

# Mineral Production Trends in Nova Scotia: 2014 Year in Review

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## Introduction

Significant benefits are derived from the mineral products produced in our province, for example:

- electricity and cement produced using both coal and limestone;
- table salts and road salts for consumption and safety;
- construction aggregate for roads and buildings; and
- gypsum to build home interiors.

Beyond the direct benefits received by using mineral products, mineral development provides additional benefits to the residents of the province, including stable, high-quality employment; payments to government through collection of royalties and taxes; and business expenditures that support long-term local enterprises.

This paper outlines recent mineral production trends in Nova Scotia and also provides site-by-site descriptions of a number of operations.

## Sources of Information and Methods

The data used in this analysis are derived from the Annual Reports on Mining Operations submitted by mine operators to the Department of Natural Resources (DNR) as a requirement of the *Mineral Resources Act* to maintain their mineral rights in good standing, either as a mineral lease or a non-mineral registration. Individual mine production data are kept confidential by DNR for two years after submission, thus the lag in making them available here.

For construction stone and aggregate production, data used are from the Annual Census of Mines, Quarries and Sand Pits that is conducted by Natural Resources Canada (2016). Market value of commodities is also taken from Natural Resources Canada when it is available, otherwise it is estimated using open-market prices.

Mineral production information is entered into spreadsheets and graphed in order to identify production trends and to compare commodities produced as is illustrated in Table 1 and Figures 1 to 3, showing all mineral production for 2014 and for the period 1987 to 2014.

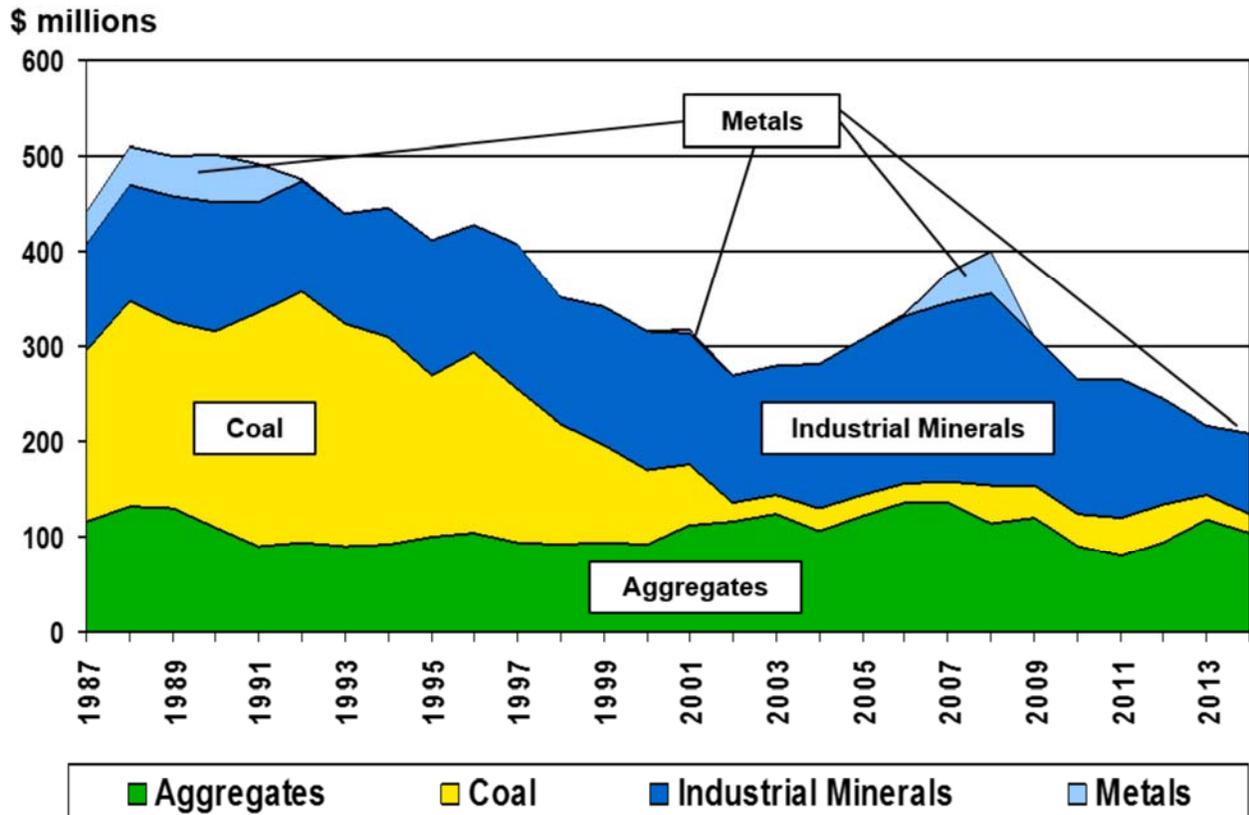
## Active Mines and Quarries

Excluding aggregate and other construction material operations, 11 mines and quarries actively produced in 2014 and operated under the authority of the *Mineral Resources Act*. Nova Scotia Environment regulates the operation of aggregate and construction producers. Figures 4 and 5 show the locations of and a composite of several aerial photos of the 11 active mines and quarries. Table 1 shows the seven mineral commodities produced by these mines as well as aggregate production; the commodities are ranked in order of their market value.

There has been a noticeable decline in total market value of Nova Scotia minerals (Fig. 1). In 2014 the total market value of primary mineral production from mines and quarries in Nova Scotia declined to an all-time modern-era low of \$209.5 million, which resulted from 16.8 million tonnes of primary mineral production. That's a significant drop from a recent high in 2009 of about \$400 million in

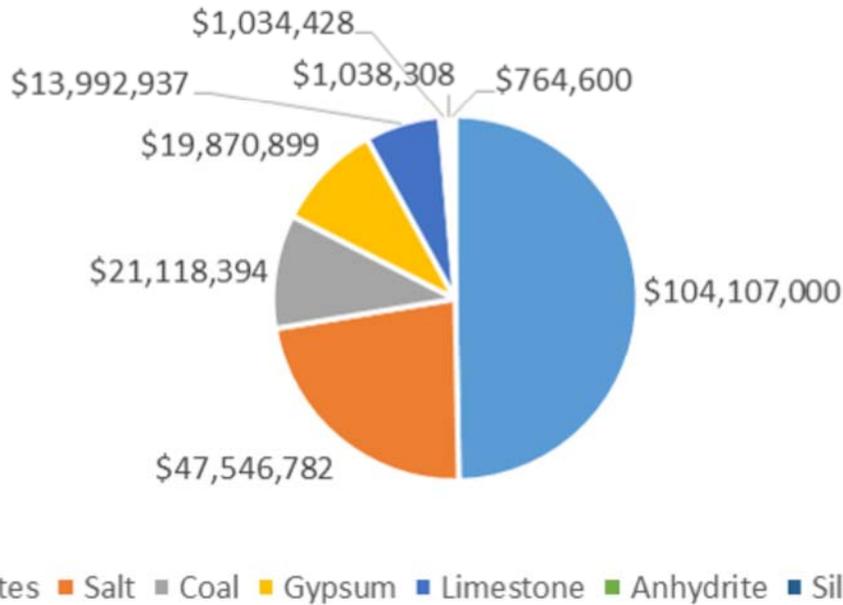
**Table 1.** Mineral and aggregate production in 2014 (tonnes and estimated market value)

Commodities	Tonnes	Percent of Total	
		Tonnes	Market Value
Aggregates	13,272,000	78.5%	\$104,107,000
Salt	873,701	5.2%	\$47,546,782
Coal	372,853	2.2%	\$21,118,394
Gypsum	1,801,918	10.7%	\$19,870,899
Limestone	466,742	2.8%	\$13,992,937
Anhydrite	93,803	0.6%	\$1,034,428
Silica Sand	16,336	0.1%	\$1,038,308
Gold	0.0172	0.0%	\$764,600
<b>Total Mineral Production</b>	<b>16,897,353</b>	<b>100%</b>	<b>\$209,473,347</b>



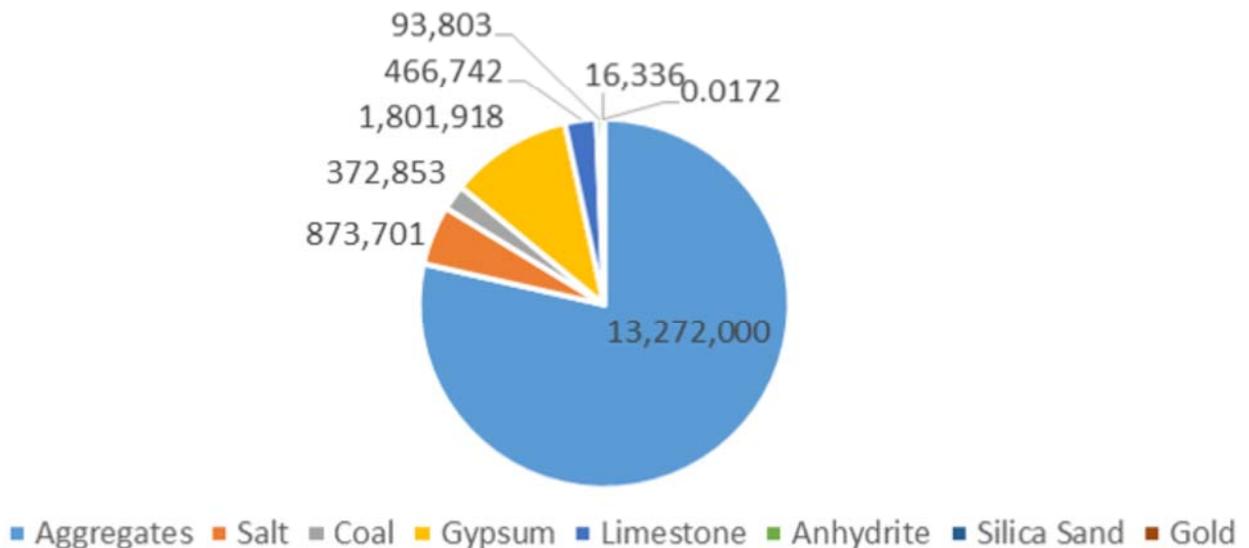
**Figure 1.** Value of minerals and aggregate produced 1987 to 2014.

## 2014 Mineral and Aggregates Production \$ Value of Production

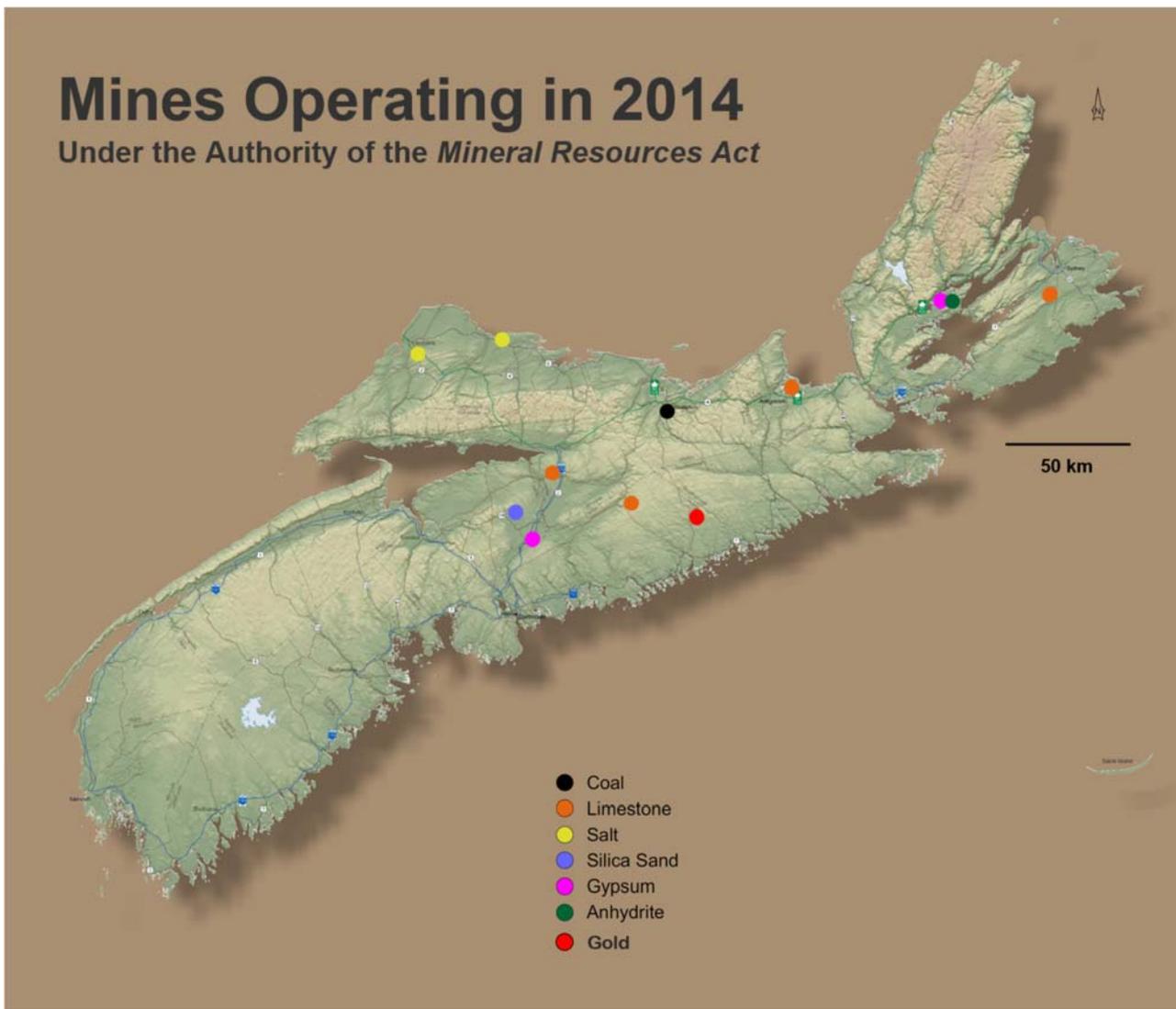


**Figure 2.** Mineral and aggregate production in 2014 (dollar value of production).

## 2014 Mineral and Aggregates Production Tonnes of Production



**Figure 3.** Mineral and aggregate production in 2014 (tonnes of production).



**Figure 4.** Commodities mined in 2014 under authority of the *Mineral Resources Act*.

production. The majority of the drop in value can be attributed to two commodities:

- the cessation of base metal mining due to poor economics caused by low metal prices; and
- the near total collapse in the demand for natural gypsum rock for wallboard manufacturing due to a slowdown in United States housing construction and the increasing substitution of natural gypsum with lower cost synthetic gypsum created as a by-product of flue-gas desulphurization at coal-fired power plants. This change in the marketplace came after several years of record production of natural gypsum from Nova Scotia quarries.

## Construction Materials

In 2014, construction materials, including aggregates, represented 49.7% of the dollar value and 78.5% of the tonnage of all materials mined (Table 1, Figs. 2, 3). Aggregates are now the most important mineral commodity produced in the province in terms of tonnes mined, market value and direct employment. Aggregate is mostly sold and used locally, and is therefore less influenced by change in the world prices of commodities than are gold, base metals (for example lead and zinc) and industrial minerals (for example gypsum). About 25% of the aggregate produced is exported by ocean vessel to destinations outside of Canada.



**Figure 5.** Mines and quarries producing in 2014 under authority of the *Mineral Resources Act*.

Aggregates are used in almost all construction projects, including homes, highways and other public infrastructure. Demand for aggregates continued to grow in 2014, and its production exceeds all other industrial mineral production combined (which includes salt, gypsum, limestone, anhydrite and silica sand). Figure 6 shows the steady increase in construction aggregate production. Aggregate production is widespread throughout the province due to the need to minimize shipping costs, and many operations are seasonal or intermittently operated to supply local construction projects. Government is currently developing a map showing where the most active aggregate quarries are located. The reader may be interested in the results of a recent survey of pits and quarries conducted by DNR (Hennick *et al.*, 2015).

## Salt

### Salt Production in 2014

Salt accounted for 22.7% (\$47.5 million) of the total value and 5.2% (873 701 t) of the total tonnage mined in 2014 (Table 1, Figs. 2, 3). Salt is

the second most-valued mineral product produced, mostly as a result of its relatively high unit-value of about \$54/t.

Figure 7 shows salt production in Nova Scotia from 1920 to 2014. Since about 1980, production has averaged about one million tonnes per year. Annual fluctuations are directly related to the severity of winter weather in the region and therefore the changing demand for de-icing roads.

### *Pugwash, Cumberland County*

K+S Windsor Salt Ltd. operates an underground salt mine at Pugwash, Cumberland County. The salt is mined by a room and pillar system of extraction using a drill and blast method to break the rock, which is then hauled by trucks to the primary shaft to be transported to the surface. Transportation of final products is by road, rail or from the company-owned ship-loading facility at Pugwash.

In 2014, 771 874 t of saleable products were produced. Production was almost exclusively sold

Millions of tonnes

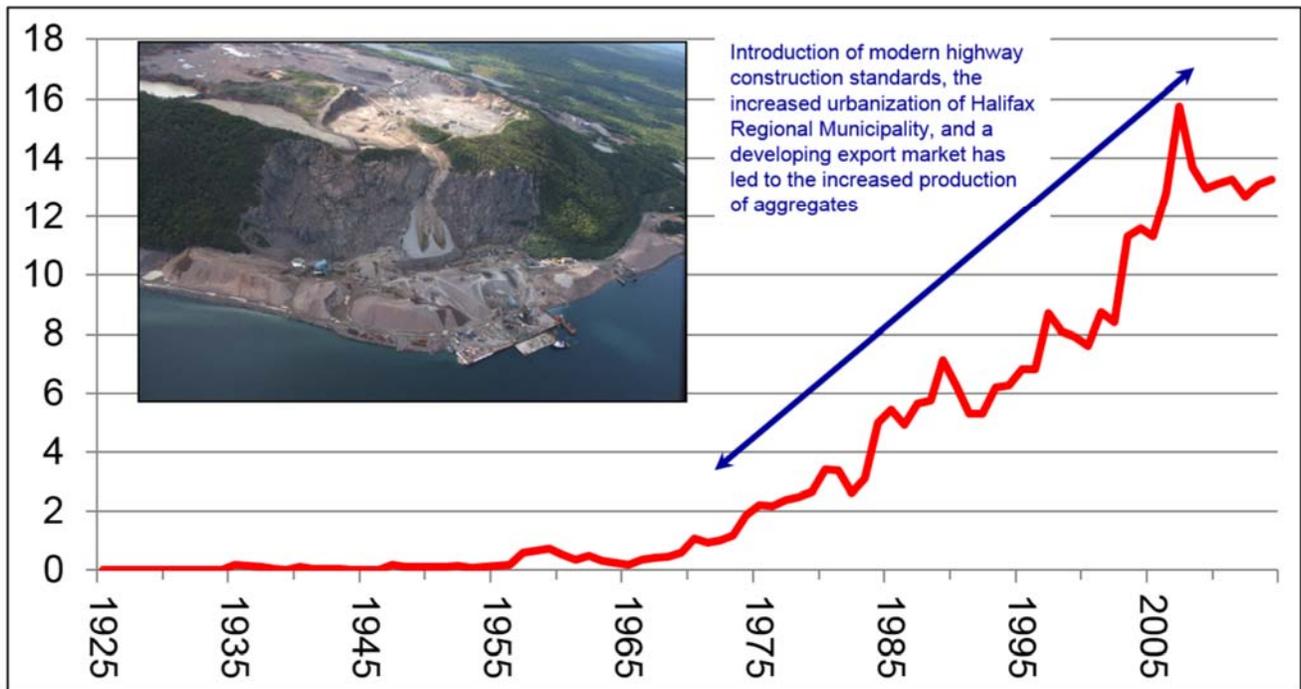


Figure 6. Construction material and aggregate production 1925 to 2014.

Millions of tonnes

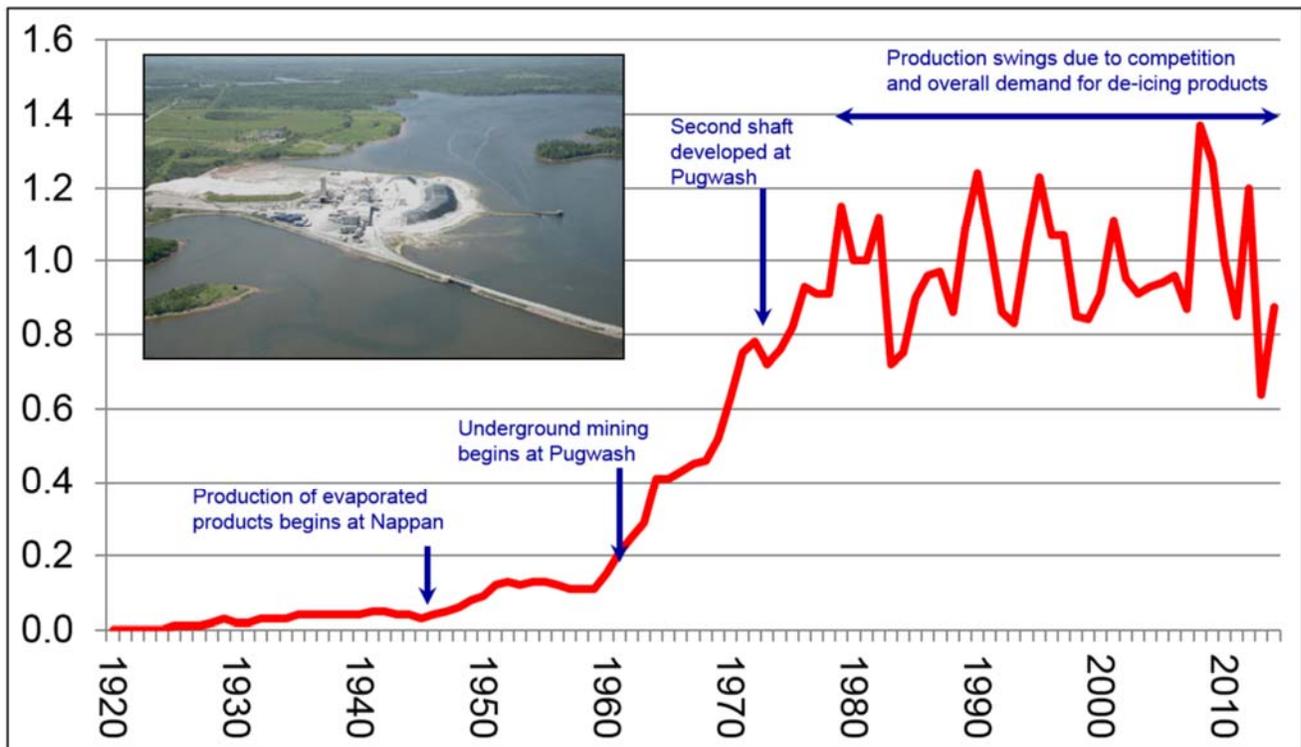


Figure 7. Salt production 1920 to 2014.

for de-icing roads in Nova Scotia and elsewhere in the Atlantic region.

### ***Nappan, Cumberland County***

Compass Minerals Canada Corp. operates an underground salt mine in Nappan, Cumberland County. Salt is extracted by solution mining, in which water is pumped into underground wells and the salt is dissolved. The resulting brine solution is then returned to the surface. The salt is recovered from the brine in a processing plant, using a mechanical vapour recompression evaporating process. The plant produces a wide range of refined food-grade salt products.

In 2014, 98 971 t of food-grade salt were produced for use by the food-processing industry and individual consumers for domestic needs.

## **Salt Outlook**

The current level of salt production is expected to continue as no new salt mines are in the advanced planning stage. Rock salt continues to be the most economic method to de-ice road and walkway surfaces; however, there are some alternatives, such as sand or vegetable juices, that are being used in some areas negatively affected by salt runoff.

## **Coal**

### **Coal Production in 2014**

During 2014, coal accounted for 10.1% (\$21 million) of the total value and 2.2% (372 853 t) of the total tonnage mined (Table 1, Figs. 2, 3), all of which was produced by one surface mine in Pictou County. Figure 8 shows the amount of coal mined in Nova Scotia from 1874 to 2014. The graph shows a significant decline in production with the closure of underground coal mines in Cape Breton in 2001.

In 2014, Pioneer Coal Mines Limited was the sole producer of coal in the province from an open pit mine in Stellarton, Pictou County. A total of 372 852 t of coal was produced and trucked to Nova Scotia Power's electrical generating station at Trenton.

Pioneer Coal mined coal from four steeply dipping seams at the Stellarton surface mine. The company has been mining the Foord Seam since 1996 (approximately 12 m thickness). They began mining the Cage Seam in 2001 (approximately 5 m thickness) and subsequently began mining the Third (3.5 m thickness) and the Flemming/McGregor (1.5 m plus 3 m with a 1.5 m rock parting) seams. A fifth seam, called the New Seam, was found to be of poor quality and therefore not mined.

Conventional surface mining methods are used at Stellarton. The coal and overlying rock are excavated using hydraulic excavators, conveyors and off-road haul trucks. No blasting is employed. Conveyors are installed to reduce truck-haulage requirements. High-wall ground control is enhanced using a large rock saw to establish pit walls.

As the mine progresses from west to east, areas are progressively or concurrently backfilled with development rock, covered with overburden till and topsoil, and revegetated. Some of the reclamation work has included the construction of a large municipal water-supply tank and a community track-and-field facility, which will provide long-term benefits to the area from the mining operations.

## **Coal Outlook**

The amount of electricity derived from renewable energy sources (wind, water and biomass) is increasing rapidly toward a provincial target of 40% renewable electricity generation by 2017; however, it is expected that significant coal usage will continue for at least another 30 years and that Nova Scotia Power will remain dependent on coal to generate much of the province's electricity. Ever since the closure of large-scale underground coal mining on Cape Breton Island, the majority of the coal required for electricity generation has been imported from outside Canada and supplemented by a few surface coal mines in the province.

In 2014, Kameron Coal Management Limited, a subsidiary of the Cline Group, purchased the Donkin coal property in Cape Breton County from Glencore and Morien Resources. As a result, the amount of local coal mined and burned in Nova

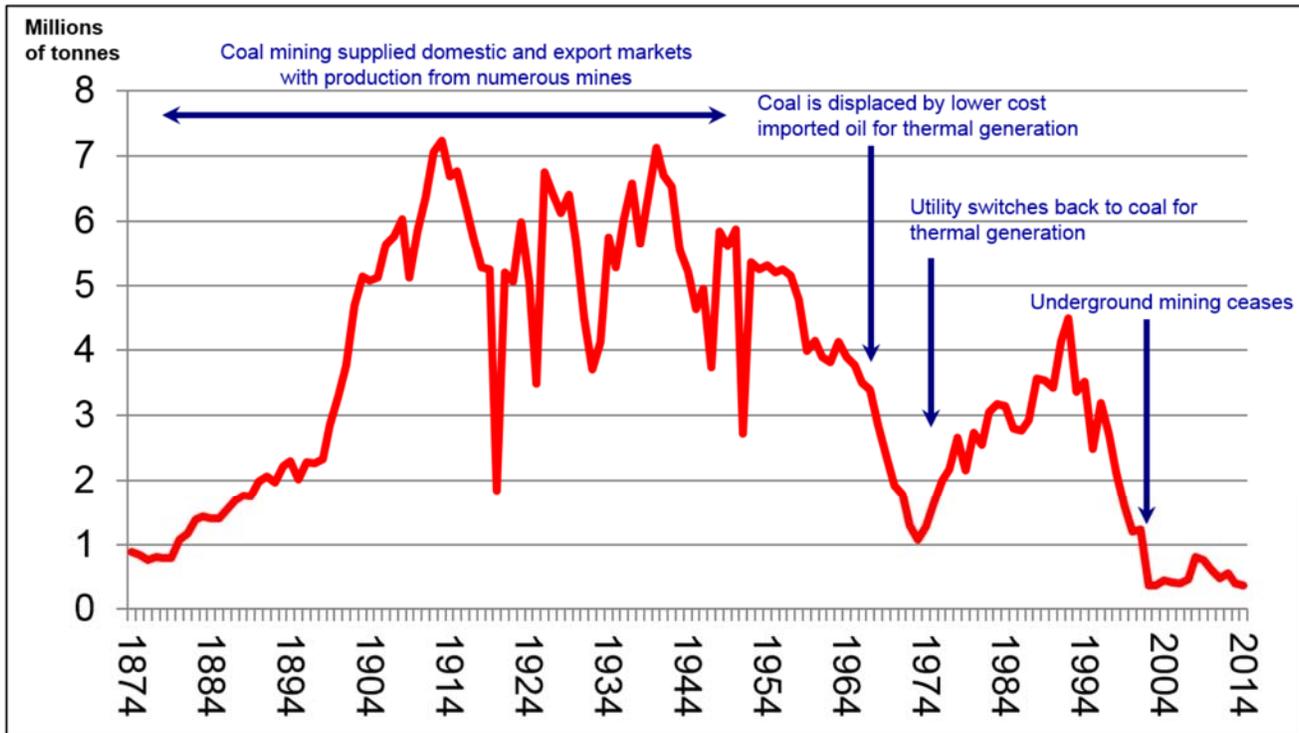


Figure 8. Coal production 1874 to 2014.

Scotia to generate electricity could increase if the development of the Donkin coal block is successful.

## Gypsum and Anhydrite

### Gypsum and Anhydrite Production in 2014

During 2014, gypsum and anhydrite production accounted for 10% (\$20.9 million) of the total value and 11.3% (1 895 721 t) of the total tonnage mined in the province (Table 1, Figs. 2, 3). In 2014, only two gypsum and anhydrite mines remained open for production while several mine sites remained in a 'care and maintenance' status waiting for improved market conditions to restart.

Figure 9 shows the dramatic drop in gypsum production from its peak in 2005 of 8.6 million tonnes to about 1.8 million tonnes in 2014. The graph also shows a steady increase in production from about 1 million tonnes in 1945 to nearly 8.6 million tonnes in 2005. This increase in gypsum demand was driven mainly by the advent of gypsum wallboard manufacturing and the demand

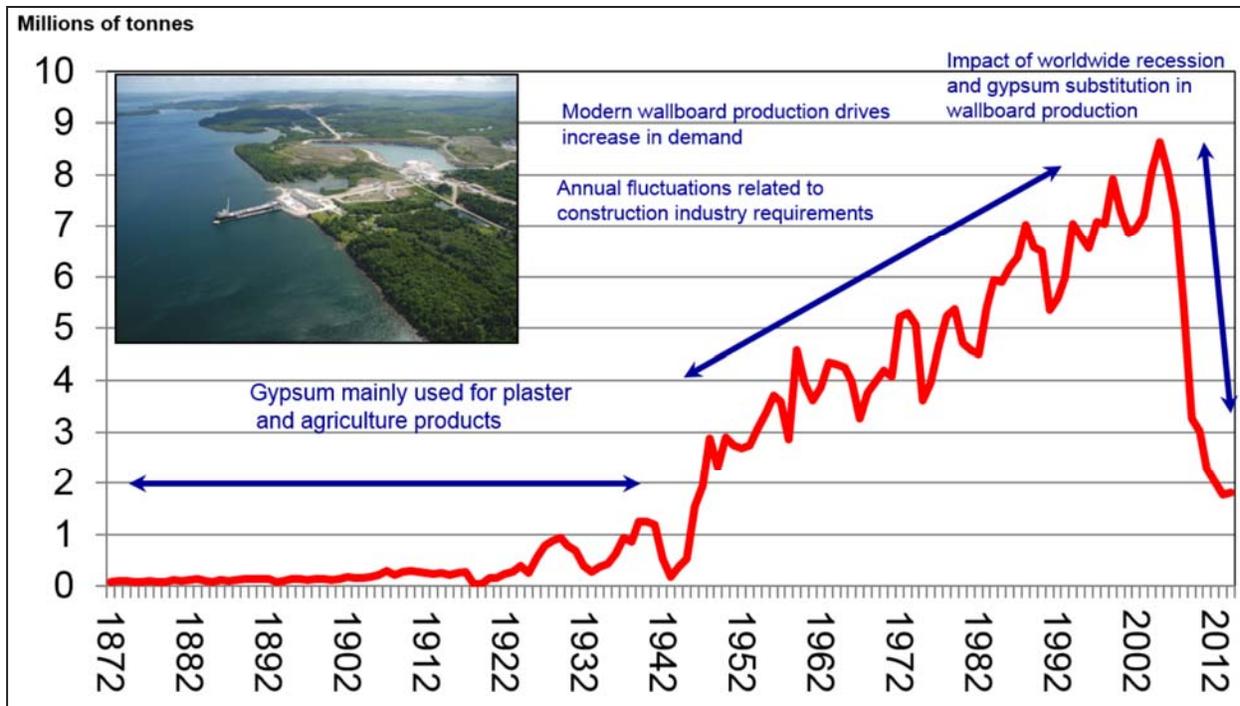
for new houses, mainly in the United States. The financial crisis of 2007-08 and the resulting Great Recession reduced the demand for new houses from 1.5 million to less than 0.5 million per year. This decline in the marketplace plus competition from synthetic gypsum (derived from coal-fired electric generating plants) resulted in the catastrophic fall in demand for natural gypsum.

On a more encouraging trend, 27 551 t of gypsum were sold for agriculture use as a soil amendment in 2014. Gypsum fines from the crushing plant at East Milford, Halifax County were used to supply an agriculture market, primarily in Prince Edward Island.

An additional 93 803 t of anhydrite were produced and sold during the year and mostly shipped to cement manufacturers by ocean vessel from Little Narrows.

#### *East Milford, Halifax County*

National Gypsum Company is a major manufacturer of gypsum wallboard in the United States. In 2014, its Canadian subsidiary, National



**Figure 9.** Gypsum production 1872-2014.

Gypsum (Canada) Ltd., shipped 1 602 534 t of natural gypsum from its quarry in East Milford, Halifax County. The quarry has been in continuous operation since 1954.

The gypsum is drilled, blasted and loaded onto trucks using hydraulic loaders and excavators. The gypsum is crushed, screened and transported by train from East Milford to Wrights Cove, Dartmouth, a distance of 45 km. Crushed rock is loaded onto ships for customers in Canada and the United States. The quarry also sells products within Nova Scotia for use in cement and wallboard manufacturing. About 27 000 t were sold to customers in Atlantic Canada for agriculture use.

In 2013, DNR issued an additional non-mineral registration to cover the extension of the East Milford deposit to the northeast. In 2014, the company initiated an environmental assessment of a proposed 144-ha extension of the East Milford quarry, which presently occupies an area of 301 ha.

### ***Little Narrows, Victoria County***

USG is the world's largest manufacturer of gypsum wallboard. In 2014, its Canadian subsidiary, CGC

Inc., operated a gypsum quarry and an anhydrite quarry near Little Narrows, Victoria County.

The ore is drilled, blasted and loaded onto trucks using hydraulic loaders and excavators. The blasted rock is further crushed and screened to remove impurities.

All the gypsum and anhydrite produced is shipped from the company's ship-loading facility on the Bras d'Or Lakes to customers in the eastern United States and central Canada, mainly cement manufacturers. In 2014, 93 803 t of anhydrite and 199 384 t of gypsum were mined and shipped.

### **Gypsum and Anhydrite Outlook**

Gypsum and anhydrite production is expected to increase as construction of new buildings projects, especially in the United States, increases and as coal-fired power generation is reduced, resulting in less synthetic-gypsum being produced.

Three major quarries (Miller Creek and Wentworth in Hants County and Melford in Victoria County) and one smaller quarry (Brierly Brook, Antigonish County) remained on care and maintenance in 2014.

The Murchyville deposit in Halifax County is a fully permitted gypsum deposit. The non-mineral registration is held by Tusket Mining Inc., which is owned by Germany-based Knauff. The deposit could be developed into an operating quarry should the availability of synthetic gypsum in Europe decline as a result of the closure of coal-fired electric generating plants there.

## Limestone

### Limestone Production in 2014

In 2014, limestone production from four quarries in the province accounted for 6.7% (\$14 million) of total value and 2.8% (466 742 t) of the total mined tonnage (Table 1, Figs. 2, 3). The majority of the limestone produced (294 693 t) in the province was used as a feed-stock or raw material for Portland cement production. The next largest use of limestone was for management of combustion gas emissions at a coal-fired power station (142 902 t). The remainder (29 147 t) was used for agriculture soil amendment and in the manufacture of pulp and paper products. Figure 10 shows the annual production of limestone in Nova Scotia from 2002 to 2014.

#### *Brookfield, Colchester County*

Lafarge Canada Inc. operates a limestone quarry and crushing plant adjacent to its Brookfield cement manufacturing plant. The plant is located in Pleasant Valley, 5 km west of Brookfield, Colchester County. Soil overburden is removed and limestone and development rock are drilled, blasted and loaded on off-road trucks by hydraulic excavators. The rock is further crushed and stored in a covered storage hall.

In 2014, the Lafarge Brookfield Quarry produced 294 693 t of crushed limestone. All of the limestone produced from the quarry is used to manufacture Portland cement products.

#### *Glen Morrison, Cape Breton County*

Nova Scotia Power Inc. owns and operates the limestone quarry at Glen Morrison, Cape Breton County, which began production in 1993. Soil overburden is removed and limestone rock is

drilled, blasted and loaded on off-road trucks by hydraulic excavators. The rock is further crushed, sized and stored in a covered storage building. The company produces several products at the on-site milling facility.

During 2014, most of the 142 902 t of production from this site was shipped to Point Aconi for use in Nova Scotia Power's fluidized bed power station. Kelly Rock Ltd. operates the quarry on behalf of Nova Scotia Power.

#### *Upper Musquodoboit, Halifax County*

Mosher Limestone operates several quarries near Upper Musquodoboit, Halifax County. In 2014, production was limited to the Mosher #1 and the Upper Musquodoboit quarries. No drilling or blasting was carried out in 2014; the dolomite for the mill feed was sourced from material blasted in previous years and from oversized material broken by using a rock breaker. The company crushed 18 000 t of material in 2014.

The company produces agricultural-grade dolomite and limestone in its fine-grinding plant at Upper Musquodoboit. The product is bagged or supplied in bulk for distribution throughout the Atlantic Provinces. The company also produces a pelletized limestone product for the domestic garden market.

#### *South Side Antigonish Harbour, Antigonish County*

Antigonish Limestone Ltd. operates a small quarry at Southside Antigonish Harbour, Antigonish County, which produces limestone for the agricultural market (7 392 t) and pulp and paper industry (3 755 t) in the province.

During 2014 there was no drilling, blasting or crushing activity. The cage mill was operated, and product was sourced from onsite stockpiles. It is anticipated that additional materials will be mined in 2015.

## Limestone Outlook

Limestone and dolomite production is expected to remain consistent and is most affected by demand for Portland cement products.

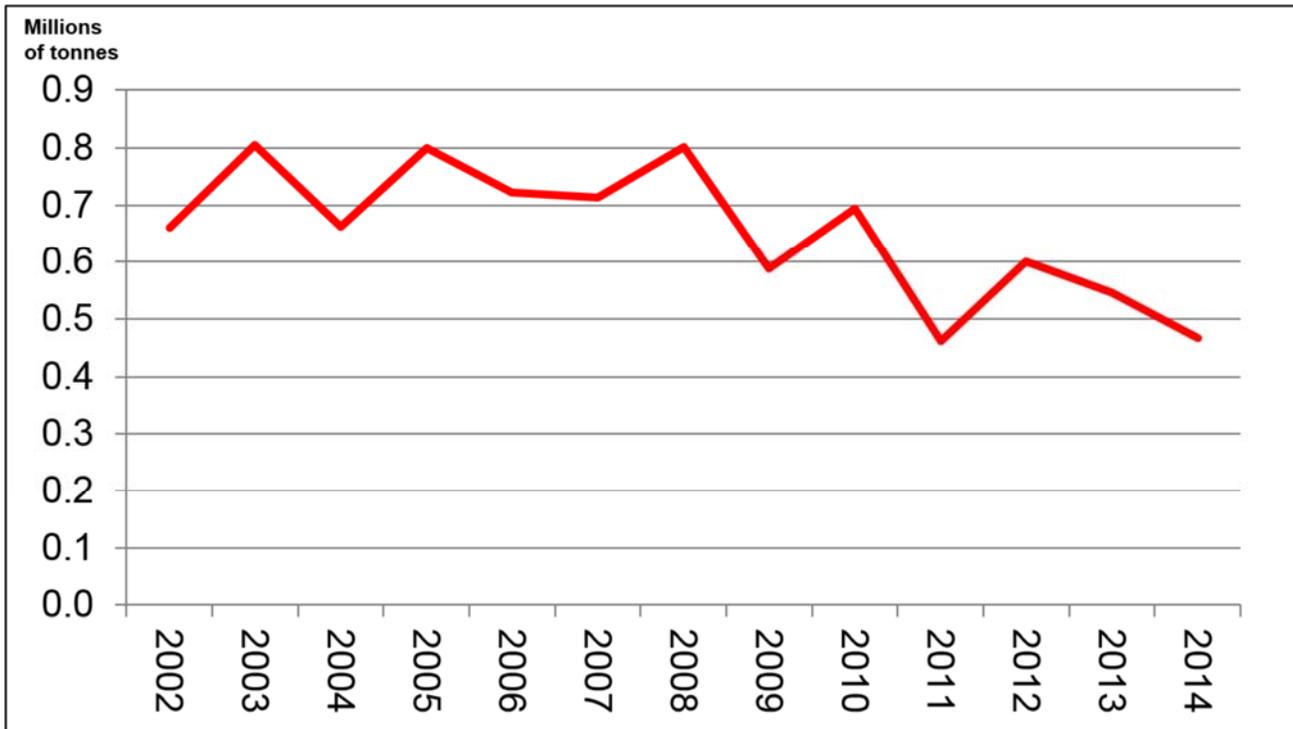


Figure 10. Limestone production 2002 to 2014.

## Silica Sand

Figure 11 shows silica sand production from 2002 to 2014. Silica sand is currently mined at one location in the province: Shaw Resources (a member of the Shaw Group Ltd.) produces silica sand from a deposit located on the West Indian Road in Nine Mile River, Hants County. Sand is processed by washing and sizing into several silica sand products that are shipped throughout the Atlantic Provinces. In 2014, 16 336 t were shipped. There was no extraction from the pit in 2014 and on-site stockpiles were used for wash-plant feed.

## Gold

### Gold Production in 2014

In 2014, there was limited production of gold from a single underground mine. Figure 12 shows the sporadic production of gold from 1980 to 2014.

Dufferin Resources Incorporated operated an underground mine at Dufferin Mines, Halifax County for about three months during 2014. Gold

production of 552 ounces (17 169 g) was achieved prior to the mine being shut down (Table 1). The mine is an underground trackless mine with ramp access, and the ore is treated in a processing plant at the mine site.

## Gold Outlook

There is one gold-mine project that is at an advanced state of planning for production. The Touquoy project near Moose River Mines in Halifax County is operated by DDV Gold, a wholly-owned subsidiary of Atlantic Gold Corporation, and is aiming to produce gold from relatively low-grade bulk-mining as opposed to high-grade vein-mining, which has been traditionally where gold has been located in the province.

## Conclusions

This article examined 2014 mineral production trends in the province, including construction stone, from mines, pits and quarries. Despite the continued increase in aggregate production, the total annual value of mineral production in Nova Scotia slipped to an all-time recent low in 2014 of

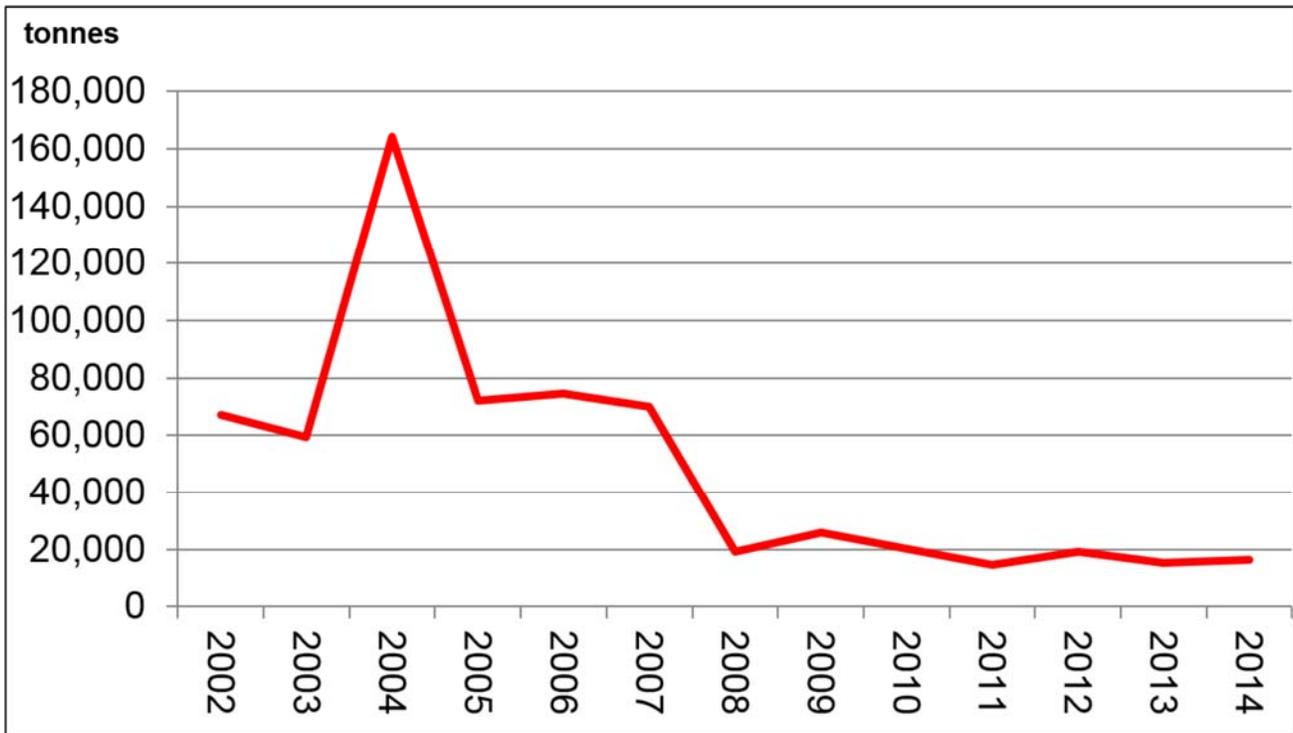


Figure 11. Silica sand production 2002 to 2014.

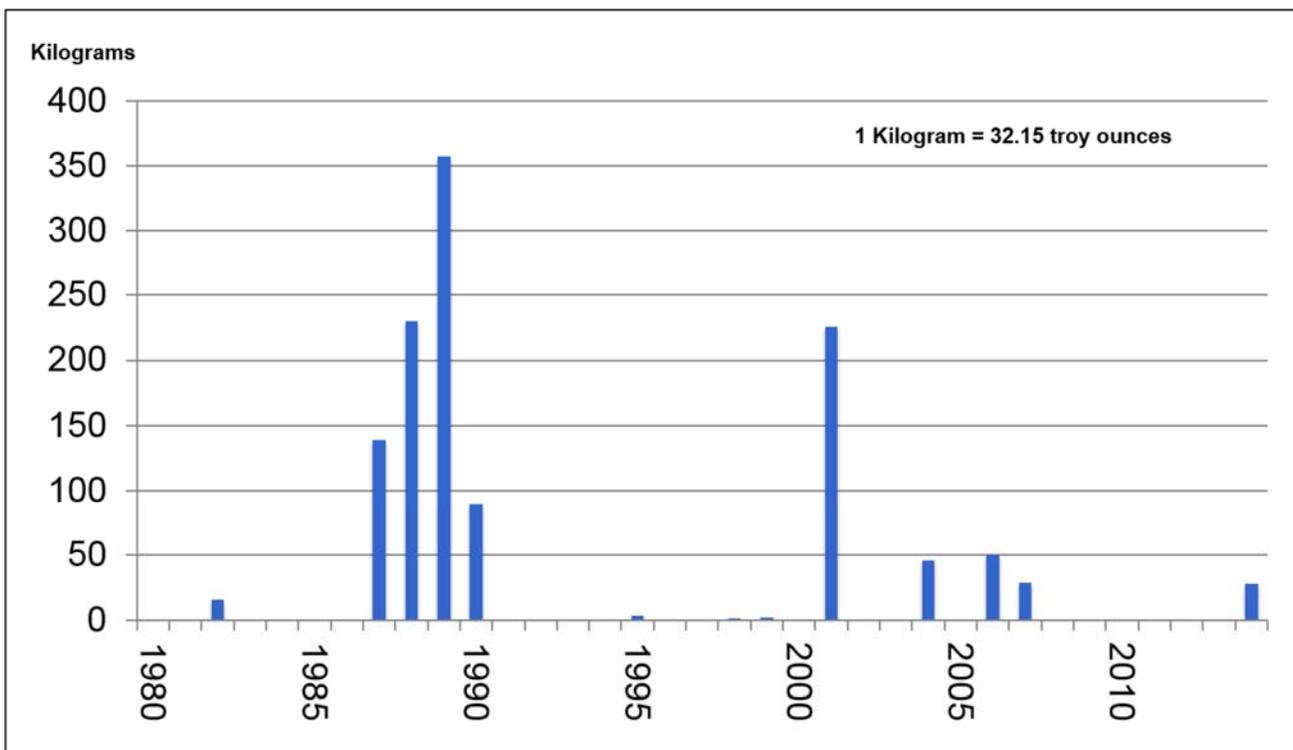


Figure 12. Gold production 1980 to 2014.

about \$209 million. Aggregate production is expected to continue to increase while salt, limestone and silica sand production is expected to remain flat in the short term. A rebound in gypsum production depends heavily on a resurgence in new housing starts in the United States (the demand side) and the closure of coal-fired electric generating plants (the competitive supply side). Coal production is anticipated to decrease slightly in the short term; however, the expected development of an underground mine in Donkin will reverse this trend.

Several operations presently on care and maintenance could re-open, and several mineral development projects in the province could proceed to production in the next 2 to 10 years, providing relief to the significant downward trend observed in the past few years. Among the many factors that can affect future production of minerals in Nova Scotia, some of the more important are the number of new housing starts in the United States; the number of coal-fired electrical generating plant closures in the United States and Europe; the severity of winter driving conditions in the Atlantic

region; the international prices of gold, coal, lead, zinc and tin; foreign exchange rates; and the demand for coal in local and export markets. Construction stone, including aggregate, may also increase significantly as projects move through the environmental assessment process for approval to operate.

## References

Hennick, E. W., Khan, D. A. and Whiteway, P. W. 2015: Survey of recent activity in Nova Scotia pits and quarries; *in* Geoscience and Mines Branch Report of Activities 2014; Nova Scotia Department of Natural Resources, Report ME 2015-001, p. 23-39; [http://novascotia.ca/natr/meb/data/pubs/15re01/15re01\\_06\\_HennicketalROA2014.pdf](http://novascotia.ca/natr/meb/data/pubs/15re01/15re01_06_HennicketalROA2014.pdf).

Natural Resources Canada 2016: Revised Statistics of the Mineral Production of Canada, by Province, 2014; <http://sead.nrcan.gc.ca/prod-prod/Prelim-data-en.aspx?FileT=Prelim2&Lang=en>, accessed 12 August 2016.