NTS 11F/15), Richmond County

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Introduction

The reclamation of the Irish Cove Quarry demonstrates how planned reclamation with community input can restore the land to a sustainable natural environment, free from safety hazards and long-term liabilities. This project also demonstrates land-use efficiency, wherein mining is part of a sequence of usage, preceded by hunting and traditional use, settlement, farming and forestry. Each sequence provided economic benefits to the community without jeopardizing the ability of the land to provide for future generations.

Property Description

The Irish Cove limestone quarry (Fig. 1) is located in one of the most scenic areas of Cape Breton Island. The quarry property lies on Crown land, adjacent to the village of Irish Cove on the eastern shore of Bras d'Or Lake, about 35 km north of St. Peter's and 50 km south of Sydney. The 65 ha property is composed of four adjacent Crown land parcels and 790 m of waterfront along the edge of Bras d'Or Lake. Private land holdings lie to the east and west sides of the property and Highway 4 defines the southern boundary. The Crown land block continues on the other side of Highway 4, uphill and upstream within the catchment area of Irish Cove Brook. A scenic look-off, located along Highway 4 and near the summit of MacLeod's Hill, offers a spectacular view over Bras d'Or Lake, the East Bay Hills and the village of Irish Cove. Prior to quarrying the land consisted of a rolling, pastoral landscape with northeast-facing slopes, gently dipping toward the lake. The property was occupied by small farms with cleared pasture bounded by regenerated forest.

The quarry operation excavated part of a northeast-facing slope between the lower flanks of the East Bay Hills and the Bras d'Or Lake shore (Fig. 2). The original contours were altered to yield

a more roughened terrain with steep highwalls surrounded by hummocky areas formed by piles of topsoil and overburden. Most of the overburden is revegetating naturally with pioneer and other invasive species of grasses, legumes, forbs and low shrubs. The most visually dominant elements on the property are large stockpiles of light-grey, crushed limestone, which lie immediately adjacent to Irish Cove Brook. From the far west to southwest side of the property the land is mostly tree covered and was not affected by the quarry operation. In the late 1990s an illegal clear cut occurred close to the upper section of the quarry highwalls. In the northern area an old section of Route 4 runs parallel to the shoreline, which was used for the quarry. The Irish Cove bypass was constructed in the 1970s, and runs down MacLeod's Hill and curves around the quarry and Irish Cove village. Two settling ponds located close to the lake shore are contained by an embankment dam. One is a small pond which contains wetland vegetation, while the other is dry most of the year, except in the wetter months during spring.

The quarried area contains debris, stockpiles of limestone, exposed cliffs, and steep overburden mounds which all provide hazards to public safety. The most disturbed portion of the site occurs in the area containing the steep quarry walls (Fig. 2, middle ground, right of centre) and the stockpile area lying adjacent to Irish Cove Brook (Fig. 2, middle ground left of centre). The brook and riparian area has been impacted by the former operation and continues to be stressed from the crushed limestone stockpiles along the west bank, which erode into the stream. The occupation of the stockpiles on the riparian zone continues to inhibit revegetation.

The quarry landscape spoils the area's scenic and ecological values. The excavated terrain, lack of revegetation, size, height and light hue of the stockpiles all contribute to an unsightly appearance

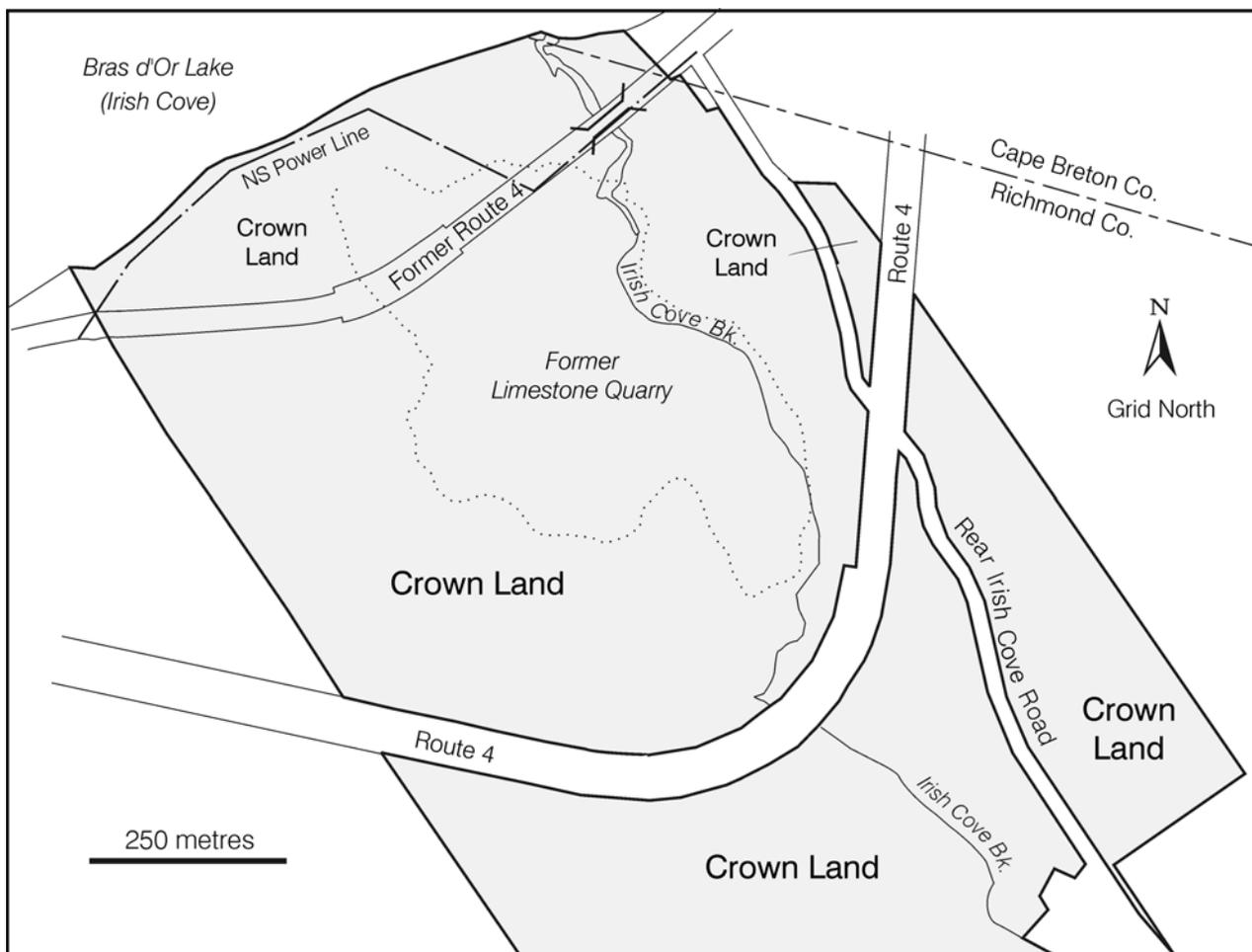


Figure 1. Map of the Irish Cove Limestone Quarry property.

that is conspicuous from the lake and Highway 4. Areas where topsoil has been removed for quarrying, and other areas covered with deep layers of limestone gravel, provide unsuitable conditions for substantial regeneration of vegetation. The combined effect of landscaping and revegetating the site will greatly improve the local ecosystem, habitat and scenic values.

Reclamation Planning

In 1988 Scotia Limestone Limited provided the province with a Letter of Guarantee committing the owner to reclaim the site. This obligation was acquired by SYSCO upon the purchase of the property from Scotia Limestone. After the quarry closed the property was left in an abandoned state, including a stockpile of over 100 000 tonnes of crushed, screened limestone. The land was

reconveyed to the Crown in 1993 and DNR made several unsuccessful attempts to sell the stockpiled limestone to augment the cost of reclamation. As the site remained untouched for over 12 years, the residents of Irish Cove and nearby Johnstown registered concern that the property was unsafe and unsightly. The department turned to investigating options for reclamation, which led to an allocation from the SYSCO fund for reclaiming former SYSCO quarries.

In June 2001, DNR staff prepared a draft reclamation plan entitled *Irish Cove Limestone Quarry: A Conceptual Plan for Reclamation and Site Development*. The report referred to DNR's Integrated Resource Management (IRM) assessment for the Irish Cove Crown block, noting the presence of a mix of resource, recreational and ecological values including high scenic values,



Figure 2. Photo of the Irish Cove Quarry (looking south) circa 1992.

significant wildlife values and “a rare opportunity to provide public access to the Bras d’Or Lake shore.” This suggested that the property’s natural assets provide an opportunity to redevelop the site for nature conservation and passive recreational use (Fig. 3).

Issues, Objectives and Options

The department’s foremost concern was to improve the condition of the property by reducing public safety hazards and improving environmental quality. Central issues and recommended actions (Table 1) were determined by DNR staff and a working group which consisted of local residents and representatives from other agencies.

Safety objectives aim to reduce the severity of all slopes and high walls to an average grade ratio of 1:3. This is to reduce the hazards of steep terrain and provide adequate slopes for revegetation. The piles are relatively high and steep, and tend to attract ATV and motorcycle riders. During winter the snow-covered slopes are popular for tobogganing, which has resulted in at least one known injury. One of the most important safety measures in this reclamation project is to move most (90%) of the stockpiled material back into the quarry for backfilling against highwalls. The remaining material will be used to cover and landscape the riparian zone. A former truck-loading ramp and drop-off presents a public hazard. The structure will be dismantled and disposed of with the other quarry debris. The remaining embankment is to be smoothed down and incorporated into the new landscaping.

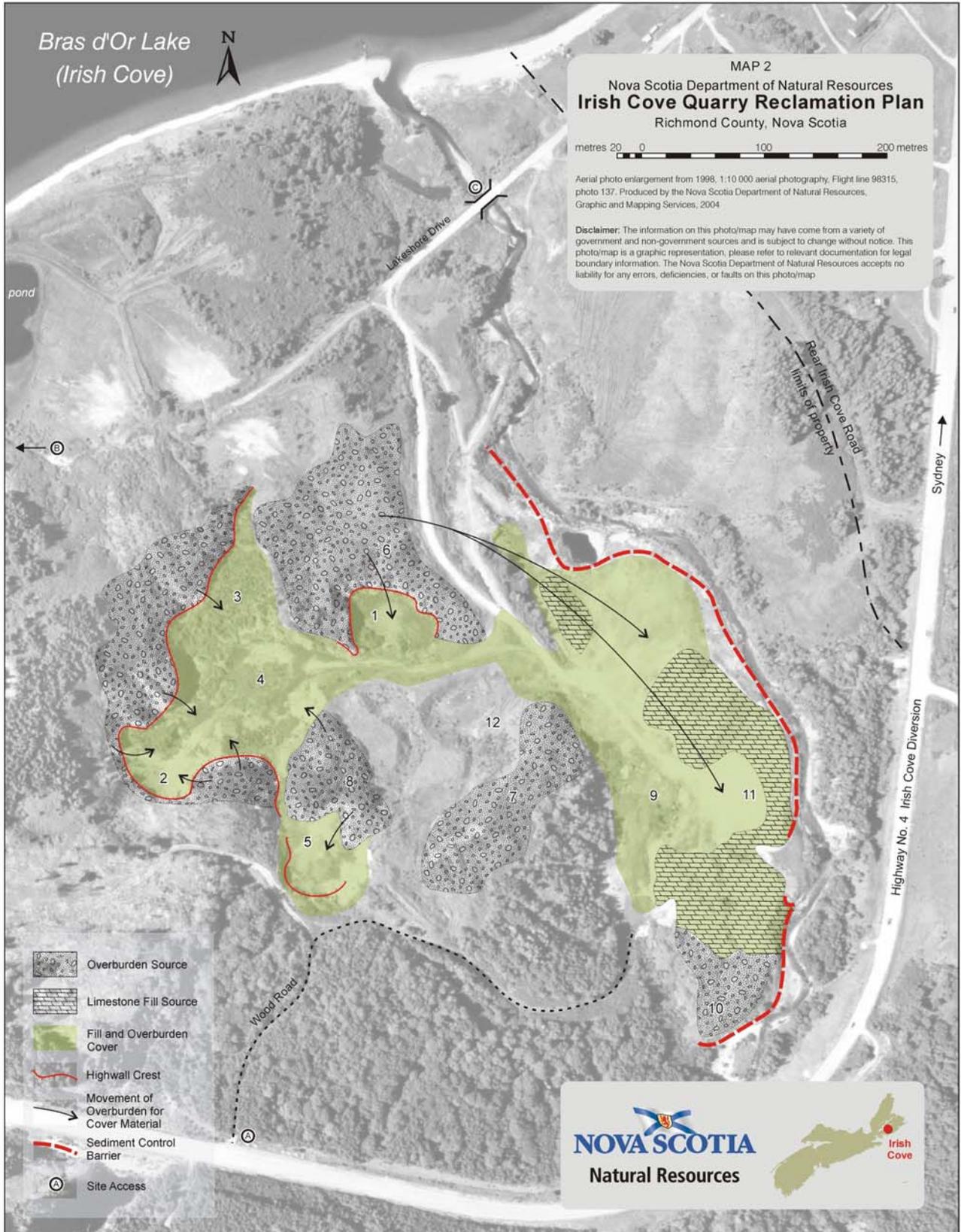


Figure 3. Reclamation plan for the Irish Cove Quarry.

Table 1. Main issues and options determined for the Irish Cove Quarry property.

Primary Reclamation Issues		Post-reclamation options
Safety Issues	Environmental Issues	
Stockpiles	Quarry debris	Public access 'Geopark' and recreational area Nature Trail System Memorial Grove Nature conservation
High walls	Visual Impact	
Quarry debris	Stream and riparian zone habitat	
Loading ramp	Reduced habitat	
Embankment dam	Vegetation	
Wooden bridge	Topsoil and fill	
Abandoned well	ATV use	
ATV use		

Environmental objectives are directed at improving conditions for valued ecological components such as wildlife habitat and levels of biodiversity. Wildlife habitat will be improved through suitable revegetation techniques. Exposed areas will undergo hydroseeding and replantation to prevent erosion and runoff, and to aid revegetation. Hills and steep slopes will be recontoured to blend with the surrounding topography.

There is ample evidence of ATV use in different parts of the site. Tracks were observed on the stockpile slopes, on stream banks and along the settling pond embankment. To protect the investment made in reclamation, revegetation and stream restoration, signs will be posted prohibiting ATV and motorcycle use on the site. The ATV issue was discussed at reclamation planning meetings where community representatives indicated that they could play a part in increasing local awareness to help prevent ATV and motorcycle use on the property. This will be particularly important immediately after the site has been hydroseeded and in an early stage of revegetation. DNR regional wardens will be asked to include the Irish Cove property as part of their Crown land surveillance.

Post-reclamation Options

The initial proposal for post-reclamation redevelopment was for amenity use. A 'Geopark' and recreation area was proposed, which aimed at highlighting the geology, fossils, process of natural regeneration, stream restoration, vistas and access to the Bras d'Or Lake shore. Some development

was suggested, including a picnic shelter, parking area and nature trail system with interpretive panels. The concept was presented by DNR staff to local residents at a public meeting in Johnstown in June 2001.

The community's reaction was generally positive; however, some residents expressed concern that a developed recreation area would produce increased traffic and parking along Lakeshore Drive in Irish Cove. DNR was asked to consider alternate access to the Geopark, although local residents expressed an interest in maintaining existing access across the brook at the end of Lakeshore Drive. The only alternate access point is a former skidder road ('woods' road) that runs off Highway 4 along the southern boundary. This is a short road that runs downhill from Highway 4 to the top of the quarry's high walls, then turns east and joins an old quarry road that leads downhill to the stockpile area next to the brook. The existing condition of the alternate route required considerable work and expense to upgrade to a two-lane road, plus the cost of developing a graded parking area. As the scale of development and further costs for alternate access were not accounted for in the original reclamation budget it was decided that the Geopark recreation area concept be replaced by a more general amenity solution for nature conservation and stream restoration.

Land Reclamation

Land reclamation began in September 2003 after the Department of Transportation and Public Works signed a contract with Harold Phillips and



Figure 4. Photo of the Irish Cove Quarry reclamation project (June 2004).

Son. Ltd., of Mira Gut. The preliminary work and site preparation included permitting, cleaning up the site and establishing sediment and erosion control structures (Fig. 4). Debris was removed such as truck parts, wooden structures, metal and plastic pipe, cable, tires, fuel drums, power lines, etc. Non-essential power poles and lines were disconnected and removed. The power poles were donated to the local community after residents expressed interest in acquiring them for holding lamps along a nearby cross-country ski trail. A drilled water well was inspected by Nova Scotia Department of Environment and Labour staff and later decommissioned.

Groundwork and Recontouring

All groundwork was carried out with material

found onsite, particularly the stockpiled limestone. This material was located on the banks of the brook which impeded the stream's meandering ability and prevented the development of vegetation and wildlife habitat in the riparian zone. The material was moved away from the banks of the brook to provide at least a 25-30 m wide flood zone. The landscaping provided final contours to approximate a northeasterly aspect (dipping toward the lake and the brook) with a slope ratio of between 1:10 and 1:3.

Reclaiming Highwalls and Overburden

The quarry walls and steep overburden (areas 1, 2, 3 and 5 as shown on Fig. 3) lying above the crests of the walls were public safety hazards. The quarry walls located in Areas 1 and 2 were, by far, the



Figure 5. Photo of the Irish Cove Quarry highwalls before reclamation.



Figure 6. Quarry walls after reclamation and recontouring.

greatest danger to public safety with steep faces exceeding 10 m in some places (Fig. 5). Therefore, these areas were the top priority areas to be backfilled. The stockpiled limestone was moved back into the quarry as fill and ramped up against the walls to slopes of approximately 1:3 (Fig. 6). The northern and southern flanks of Area 4 (former quarry faces) also required limestone fill material to achieve the required 1:3 slope ratio.

The second issue is the acquisition of cover material. The quarry operation did not separate and stockpile the topsoil which leaves a mix of topsoil and overburden as the only source of growing medium for revegetation. Prior to quarrying the overburden was either “pushed” off the limestone or stockpiled in specific areas as shown in Figure 3. In some areas the overburden was originally 10-12 m thick and, therefore, the easiest method of removal was to simply push it to the perimeter of the workings. Over time, the quarry face advanced toward the perimeter resulting in steep, unstable overburden piles crowning the pit walls (Areas 2 and 3). Over time these slopes revegetated naturally with a dense growth of wild rose bushes, which provide the additional danger of obscuring the edges of the quarry walls.

After the stockpiled limestone was backfilled in Area 2 and 3, overburden at the crests of the pit walls was pushed back down on top of the limestone fill as a cover for revegetation. The new slope essentially creates a smooth surface from the base of the slope to the top where the overburden formally rested. Remnants of the pit walls that stood as a constant reminder of quarrying are now barely visible.

Grasses and shrubs flourish on all the overburden piles including small trees in some areas. Although the overburden in Areas 7, 8 and 10 was identified for cover material, it will be kept intact to preserve existing vegetation and reduce the overall disturbance of the site.

Revegetation

Once the ground conditions were suitable in the late spring of 2004, the revegetation process began (Fig. 7). This included the replantation of 185 small

trees and shrubs and hydroseeding all uncovered areas. Revegetation aims to augment the gradual redevelopment of natural forest conditions in areas where quarry activity occurred. This will provide a necessary boost for local species diversity and the normal processes of plant succession, which is taking place from adjacent pockets of undisturbed vegetation. The undisturbed forest areas contain stands of white spruce, eastern hemlock and ash along with juvenile seedlings.

Wild rose, blackberry and raspberry bushes, white ash and alder form part of the existing shrub cover, which contributes nitrogen necessary for improving soil fertility. The selection of shrubs for transplantation was conducted by a vegetation specialist from Transportation and Public Works. The shrubs were extracted by machine and transplanted immediately. Areas where overburden slopes have been relandscaped with limestone fill and overburden have been seeded and fertilized by hydraulic seeding and manual methods of dispersal. The seed mix recipe is designed to attract wildlife. It contains creeping red fescue, birdsfoot trefoil, orchard grass, kentucky bluegrass, alsike and white clover. A layer of hay mulch was spread over the seed to retain moisture and minimize seed and soil loss from wind, rain and runoff.

Prior to reclamation DNR called for a survey of vascular plants growing on the property, which was conducted by Crompton and Stahevitch-Crompton in the fall of 2002. Their observations described a variety of plant communities in early succession throughout the site. The survey found the quarried areas to be arid, where the soils are shallow and depleted in nutrients and organic matter. The arid conditions are likely due to the lack of moisture-retaining organic matter and the rapid drainage capability of the underlying limestone. Most of the plants found are classified as abundant, common or occasional in abundance. Only a few species are regarded to be rare (such as hawkweed, sandwort, curled dock and woundwort hedge-nettle), which were found in areas undisturbed by quarrying or farming. Once the revegetation efforts have had four or five years to establish, a second plant survey should be done for a comparative analysis and to measure species diversity.



Figure 7. Photo of the reclamation project circa June 2004. Areas 2, 3 and 4 (background) are complete and seeded. Area 1 (middle ground) is used as a source of cover material for Areas 9 and 11 (former stock pile in foreground).

Stream Restoration

Irish Cove Brook and the riparian zone represent the most significant ecological components of the site, which provide a vital ecological link between the forested uplands and the marine environment of Bras d'Or Lake. The brook flows down the East Bay Hills in a northwesterly direction, and enters the property through a large culvert underneath Highway 4. Once through the culvert the flow is deflected sharply to the east and northeast and runs along the eastern edge of the property between a limestone escarpment and stockpile area (see Fig. 3). Several issues occur concerning aquatic habitat, including siltation, erosion, shallow water and greatly reduced cover due to a sparsely vegetated riparian zone. The stockpiles have significantly reduced the capacity for revegetation and habitat development in the riparian zone. The

limestone gravel tends to drain moisture quickly and leaves the surface areas extremely arid and nutrient poor. The stockpiles also confine the stream, which prevents the development of a meandering pattern and deposition of nutrient-laden silt. Some stockpile slopes have spilled into the brook, which leads to local bank slumping and subsequent siltation of the stream bed and estuary channel.

The main objectives for restoring Irish Cove Brook and the riparian zone include: improving aquatic habitat for salmon and trout, producing higher species diversity, increasing vegetation cover, improving stream-bed morphology, and providing a net gain in fish habitat.

DNR asked for assistance with stream restoration planning from the provincial Department of Fisheries and Aquaculture (DOFA)

and the federal Inland Water Habitat Management Division at Bedford Institute of Oceanography. DOFA staff conducted a stream assessment in July 2003 to evaluate and monitor physical and biological stream conditions such as water quality indicators, fish species, water temperature, substrate composition, canopy and shade cover, velocity and water depth. These data will provide a benchmark for future surveys after the reclamation and stream work is complete. In June and August 2003, DFO staff visited the site to assess and develop a layout design for in-stream structures. This involved measuring and marking locations for structures (either digger logs¹ or rock ledges) and determining the need for additional structures. In-stream structures are used to re-establish the natural meander of a stream and to develop pools and gravel beds that are suitable for spawning. As the water flows over the log (or rock sill), fine materials are removed and the remaining gravel is sorted, thus creating a preferred habitat for fish. These structures also help raise the oxygen content of the water, and the boulder and cobble ramp provides habitat for aquatic insects on which fish feed.

A restored riparian zone will help to reduce pollutants in surface runoff, help control surface and bank erosion, provide a shaded microclimate that keeps the water cool for stream biota, provide fish habitat in the form of undercut banks with the

"ceiling" held together by roots of woody vegetation, provide organic material for stream biota, provide habitat for terrestrial insects, and travel corridors for animals. Once the stockpile material has been removed the remaining landscape will be graded to a gentle slope and revegetated. Bioengineering techniques such as wattling can be used to boost the success rate of revegetation efforts and help to reduce erosion, especially along the stream banks.

Irish Cove Brook has the potential to function once again as an anadromous stream, similar to other streams flowing into the Bras d'Or Lake which contain trout and salmon. After the reclamation work is complete in 2004, it is hoped that the work toward stream restoration will commence in the summer months next year. This phase of the project will rely mostly on the efforts of interested community organizations and local support to raise the necessary funding. Meetings have already occurred between DNR staff, Strait-Highlands Regional Development Agency, Johnstown Community Development Cooperative, the Richmond Fish and Wildlife Association, local residents and others. All are optimistic that this phase of the project will be accomplished. This will complete the task of reclaiming the Irish Cove Quarry and provides Nova Scotia with a successful demonstration of how sustainable development principles can be applied to mining.

¹Digger log structures consist of hardwood logs secured to the streambed, at a 30-degree angle to the bank, using rebar. Boulders and cobbles are removed from the downstream side of the log and placed upstream to create a ramp, causing the water to cascade over the log.