



Assembly of First Nations

First Nations Education Infrastructure Capital Needs Assessment

- August 2021 -





EXECUTIVE SUMMARY

Introduction

First Nations Engineering Services Ltd (FNESL) has been retained to provide a First Nations Education Infrastructure Capital Needs Assessment for the Assembly of First Nations (AFN). This national assessment provides a report on the capital needs for education infrastructure over a 20-year planning period under federal guidelines including the updated 2021 School Space Accommodation Standards (SSAS) as well as the Level of Service Standards and Management of Teacherages on Reserve. This project consists of a review of existing documentation such as Asset Condition Reporting System (ACRS) reports and nominal roll data to determine trends and summarize existing infrastructure and funding. The infrastructure needs for schools and teacherages in First Nations across the country is determined for the immediate, years 1 to 5, years 6 to 10, years 11 to 15, and years 16 to 20 planning phases.

This report is an update to the previous Capital Needs Assessment report, completed in 2020, which utilized the 2016 SSAS. Since then, technical improvements to the SSAS were made which will increase First Nations school sizes. The base floor allowances have been increased to be comparable to the average of provincial standards used across the country. Additionally, the SSAS has added new and guaranteed spaces for students including language and culture rooms, knowledge keeper offices, itinerant/counselling spaces, and outdoor classrooms. This Needs Assessment includes all these changes in the calculation of eligible school sizes.

Existing Assets

There are currently 391 existing schools and 1026 existing teacherages analyzed in this study, as per the dataset supplied by Indigenous Services Canada (ISC). This represents 74% of the total number of schools on reserve in Canada, which AFN estimates to be 526. The average construction year for schools in this study is 1994, and the average construction year for teacherages is 1996. On average, on reserve First Nations schools were given a General Condition Rating (GCR) of 6.47 out of 10 on the last ACRS inspection. For teacherages, the average GCR was 6.29. Of the 391 existing schools, 47 schools also have portables.

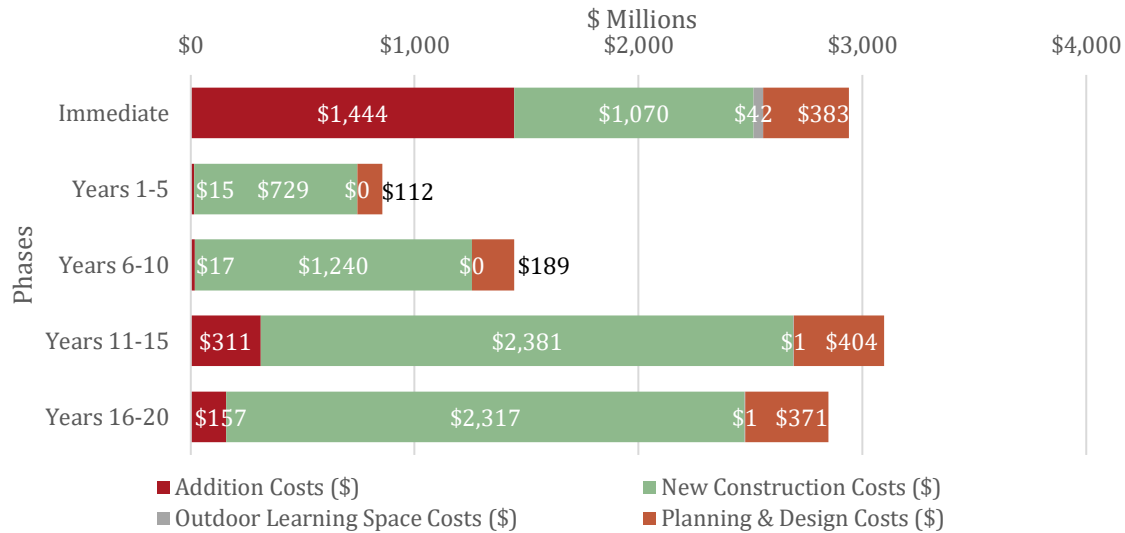
Schools Capital Needs

A capital cost estimate was developed for school facilities using the 2021 SSAS with projected enrolment. The enrolment projections are estimated based on current enrolment data, along with a projected growth rate of 0.8% per year and assumes that existing schools will continue to service the same grades as are currently offered. The total capital needs for schools over the 20-year planning period is approximately \$11.19 billion, which includes costs for additions, new construction, outdoor learning spaces, and planning and design costs. The following chart summarizes the school capital estimate over the planning period:



EXECUTIVE SUMMARY

Capital Estimates for Schools



The following table summarizes the cost estimates for schools over the 20-year planning period:

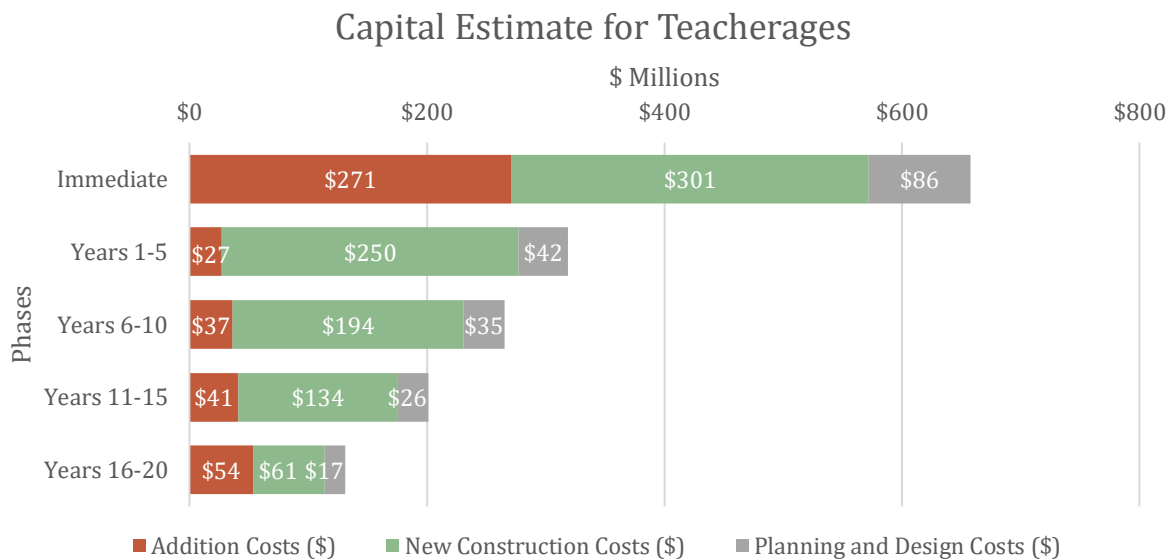
Phase	Type	Costing
Immediate	Additions	\$1,444,143,700
	New Construction	\$1,069,671,502
	Outdoor Learning Space	\$41,623,250
	Planning & Design	\$383,315,768
Years 1-5	Additions	\$15,448,060
	New Construction	\$729,446,921
	Outdoor Learning Space	\$0
	Planning & Design	\$111,734,247
Years 6-10	Additions	\$16,793,624
	New Construction	\$1,239,888,560
	Outdoor Learning Space	\$0
	Planning & Design	\$188,502,328
Years 11-15	Additions	\$311,112,327
	New Construction	\$2,380,972,699
	Outdoor Learning Space	\$1,452,528
	Planning & Design	\$404,030,633
Years 16-20	Additions	\$157,354,368
	New Construction	\$2,317,345,624
	Outdoor Learning Space	\$1,156,299
	Planning & Design	\$371,378,444
Total - All Years	All Types	\$11,185,370,884



EXECUTIVE SUMMARY

Teacherages Capital Needs

A capital cost estimate was developed for teacherages using the Level of Service Standards and Management of Teacherages on Reserve guidelines for the projected enrolment. The total capital needs for teacherages over the 20-year planning period is \$1.57 billion which includes costs for additions, new construction, and planning and design costs. The following chart summarizes the teacherages capital estimate over the planning period:



The following table summarizes the cost estimates for teacherages over the 20-year planning period:

Phase	Type	Costing
Immediate	Additions	\$271,013,022
	New Construction	\$300,997,668
	Planning & Design	\$85,801,604
Years 1-5	Additions	\$27,227,873
	New Construction	\$250,024,423
	Planning & Design	\$41,587,844
Years 6-10	Additions	\$36,630,431
	New Construction	\$194,169,638
	Planning & Design	\$34,620,010
Years 11-15	Additions	\$41,405,631
	New Construction	\$133,633,118
	Planning & Design	\$26,255,812
Years 16-20	Additions	\$53,572,342
	New Construction	\$60,612,347
	Planning & Design	\$17,127,703
Total - All Years	All Types	\$1,574,679,465



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1.0 Introduction

1.1 Assembly of First Nations

Assembly of First Nations (AFN) is a national advocacy organization representing the 634 First Nation communities in Canada. The role of the National Chief and the AFN is to advocate on behalf of First Nations as directed by Chiefs-in-Assembly, including facilitating and coordinating national and regional discussions and dialogue, advocacy efforts and campaigns, legal and policy analysis, and communicating with governments [1]. The AFN is dedicated to advancing the aspirations and priorities of First Nations through study, response, and advocacy on a range of policy matters [2].

1.2 Study Scope

In July 2019, Chiefs-in-Assembly resolved to support Resolution 34/2019, *First Nations Education Infrastructure Review*, which supports policy or program changes to First Nations education infrastructure. Furthermore, the Resolution indicates that this review would be led by the AFN, the Chiefs Committee on Education (CCOE) and the National Indian Education Council (NIEC). Alongside the ongoing Education Transformation process, the AFN Languages and Learning Sector has been working to conduct research and develop a set of recommendations for the NIEC and CCOE regarding First Nations education infrastructure policy and issues. As part of these recommendations, it was encouraged that AFN undertake an education infrastructure review on a national scale.

First Nations Engineering Services Ltd. (FNESL) was retained in December 2019 to complete a National First Nations Education Infrastructure Capital Needs Assessment over a 15-year planning period. This project provides essential research to equip the AFN, CCOE, NIEC and other stakeholders in identifying existing and anticipated education infrastructure needs on-reserve across Canada.

In April 2021 FNESL was retained to update the assessment to account for changes to Indigenous Services Canada's School Space Accommodation Standards. For this iteration, it was determined that a 20-year planning period would be more suitable, in order to facilitate integration of the report findings with the broader infrastructure planning initiative underway by AFN, the National First Nations Infrastructure Assessment, which utilizes a 20-year planning period.

This project consists of a review of existing documentation such as ACRS reports and nominal roll data to determine trends and summarize existing infrastructure and funding. The infrastructure needs for schools and teacherages in First Nations across the country has been determined for the following phases: immediate, years 1 to 5, years 6 to 10, years 11 to 15, and years 16 to 20. Capital needs for both schools and teacherages are considered. The particular context and needs of remote First Nations are also discussed.

The objectives of this study are to:

- Complete capital costing of all schools on reserve in Canada (immediate, 5, 10, 15, 20-year periods) assuming the same grades that are currently serviced continue to be used
- Complete capital costing of all teacherages on reserve in Canada (immediate, 5, 10, 15, 20-year periods)
- Summarize capital cost needs for education infrastructure for all First Nations in Canada over the 20-year planning period
- Discuss the unique education infrastructure challenges facing northern & remote First Nations



1.3 Existing Schools

As per Assembly of First Nations records and tracking, there are approximately five hundred and twenty-six (526) schools on reserve in Canada. However, for this study, Indigenous Services Canada (ISC) compiled and shared data for First Nations on reserve school facilities which excluded federal schools, private schools, schools in self-governing First Nations communities, and schools whose education programming is delivered by the province. With these exclusions, 391 schools remain, which have been assessed for this study. Of these, 9 have a nominal roll of zero listed, and are therefore assumed to not be in operation.

1.4 Existing Teacherages

Based on the anonymized data provided by ISC for this study, there are 1026 teacherages on reserve in Canada. Some First Nations have only one teacherage, and one has as many as fifty-two (52) teacherages.



2.0 Data Collection

2.1 Sources of Information

Various sources of information were used in preparation of this report. The following documents were provided by Assembly of First Nations for review:

1. Integrated Capital Management System (ICMS) and Nominal Roll Information Summary, compiled by ISC for all First Nations in Canada (including data from Asset Condition Reporting System (ACRS) inspections), February 2020
2. *AFN Needs Assessment Study Data Methodology* document, provided by ISC, February 2020
3. 1998 to 2019 Registered Indian Population data from ISC records, by age and residency

Other significant sources of information accessed for this study include:

1. ISC School Space Accommodation Standards (SSAS)- April 1, 2021
2. ISC 2021 School Space Accommodation Standards (SSAS) Calculator (Excel format)

Additional sources of data and information consulted for this project are listed in Section 8 below.

2.1.1 Data Collection and Compilation

The following information was accessed from the various data sources outlined above.

School Size	-	The gross floor area of each school operated by the First Nation. Information available in the latest version of the ACRS report
Building Age	-	Building age of each school operated by the First Nation. Information available in the latest version of the ACRS report (2021 minus year school was constructed)
Building Condition / Years Remaining	-	Building condition and years of life remaining for each school operated by the First Nation. Information available in the latest version of the ACRS report
School Grades	-	The grades served for each school operated by the First Nation. Information available from nominal roll information supplied by ISC
Enrolment	-	Enrolment for each school operated by the First Nation. Information available from most recent enrolment data supplied by ISC

Some assumptions were required to be made, due to the lack of specific information available for the average student enrolment growth rate, the average distribution of student body across grades, the average proportion of special needs students, and the identification of schools requiring additional gym allowance. Discussion regarding relevant background information that informed these assumptions is described in section 2.2 to 2.5 below.



2.2 Enrolment Growth Rate

This Education Infrastructure Capital Needs Assessment Study requires an estimated enrolment growth rate to apply to nominal rolls across First Nations schools in Canada, in order to determine the required school floor area at various stages over the planning period. To determine what a reasonable “enrolment growth rate” would be, ISC data for the Registered Indian Population from 1998 to 2019 has been reviewed. Trends in overall population growth were assessed for the total Registered Indian population as well as the population On Reserve / Crown land. Trends in the population of student-aged youth (estimated as 5 to 19) have also been observed. Further, a Cohort Survival Projection was developed for the total on reserve population using cohort survival model software, Spectrum DemProj v5.761, as a basis for developing draft enrolment projections.

The most recent available (2019) on reserve population adjusted for late reporting of births was used as the population in the initial year for the cohort survival projection. There are six variables associated with the computerized cohort survival model: migration rates, fertility rates, life expectancy, life model tables, age specific fertility rates, and sex ratio of males and females at birth. Using the DemProj program, with these variables, an analysis was performed to project the total population, for each year, over the planning period. Values to be used for each variable in the software were determined by assessing Canadian averages and adjusting to account for observed trends in the Registered Indian Population, as documented in the Statistics Canada report *Projections of the Aboriginal Population and Households in Canada, 2011 to 2036*.

The result of the cohort survival projection was that the total On Reserve/Crown Land population is expected to grow from 525,433 in 2019 (this value has been adjusted to account for late reporting of births) to 702,959 in 2035. This represents an Average Annual Growth Rate (AAGR) of 1.84%, which is consistent with the *Projections of the Aboriginal Population and Households in Canada, 2011 to 2036*, Scenario 3, Constant Fertility which projected the First Nation Population to have an average annual growth rate of 1.8% over the planning period.

The results of the cohort survival projection also indicate the expected population in each 5-year age cohort over the planning interval. The DemProj results indicate that by 2035, there are expected to be 167,204 youth aged 5 to 19 residing on reserve. This represents an average annual growth of 0.79% in this youth age cohort from the 2019 population of 5 to 19-year-olds of 147,511.

Based on this analysis, this Education Infrastructure Capital Needs Assessment Study assumes an “average enrolment growth rate” of 0.8% for all schools.

2.3 Distribution of Enrolment Across Grades

The School Space Accommodation Standards uses inputs such as the number of kindergarten, primary, junior secondary, and senior secondary students to determine school floor area requirements. In order to assign projected enrolment to grades, it is necessary to understand the typical distribution of students across age cohorts. We have analyzed the population data for all First Nations youth on reserve from 1998 to 2019 to understand and be able to approximate how the student body at each school may be distributed across grades.

The on-reserve population aged 5 to 19 was reviewed for this analysis. In some years, such as 1998 and 1999, there are slightly more 5 to 9-year-olds than 10 to 14-year-olds, and the number of 11 to 15-year-olds was lower than either of the other two cohorts. In other years, such as 2009 and 2010,



the distribution is reversed, in that among 5 to 19-year-olds there are slightly more 15 to 19-year-olds than 10 to 14-year-olds, with the least amount of 5 to 9-year-olds.

In addition to assessing each year's youth cohort distribution, FNESL also considered the average distribution across the 1998 – 2019 data range. On average across all 22 years reviewed, of the on-reserve youth aged 5 to 19, 34.2% are 5 to 9 years old, 33.7% are 10 to 14 years old, and 32.1% are 15 to 19 years old. This represents an almost entirely even distribution among these three age brackets, as shown in Figure 2.1 below.

Distribution of Youth Population Among Cohorts: AVERAGE 1998-2019

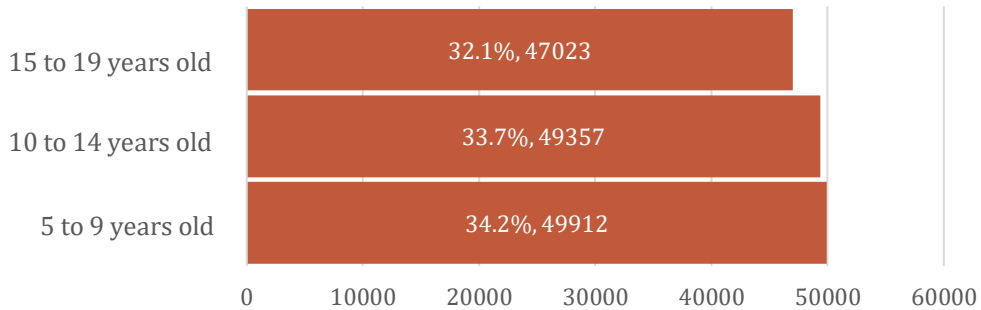


Figure 0.1: Average Distribution of Youth Among Cohorts, 1998-2019

As the year-over-year variance precludes confidently predicting the distribution across grades, and as the average distribution is well-balanced among these youth-aged cohorts, it is reasonable to assume that projected enrolment may be evenly distributed among school grades.

2.4 Number of Special Needs Students

In order to use the School Space Accommodation Standards to calculate the required floor area for a projected school enrolment, it is also necessary to estimate how many special needs students there will be at each school, as this is an input into the SSAS calculations. For this high-level needs assessment study, we have assumed a uniform proportion of students with special education needs that is applied to all schools.

The following data and findings helped to confirm what proportion to assume:

- The research which is available on First Nations communities strongly suggests that disabilities and special needs are high on reserve, in fact considerably higher than in the population at large (at least double, in some places 3 to 5 times the average) [3]
- Among the entire Canadian population aged 15 to 24 years, the prevalence of disability was determined to be 13.1% in 2017 [4]
- In 2017, 32% of First Nations people living off reserve had one or more disabilities that limited them in their daily activities [5]
- In 2017, the percentage of First Nations people with disabilities living off reserve varied among provinces and territories, from as low as 20.9% in the Northwest Territories to as high as 45.0% in Nova Scotia [5]



- “In Ontario, the provincial average of special needs children is approximately 10%. In First Nations, it is tripled” [6]
- The percentage of the “high cost” population for First Nations was 16.4% versus 7.1% for the provincial jurisdiction [7]
- From the study *Mi’kmaq Students with Special Education Needs in Nova Scotia*, 35% of Mi’kmaq Kina’Mawey students were identified by school personnel or special needs specialists to have additional learning needs (versus an estimated 17% of Nova Scotia students in the public school system) [3]
- In New Brunswick, approximately 1600 children on reserve attend provincial schools, and over 31% of them access provincial special education [7]
- “Approximately 30 per cent of [Manitoba First Nations School System] students meet the criteria for high costs special education needs. This doesn’t take into account the needs of those students that would meet the low costs criteria” [8]
- In the 2005/2006 Special Education Program (SEP) final report for the BC region, it was indicated that approximately 24% of the First Nations schools’ population had been identified as High Cost special education students [9]
- The *Special Education Program Evaluation Form* was sent to all First Nations Schools with SEP funding in British Columbia in the 2006/2007 school year, and 106 band-operated schools returned completed evaluations. Of 5608 responding students, approximately 29.8% were identified as having special education needs. Of these, 936 had been formally assessed and identified as special needs students, and 737 had been informally assessed and judged by principals and teachers to fit the learning and social emotional characteristics of special needs students [9]
- A summary of high cost special needs students from 2002/2003 to 2006/2007 among First Nations students across Canada found that the average proportion of HCSE students was 10.2% of total students across all regions [3]
- Data from 2004 of special education needs among BC First Nations students showed that high cost students accounted for almost exactly one third of the total special needs student numbers (647 high-cost special education needs, 1273 low-cost special needs) [3]

From this data, and in accordance with the institutional knowledge and experience of the Assembly of First Nations and various Regional First Nations advocacy bodies, we have included in this study that 30% of all First Nations students on reserve are assumed to have special education needs.

2.5 Extra Gym Allowance

Another variable that affects the floor area calculation for a given school is whether the First Nation is a remote zone 3 or 4 community that does not have another emergency shelter, and is therefore eligible for an additional gym allowance. Recent Tier 1 school review data submitted to ISC suggests that more than 50% of Zone 3 or 4 schools submitted received an extra gym allowance. Therefore, this study assumes that 50% of all Zone 3 and 4 schools would be eligible for the extra gym allowance [10].



3.0 Summary of Existing Assets

3.1 Schools

Based on a review of asset and nominal roll data supplied by ISC (February 2020), there are 391 First Nations schools on reserves throughout Canada which together currently accommodate 68,737 students. This quantity excludes all federal and private schools, as well as schools in self-governing First Nations communities, and schools whose education programming is delivered by the Province.

These schools can be categorized according to the four zones which indicate the remoteness of the community in relation to the distance from the nearest service center. The nearest service center is defined as the nearest community where a First Nations school can access government services, banks and suppliers. Using the above definition of a service center, First Nations schools are classified geographically into the following zones:

- Zone 1 is when the First Nation is located within 50 km of the nearest service center with year-round road access.
- Zone 2 is when the First Nation is located between 50 and 350 km from the nearest service center with year-round road access.
- Zone 3 is when the First Nation is located over 350 km from the nearest service center with year-round road access.
- Zone 4 is when the First Nation has no year-round road access to a service center and, as a result, experiences a higher cost of transportation, administration, supplies, O&M, etc.

Of the school assets in the database prepared by ISC, there are 114 First Nation schools located in Zone 1, 183 in Zone 2, 11 in Zone 3, and 83 in Zone 4. This information is presented in Figure 3.1 below.

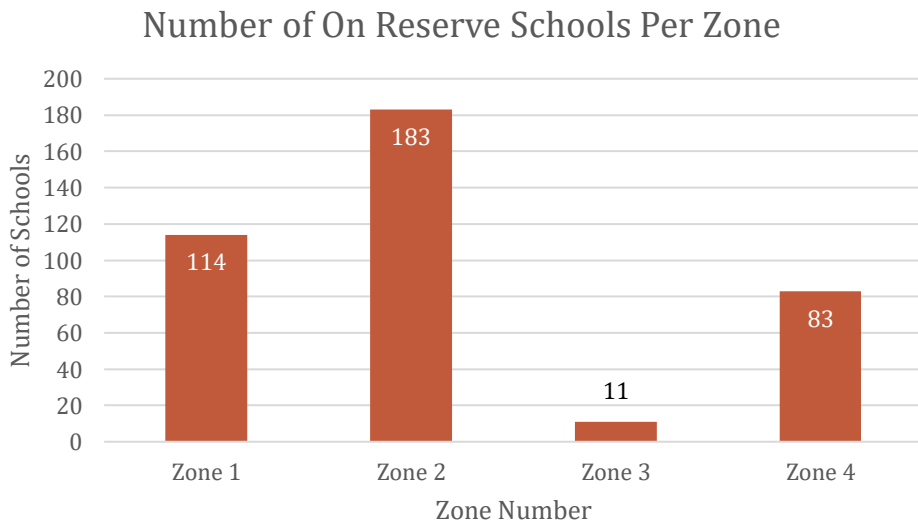


Figure 3.1: Number of Existing On Reserve Schools per Zone

The overall average number of students per First Nation school is 176. This average varies from zone to zone, as follows:



- Zone 1 schools have, on average, 135 students per school
- Zone 2 schools have, on average, 183 students per school
- Zone 3 schools have, on average, 160 students per school
- Zone 4 schools have, on average, 221 students per school

As can be observed from the statistics above, Zone 1 has the lowest average number of students per school, while Zone 4 has the greatest average number of students per school. This information is also summarized in Figure 3.2 below.

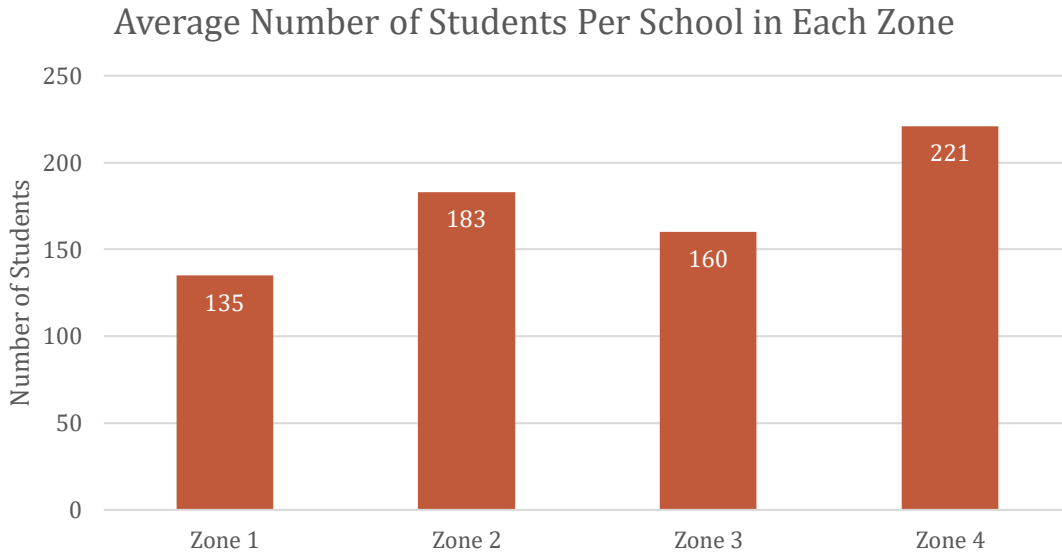


Figure 3.2: Average Number of Students Per School in Each Zone

Of the 391 schools included in this study, 47 schools have portables, with an average of 1.96 portables (per school with one or more portable). On average, portables are approximately 14 years old, as the average construction year of portable education structures is 2006. The average GCR of portables accordingly to the latest ACRS inspection is 6.53. The average O&M rating for the portable assets was Fair. Seven (7) of the portables on reserve in Canada are understood to be currently used as the main building for the school (as evidenced by the subcategory which denotes them as 'PORTABLEMain Building').

The average year of construction of on reserve First Nations schools was found to be 1994. The average year of construction in Zone 1 for First Nations schools is 1993, Zone 2 is 1995, Zone 3 is 1995, and Zone 4 is 1996. On average, the schools that are in Zone 1 have the lowest average construction year, and the schools that are in Zone 4 have the highest average construction year. This information is depicted in Figure 3.3 below.

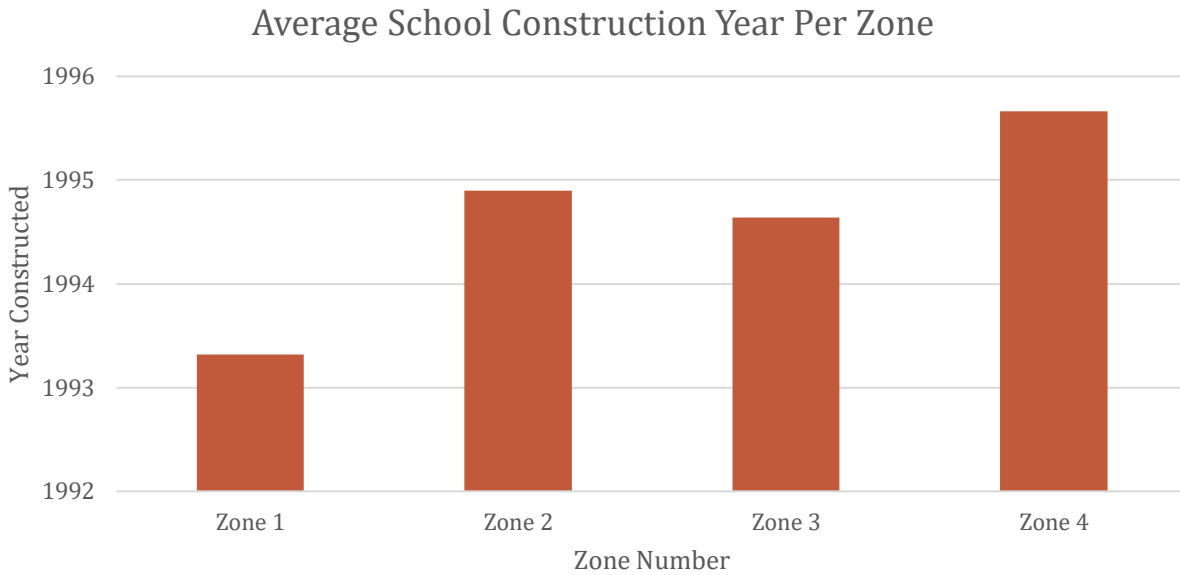


Figure 3.3: Average School Construction Year per Zone

According to the most recent ACRS inspection information, the average estimated remaining life of all schools is 23.7 years. In Zone 1, the average estimated life remaining is 23.6 years, in Zone 2 it is 22.4 years, Zone 3 it is 29.5 years, and in Zone 4 it is 25.9 years. The school buildings in Zone 2 have the lowest average estimated life remaining, while the schools in Zone 3 have the highest average estimated life remaining. This information is depicted in Figure 3.4 below.

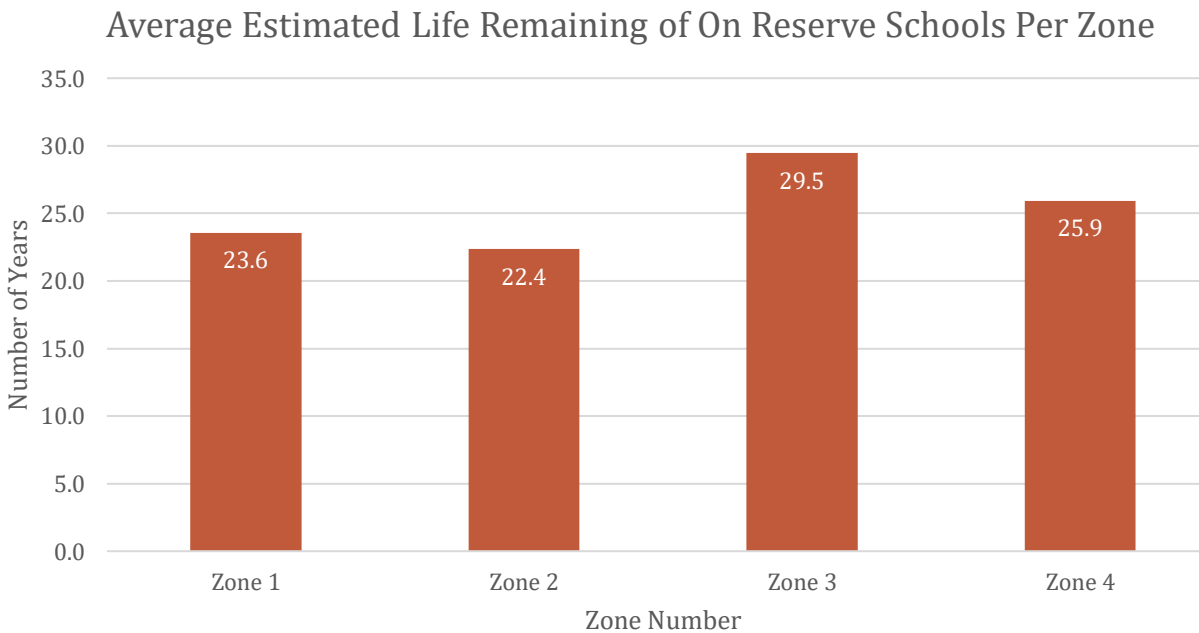


Figure 3.4: Average Estimated Life Remaining of On Reserve Schools per Zone



The overall average General Condition Rating (GCR) for on reserve schools in all zones was determined to be 6.47 (which correlates to a “Fair” rating). Each of the four zones also independently had an average school GCR rating of “Fair”, as follows:

- Zone 1 schools had an average GCR of 6.61
- Zone 2 schools had an average GCR of 6.41
- Zone 3 schools had an average GCR of 6.82
- Zone 4 schools had an average GCR of 6.36

As reported in ACRS inspection reports, the most frequent GCR rating in Zone 1 (the mode) is a value of 7 which occurred 31 times out of 114 schools. The most frequent GCR rating in Zone 2 is a value of 7 which occurred 49 times out of 183 schools. The most frequent GCR rating in Zone 3 is a value of 7 which occurred 4 times out of 11 schools. Lastly, the most frequent GCR rating in Zone 4 is also a value of 7 which occurred 28 times out of 83 schools. This information is depicted in Figure 3.5 below.

Zones 1-4 GCR Codes

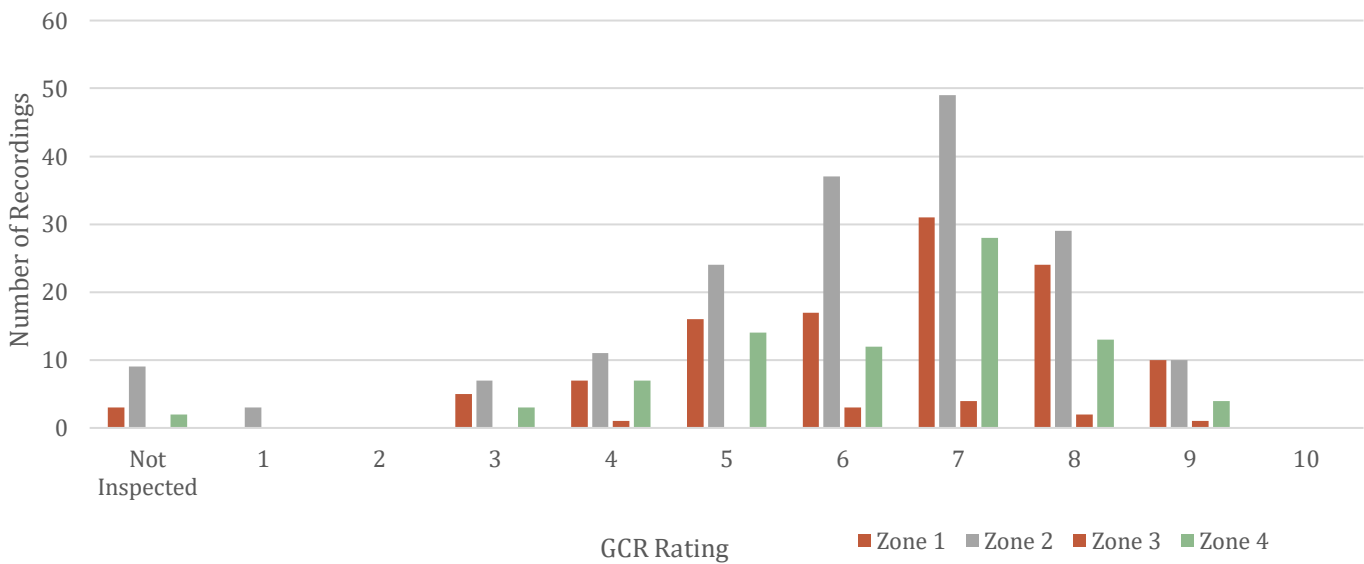


Figure 3.5: General Condition Rating for Schools per Zone

Most school assets also included a rating of how well Operations & Maintenance activities were performed. Of all 391 schools, 2 were not inspected, 51 received an O&M rating of Poor, 222 received an O&M rating of Fair, and 71 received an O&M rating of Good. Additionally, 45 schools did not have any O&M rating or code reported. In all Zones the most common rating for O&M was found to be Fair. This information is depicted in Figure 3.6 below.



Zones 1-4 O&M Ratings

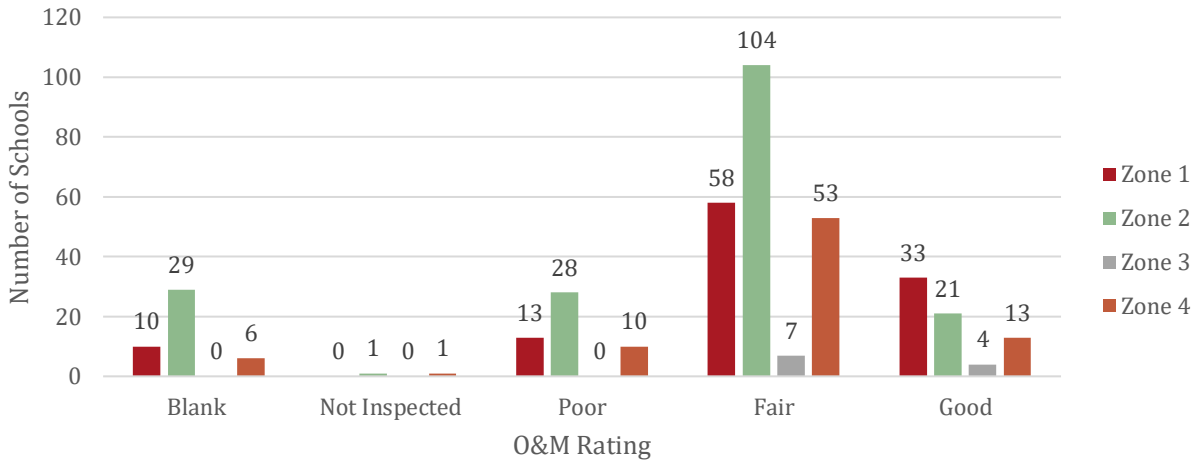


Figure 3.6: Operations & Maintenance (O&M) Rating for Schools per Zone

3.2 Teacherages

Based on a review of asset and nominal roll data supplied by ISC, there are 1026 First Nations teacherages on 135 reserves throughout Canada which together accommodate teachers for a combined student body of 35,357 students. These teacherages can also be categorized according to the four zones which indicate the remoteness of the community in relation to the distance from the nearest service center. Of the teacherage assets in the database prepared by ISC, there are 2 Zone 1 communities that have teacherages, 62 Zone 2 communities that have teacherages, 8 Zone 3 communities that have teacherages, and 63 Zone 4 communities that have teacherages. There are 15 teacherages in Zone 1, 477 teacherages in Zone 2, 48 teacherages in Zone 3, and 486 teacherages in Zone 4. This information is presented in Figure 3.7 and 3.8 below.

Communities by Zone with Teacherages

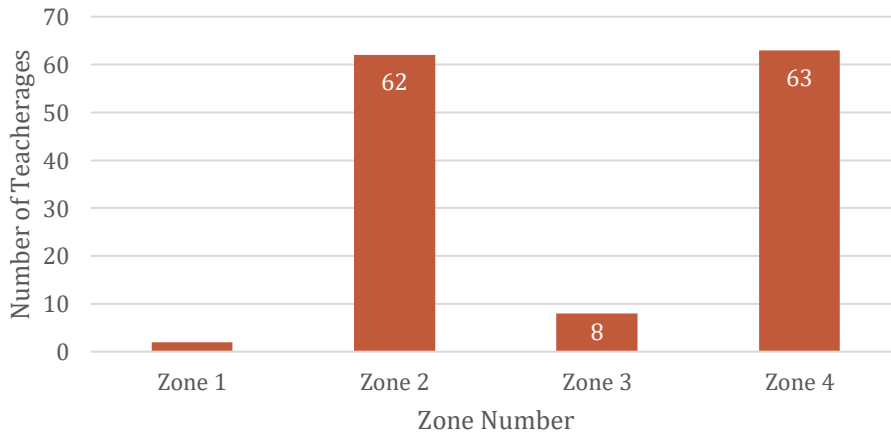


Figure 3.7: Number of Communities with Teacherages per Zone

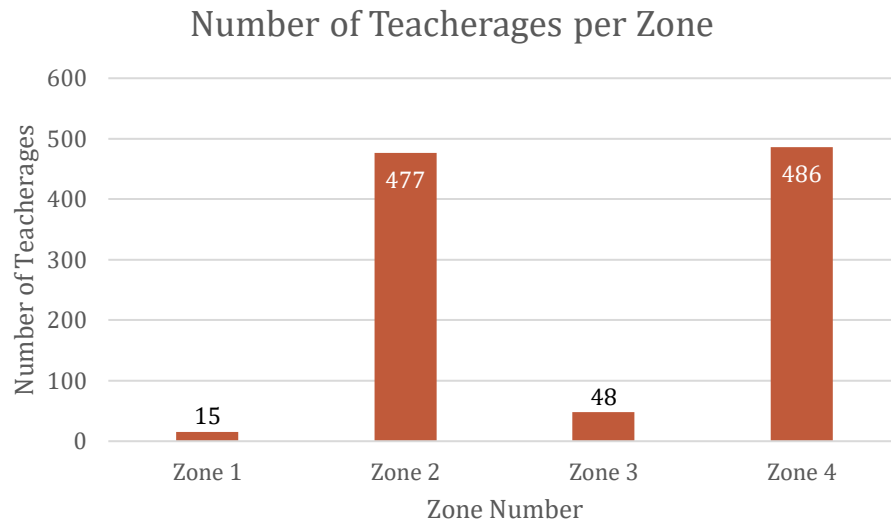


Figure 3.8: Number of Teacherages per Zone

The average number of students in a community per teacherage is 35. This average varies from zone to zone, as follows:

- Zone 1 has an average of 39 students per teacherage
- Zone 2 has an average of 38 students per teacherage
- Zone 3 has an average of 28 students per teacherage
- Zone 4 has an average of 32 students per teacherage

As can be observed from the statistics above, Zone 3 has the lowest average number of students per teacherage, while Zone 1 has the greatest average number of students per teacherage. This information is also summarized in Figure 3.9 below.

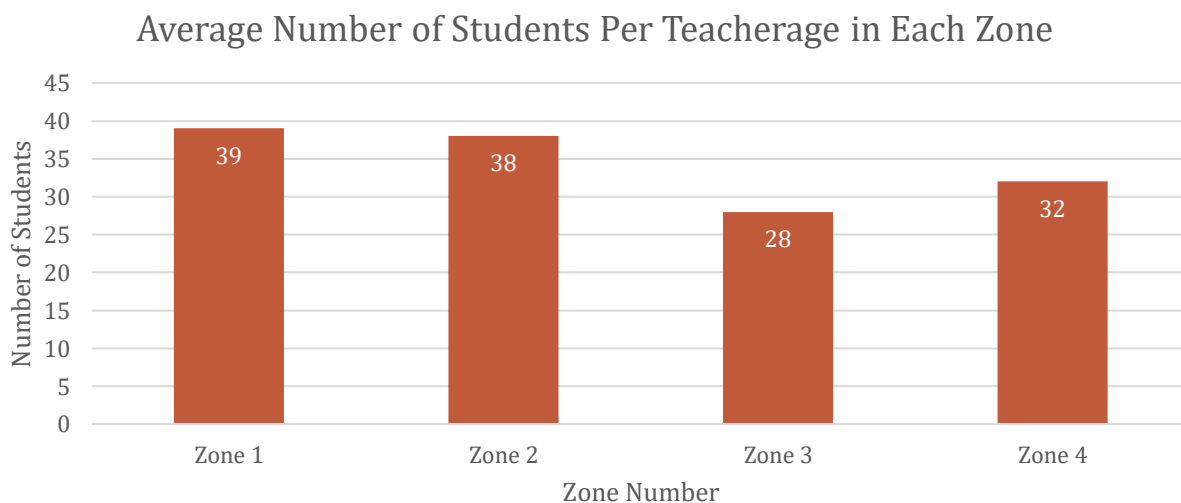


Figure 3.9: Average Number of Students Per Teacherage in Each Zone



The average year of construction of First Nations teacherages was found to be 1996. The average year of construction in Zone 1 for First Nations teacherages is 1996, Zone 2 is 1997, Zone 3 is 1999, and Zone 4 is 1995. On average, the teacherages that are in Zone 4 have the lowest construction year, and the teacherages that are in Zone 3 have the highest construction year. This information is depicted in Figure 3.10 below.

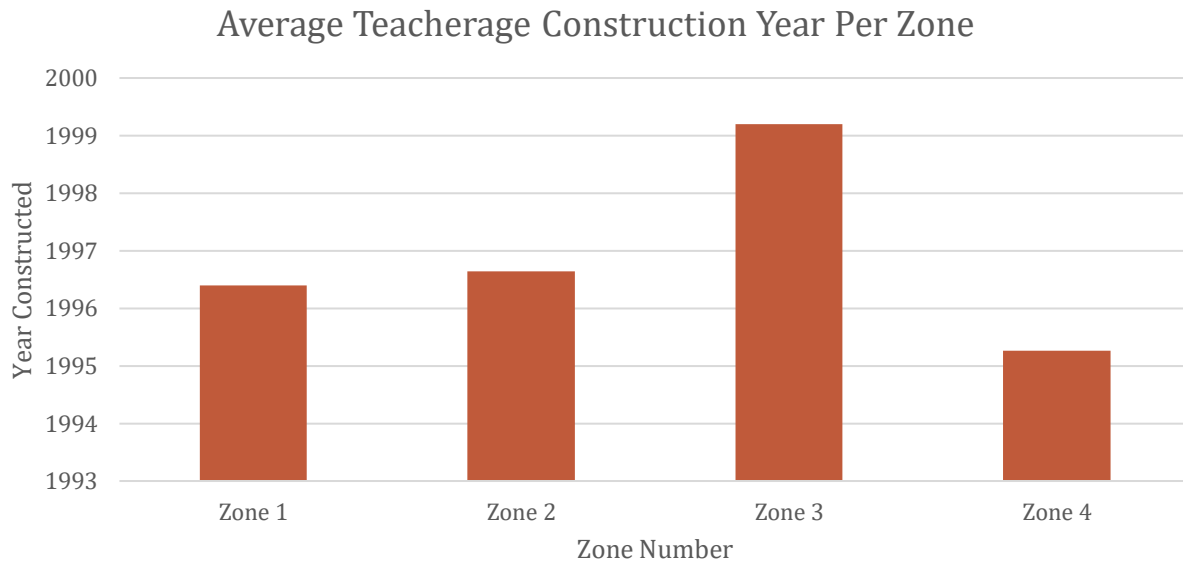
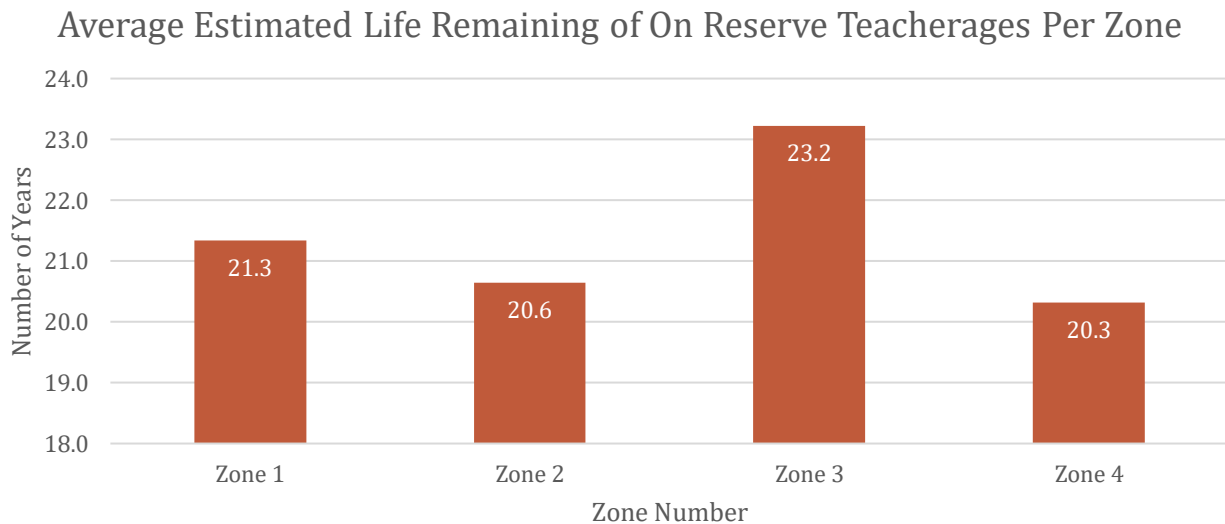


Figure 3.10: Average Teacherage Construction Year per Zone

According to the latest ACRS inspection data, the overall average estimated remaining life of all teacherages is 20.7 years. In Zone 1, the average estimated life remaining is 21.3 years, in Zone 2 it is 20.6 years, Zone 3 it is 23.2 years, and in Zone 4 it is 20.3 years. The teacherage buildings in Zone 2 and 4 have the lowest average estimated life remaining, while the teacherages in Zone 3 have the highest average estimated life remaining. This information is depicted in Figure 3.11 below.





Based on the data supplied by ISC, the overall average GCR (General Condition Rating) for on reserve teacherages in all zones was determined to be 6.29 (which correlates to a “Fair” rating). Each of the four zones also had an average GCR rating of “Fair”, as follows:

- Zone 1 teacherages had an average GCR of 6.07
- Zone 2 teacherages had an average GCR of 6.39
- Zone 3 teacherages had an average GCR of 6.76
- Zone 4 teacherages had an average GCR of 6.19

The mode of both Zone 1 and Zone 2 GCR ratings is 6. The mode for Zone 3 and Zone 4 GCR ratings is 7. This information is depicted in Figure 3.12 below.

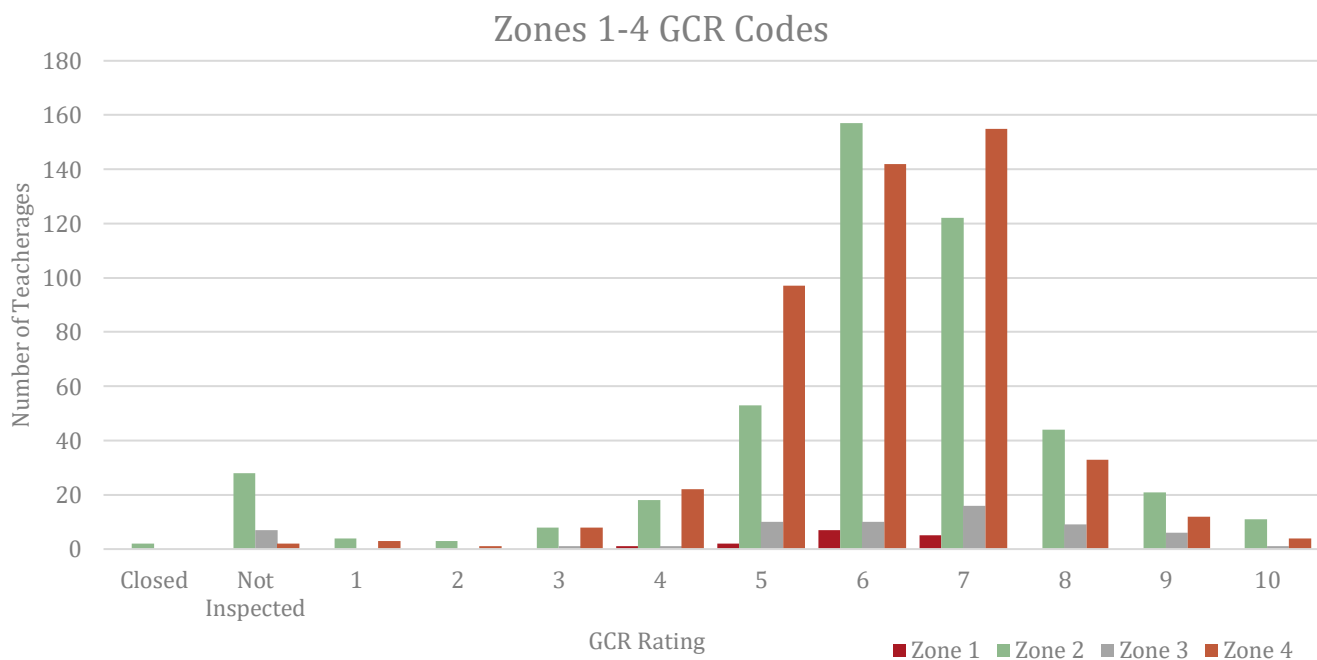


Figure 3.12: Operations & Maintenance (O&M) Rating for Teacherages per Zone

Most teacherage assets also included a rating of how well Operations & Maintenance activities were performed. Of all 1026 teacherages, 17 were not inspected, 4 were indicated as being non-operational, 154 received an O&M rating of Poor, 671 received an O&M rating of Fair, and 37 received an O&M rating of Good. Additionally, 143 teacherages did not have any O&M rating or code reported. In all Zones the most common rating for O&M was found to be Fair. This information is depicted in Figure 3.13 below.

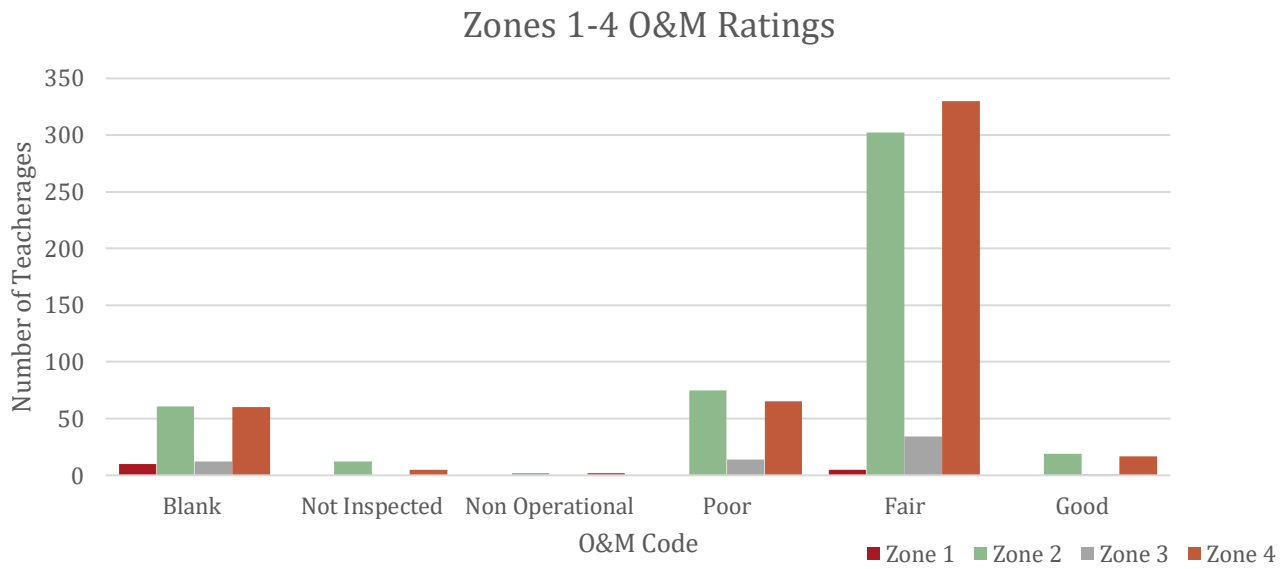


Figure 3.13: General Condition Rating for Teacherages per Zone



4.0 Methodology

The sections below describe the methodology used to calculate the floor area requirements and capital costs for schools and teacherages for this Education Infrastructure Capital Needs Assessment. Section 4.1 outlines the methodology for the schools analysis, including a description of how eligible floor area is calculated as per the School Space Accommodation Standards. Section 4.2 discusses the methodology used for the teacherages analysis, including a summary of relevant principles from the ISC Level of Service Standards and Management of Teacherages on Reserve. The methodology employed for generating capital cost estimates for schools and teacherages is discussed in section 4.1.3 and 4.2.1, respectively.

4.1 School Floor Area Requirements & Costs

The enrolment projections were used to set the space requirements for each First Nation based on existing and projected enrolments and federal guidelines for school floor area requirements as set out in the 2021 SSAS, over the immediate, 1 to 5, 6 to 10, 11 to 15, and 16 to 20 year phases, including space allowances for special needs students.

Space requirements were developed over the various phases on a per school basis with the assumption that all existing schools (subject to addition or replacement) will continue to serve the population over the period and maintain existing grades. The space requirements were determined for each phase based on projected enrolment and reference to the appropriate Gross Floor Allowance Table within the 2021 SSAS.

Space requirements which were beyond the existing building area were determined to require an addition to the existing school or replacement of the existing structure. Determination of facilities requiring an addition to or replacement of the existing structure has been based on the age, condition, and remaining life of the existing structure.

4.1.1 SSAS Eligible Space Calculations

To calculate the amount of space that a school is eligible for, the 2021 School Space Accommodation Standards were used. Since the 2016 version, technical improvements to the SSAS were made which will increase First Nations school sizes. The base floor allowances have been increased to be comparable to the average of provincial standards used across the country. Additionally, the SSAS has added new and guaranteed spaces for students including language and culture rooms, knowledge keeper offices, itinerant/counselling spaces, and outdoor classrooms.

The SSAS calculates the eligible Total Gross Floor Allowance (GFA) for a school, taking into account the number of students (both total and special needs) in the kindergarten, primary, intermediate, junior secondary, and senior secondary grade brackets. The Total GFA allowance (i.e. the total eligible school size) includes six components, three of which were original to the 2016 SSAS and three of which are Unique GFA spaces that were added in 2021 [11]:

- Instructional space allowance – This is the basic gross floor area allowance (Basic GFA) that is required for classrooms for the grade levels that will be taught in the proposed school (including kindergarten students)
- Gymnasium space allowance (Gym GFA)
- Cafeteria space allowance (Cafeteria GFA)
- Language and Culture space allowance – (Unique GFA)



- Knowledge Keeper's Office: Traditional Services space allowance (Unique GFA)
- Counselling / First Aid / Itinerant space allowance (Unique GFA)

The 2021 SSAS also includes provisions for a dedicated Outdoor Learning Space GFA. This allocation is calculated as 0.5 m² per student, with a minimum allocation of 20 m².

The Total GFA sets a maximum floor space allowance for the entire school building. This means that the Basic GFA not only includes classroom space but also encompasses circulation areas and various special purpose rooms such as administration areas, library, auditorium, and computer labs. The number, type, and size of special purpose rooms vary with the type of school and the number of students [11]. The Unique GFAs are calculated over and above the Basic GFA, gymnasium GFA, and cafeteria GFA.

According to the SSAS, there are two necessary steps that need to be performed in order to determine the Total GFA for a proposed school. These two steps are outlined in the SSAS and were utilized in determining the space allowances for all 391 First Nations schools on reserve in Canada.

Step one in determining eligible school size in accordance with the SSAS is to compile enrolment data for the desired school. The enrolment data is divided into 5 educational divisions: Kindergarten (K4 and K5), Division I (Grades 1 to 3), Division II (Grades 4 to 6), Division III (Grades 7 to 9), and Division IV (Grades 10 to 12). Based on this information, the total enrolment for Kindergarten as well as Elementary and Secondary can be determined. From this data, the number of special needs students in each educational division are determined to calculate the GFA for each school. As mentioned previously, special needs students are estimated to be 30% of the nominal roll, and this ratio has been applied in determining the floor space requirements according to the SSAS.

Step two is the calculation of Gross Floor Allowances that a school is eligible for with the use of the information compiled in the first step. Initially, it must be determined whether or not a school is eligible for extra gymnasium space. If a community is located in Zone 3 or 4 and does not already have available community space in an existing school or other building to act as an emergency shelter, the school is eligible for extra gym allowance.

The amount of space a school is eligible for is determined by the type of school, the grades and divisions that are offered, and the eligibility for additional gymnasium space. The SSAS includes GFA Tables that present values for the Basic GFA, Cafeteria GFA, Gymnasium GFA, Language and Culture GFA, Knowledge Keepers Space GFA, Counselling/Itinerant/First Aid GFA, Total GFA, and Outdoor Learning Space GFA, based on the criteria outlined previously. The tables are separated based on the grades and divisions that are offered at a school and whether or not the school is eligible for additional gymnasium space. Once the appropriate table is selected, the enrolment data is used to provide an initial Total GFA and Outdoor Learning Space GFA for a school.

4.1.2 SSAS Calculator

Using the SSAS guidelines to determine the space a school is eligible for can be a lengthy process when analyzing several schools. ISC has created a SSAS calculator that can be used to expedite the process. For this study, the SSAS calculator was recreated and reformatted so that it was current with 2021 standards, and so that it could be used for several schools' enrolment data at one time. By doing this, the eligible school size could be determined for all 391 schools in an efficient manner, and a final capital cost could be computed from this information. The results from the SSAS floor area



requirement analysis are used in this report and are illustrated in Section 5.1. The ISC SSAS Calculator for the 2021 standards was made available in July 2021 and has been consulted to confirm the eligible floor space calculations used in this assessment and perform QA/QC reviews on our methodology.

4.1.3 Cost Estimate Generation

The SSAS floor area requirement was calculated for each school to determine the eligible school size based on enrolment projections for all planning phases. Once the eligible school size was determined for each school, the costing analysis was completed based on a unit cost for each remoteness zone. Unit costs were determined based on a review of actual tender and construction costs for a range of school facilities constructed within the last five years. These values are expected to increase in the future, therefore an annual inflation value has been used in this study. The following table outlines the costs associated with each zone used to calculate the capital costs for all schools:

Table 4.1: 2021 Construction Costs per Zone (Schools)

Zone Number	Class D Unit Costs
Zone 1	\$4,570/m ²
Zone 2	\$5,711/m ²
Zone 3	\$6,853/m ²
Zone 4	\$7,996/m ²

Development of the Class D cost estimates has required use of the following assumptions:

- Cost for planning and design has been estimated at 15% of building construction costs.
- Construction costs using unit costs above include siteworks.
- Specific information on the condition of communal wastewater treatment systems and ability of the systems to meet additional school requirements have not been determined. Costs for improvement of communal wastewater treatment systems to meet federal regulations and capacity requirements have not been included.
- Specific information on the condition of communal water treatment systems and ability of the systems to meet additional school requirements, including fire flows, have not been determined. Costs for improvement of communal water treatment systems to meet provincial regulations and capacity requirements have not been included.
- Specific information on the condition of electrical supply systems and ability of the systems to meet additional school requirements, have not been determined. Costs for improvement of existing electrical systems to meet capacity requirements have not been included.
- Specific information on the condition of solid waste management systems and the ability of the systems to meet school requirements have not been determined. Costs for improvement of existing solid waste systems to meet capacity requirements have not been included.
- The availability and cost of connection to broadband internet services, required in current teaching environment, has not been determined.
- The availability and cost of incorporating alternative, lower cost energy sources (i.e. natural gas), have not been determined.
- Specific information on the land area occupied by the school and ability for expansion was not determined. Land area occupied by existing schools have been assumed to meet or have



a suitable expansion area to meet existing and future requirements, as determined by the School Space Accommodation Standards.

4.1.4 Calibration of School Construction Unit Costs

AFN has obtained recent school construction cost data from ISC for various schools across the country. Data for thirteen (13) schools has been reviewed, which were constructed between 2016 and 2019. These are summarized in Table 4.2 below.

Table 4.2: Recent Tender Unit Costs for Schools [12]

Zone	Area of Construction (m²)	Unit Cost (\$/m²)	Date of Construction
Zone 2	0 - 1,000	\$5,748.38	2016
Zone 2	0 - 1,000	\$7,801.80	2016
Zone 1	1,000 - 2,500	\$3,070.09	2019
Zone 2	1,000 - 2,500	\$5,423.24	2017
Zone 1	1,000 - 2,500	\$4,814.41	2019
Zone 4	1,000 - 2,500	\$6,961.32	2014
Zone 4	1,000 - 2,500	\$5,585.53	2014
Zone 2	1,000 - 2,500	\$5,326.28	2020
Zone 2	2,500 - 5,000	\$4,840.56	2019
Zone 1	2,500 - 5,000	\$4,129.60	2019
Zone 1	5,000 - 7,500	\$4,056.83	2019
Zone 2	5,000 - 7,500	\$3,413.66	2019
Zone 4	7,500 -10,000	\$4,338.45	2016

The costs above are based on the reported tender price, and do not include costs associated with feasibility or design, project management, contract administration / inspection, or post construction reporting.

Adjusting the unit costs to current 2021 dollars (assuming a moderate construction cost overcrowding of 2% per year), the unit costs can be calculated as averages per zone, as shown in Table 4.3 below.

Table 4.3: ISC Tender Data Unit Costs per Zones

Zone	Average Unit Cost per Zone (2021 dollars)	Variance from Class D costs above
1	\$4,180	-8.53%



2	\$5,809	1.72%
3	\$6,375*	-6.98%
4	\$7,206	-9.88%

*Interpolated from trendline of other zones, as no zone 3 data was available.

Note that for this analysis, the largest zone 4 school has been excluded, as the influence of economies of scale is expected to account for the reduction in unit costs observed with the school larger than 7,500 sq.m.

Overall, the variance observed, ranging from -10% to +2%, is well within the expected Class D cost estimate variance of $\pm 20\%$. Other factors to consider include that the tender cost sample size is relatively small, construction costs may well be inflating at a rate of higher than 2% annually, and additional risks continue to affect construction costs such as climate change and shortening winter road seasons. For these reasons, the tender cost data above serves to reinforce and validate the Class D cost estimates included in this study.

4.1.5 Outdoor Learning Space Costing

The 2021 School Space Accommodation Standards incorporates a dedicated Outdoor Learning Space (OLS) GFA for each school. This Education Infrastructure Capital Needs Assessment has incorporated a cost estimate for outdoor spaces. According to the 2021 SSAS, all schools are eligible for a minimum of 20 m² for Outdoor Learning Spaces, however this space can be significantly greater, as 0.5 m² of outdoor space is allocated per student. Outdoor learning space allocation cannot be re-allocated to interior spaces, and may include a variety of uses, such as a paved area, outdoor seating, a canopy covering, and a garden area.

There are endless ways to use OLS allocations. However, for the purposes of this capital needs assessment, a costing methodology has been developed based on an assumed land use for the OLS, as follows:

- For schools with the minimum Outdoor Learning Space GFA of 20 m², it is assumed that a garage structure will be constructed to support land-based/cultural programming
- Where allocated 40 m², it is assumed that a garage plus a steel pavilion would be constructed
- Where allocated 60 m², it is assumed that a garage, steel pavilion, and stone circle with mulch floor would be constructed
- Where allocated 80 m², it is assumed that a garage, steel pavilion, stone circle, and wooden gazebo would be constructed
- Where allocated 95 m², it is assumed that a garage, steel pavilion, stone circle, wooden gazebo, and an additional storage shed would be constructed
- For schools with OLS allocations in between the increments outlined above, it is assumed that a landscaped garden area would be prepared with the remaining available area (including raised garden beds, fencing, irrigation, etc.)
- For schools with an OLS allocation of 120 m² or more, it is assumed that all of the above would be constructed, plus a second garage structure



- Schools with greater OLS allocations are assumed to construct additional structures, in corresponding proportion to the estimates above

Cost estimates for the OLS items above were determined based on a review of budgetary construction costs for various First Nations school facilities, as well as from contactor quotes. The following table outlines the cost estimates used for the various OLS uses for a Zone 1 school. Zone multipliers were applied to escalate costs for Zone 2, 3, and 4 communities, respectively. These values are expected to increase in the future, therefore an annual inflation value has been used in this study.

Table 4.4: Costing of Outdoor Learning Space Possible Uses

OLS Use	Class D Cost Estimate (Zone 1)
Garage	\$15,000
Steel Pavilion	\$38,000
Stone Circle with Mulch Floor	\$9,500
Wooden Gazebo	\$25,000
Storage Shed	\$12,000
Landscaped Garden	\$125 /m ²

While the methodology above provides a reasonable estimate of OLS costs, it is worth clarifying that these estimates are in no way prescriptive, and we recognize that First Nations may choose to allocate their OLS GFA in a wide range of ways, some of which could result in considerably higher or lower costs than those calculated here. This methodology is merely intended to provide a reasonable preliminary estimate of possible OLS costs, understanding that a range of possible uses should be accounted for in OLS planning.

4.2 Teacherages Floor Area Requirements & Costs

A similar analysis was conducted for teacherages on reserve. The ISC Level of Service Standards and Management of Teacherages on Reserve was used in completing this analysis. The total area of teacherages was determined by the number of teachers based on a ratio of 1 teacher to 17 students. The area for teacherages as included in the Level of Service Standards and Management of Teacherages on Reserve document (replicated as Table 4.5 below) was used to determine the corresponding eligible area for the calculated number of teachers.

Table 4.5: Maximum Gross Area of Teacherage

Number of teachers	Maximum gross area
1	115 m ²
2	215 m ²
3	315 m ²
4-5	430 m ²
6-7	545 m ²
8-9	660 m ²

For instances where there are more than nine teachers in a school, the maximum gross area per the ISC standards is 660 m² plus the area required for the added number of teachers over nine.



These guidelines were used to calculate the amount of teacherage space required for 135 First Nations based on their enrolment as well as existing teacherages. Data was provided for each of the First Nations including the zone number, the nominal roll, the last approved inspected date for each teacherage, the year each teacherage was constructed, the estimated life remaining, the existing building areas, the General Condition Rating (GCR) of the existing buildings, and the Operations and Maintenance (O&M) rating. This information was used to determine the eligible teacherage area for each community.

First, the nominal roll for each First Nation with teacherages was updated to a 2021 baseline, and then projected for the years 5, 10, 15, and 20 using a projected enrolment growth rate of 0.8% per year. Based on these enrolment projections, the number of teachers required to instruct the students was determined using the 1:17 teacher/student ratio. According to the number of teachers required, the maximum gross area of teacherages for each school could be determined by using the values from Table 4.5 for each year of projected enrolment.

After the maximum teacherage area that each First Nation is eligible for was calculated, it was determined whether the community had sufficient space to accommodate the teachers. For example, if an existing school currently has 1,000 m² of teacherage space, and they are eligible for 1,100 m² of teacherage space in year 0, they would be eligible for an addition of 100 m², in year 0. This was checked for each year, 0, 5, 10, 15, and 20, based on the projected enrolment and the corresponding number of teachers required.

For each planning period, it was also determined whether existing teacherages were eligible for replacement based on the building age and/or the ACRS report of the years of life remaining.

4.2.1 Cost Estimate Generation

After assessing each First Nation with teacherages and determining how much teacherage space it is eligible for based on enrolment, teacherage construction date, and facility estimated life remaining, the corresponding cost estimates for each phase were calculated. The cost incorporates the eligible space for additions and new teacherages, as well as the costs for existing teacherages requiring replacement.

Construction costs are based on estimates from other projects in each zone. The construction costs used in this analysis are presented in the following table:

Table 4.6: 2021 Construction Costs Per Zone (Teacherages)

Zone Number	Class D Unit Costs
Zone 1	\$3,440/m ²
Zone 2	\$4,691/m ²
Zone 3	\$5,941/m ²
Zone 4	\$7,192/m ²

Unit costs were determined based on a review of actual tender and construction costs for a range of facilities similar in size and scope to a typical teacherage building. As the unit rates were initially



developed in 2020, the values have since been adjusted to account for the inflation experienced from 2020 to 2021, largely due to the impacts of COVID-19. Based on the StatsCan Construction Price Index, the prices for residential buildings increased 11.7% from the first quarter of 2020 to the first quarter of 2021.

The residential construction rates are expected to continue increasing with inflation over the twenty-year planning period of this assessment, so the rates are adjusted accordingly for the years 1 to 5, 6 to 10, 11 to 15, and 16 to 20. Moving forward from present day costs, the inflation rate used for this costing analysis is 2% per year, as it is not expected that the significant increase in residential construction costs experienced in 2020 will continue.

Development of the Class D cost estimates has required use of the following assumptions:

- Cost for planning and design has been estimated at 15% of building construction costs.
- Construction costs using unit costs above include siteworks.
- Specific information on the condition of communal wastewater treatment systems and ability of the systems to meet additional teacherage requirements have not been determined. Costs for improvement of communal wastewater treatment systems to meet federal regulations and capacity requirements have not been included.
- Specific information on the condition of communal water treatment systems and ability of the systems to meet additional teacherage requirements, including fire flows, have not been determined. Costs for improvement of communal water treatment systems to meet provincial regulations and capacity requirements have not been included.
- Specific information on the condition of electrical supply systems and ability of the systems to meet additional teacherage requirements, have not been determined. Costs for improvement of existing electrical systems to meet capacity requirements have not been included.
- Specific information on the condition of solid waste management systems and the ability of the systems to meet teacherage requirements have not been determined. Costs for improvement of existing solid waste systems to meet capacity requirements have not been included.
- The availability and cost of connection to broadband internet services has not been determined.
- The availability and cost of incorporating alternative, lower cost energy sources (i.e. natural gas), have not been determined.
- Specific information on the land area occupied by the teacherages and available land for new teacherage construction was not determined. Land area occupied by existing teacherages have been assumed to meet or have a suitable expansion area to meet existing and future requirements, as determined by the ISC Level of Service Standards for Teacherages.



5.0 Results

5.1 Capital Cost Requirements for Schools

The capital costing needs for all 391 on reserve First Nation schools are calculated in accordance with the 2021 School Space Accommodation Standards (SSAS) by using projected enrolment data over the twenty-year planning period. Sections 5.1.1, 5.1.2, 5.1.3, 5.1.4, and 5.1.5 present the results for the capital requirements for schools in the immediate, years 1 to 5, years 6 to 10, years 11 to 15, and years 16 to 20 phases, respectively. Section 5.1.6 presents a summary of the capital costs for all phases, and Section 5.1.7 presents a breakdown of costs according to zones.

5.1.1 Immediate Needs

In this section the immediate needs of the schools are presented, and the costing associated with both additions and new construction is calculated. The following data illustrates the immediate costing needs for all 391 schools in year 0, to expand existing schools or replace aged schools to meet the floor area requirements of the SSAS based on the estimated 2021 nominal roll.

In this analysis, all existing school buildings that were eligible for additional space in year 0 were allocated the amount of required space that they are eligible for in year 10 (as the SSAS will be based on the tenth year of occupancy). The data below illustrates that the immediate capital needs for these schools is significant, due to many of the existing buildings either requiring replacement or being eligible for additional space. The data in Figure 5.1 illustrates that the costs for required additions are higher than the costs for new construction in year 0. Requirements for school replacement considered both the age of each facility as well the reported estimated remaining life from the most recent ACRS inspection.

Table 5.1: Immediate Capital Cost Requirement for Schools

Phase	Type	Costing
Immediate	Additions	\$1,444,143,700
	New Construction	\$1,069,671,502
	Outdoor Learning Space	\$41,623,250
	Planning & Design	\$383,315,768



Costing for School Additions and Replacement (Immediate)

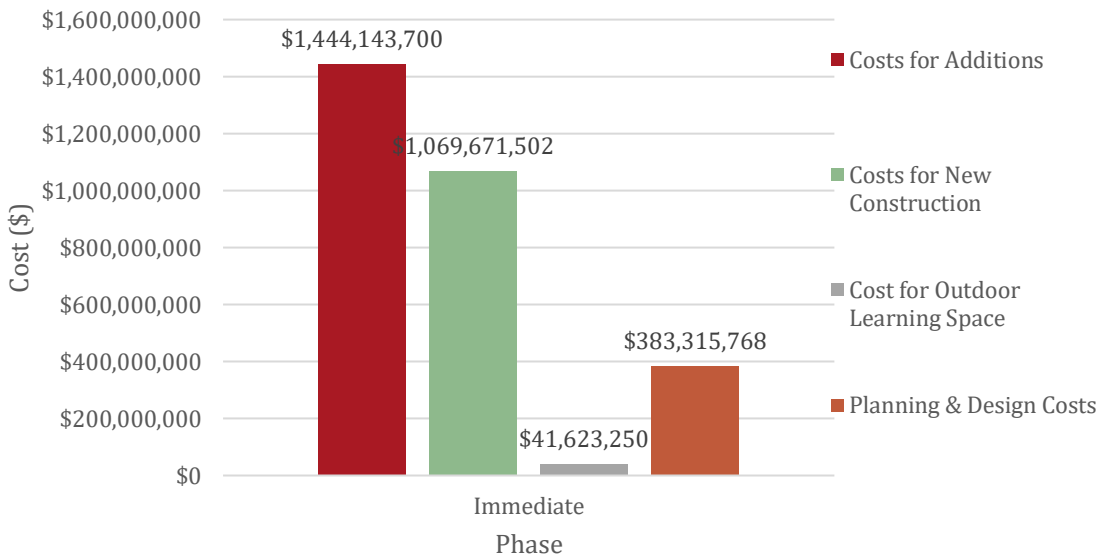


Figure 5.1: Immediate Capital Cost Requirement for Schools

5.1.2 Years 1 to 5

In this section the needs of the schools are presented for years 1 to 5, and the costing associated with both additions and new construction is calculated. The following data illustrates the costing needs for all 391 schools, to expand existing schools or replace aged schools to meet the floor area requirements of the SSAS based on the projected nominal roll.

In this analysis, all existing school buildings that were eligible for additional space in years 1 to 5 were allocated the amount of required space that they are eligible for in year 15 (using the tenth year of occupancy). The data below illustrates that the capital needs in years 1 to 5 for these schools is significant, mostly due to many of the existing buildings requiring replacement. The data in Figure 5.2 illustrates that the cost for new construction is significantly higher than the costs for required additions in years 1 to 5. Requirements for school replacement considered both the age of each facility as well the reported estimated remaining life from the most recent ACRS inspection.

Table 5.2: Years 1-5 Capital Cost Requirement for Schools

Phase	Type	Costing
Years 1-5	Additions	\$15,448,060
	New Construction	\$729,446,921
	Outdoor Learning Space	\$0
	Planning & Design	\$111,734,247



Costing for School Additions and Replacement (Years 1-5)

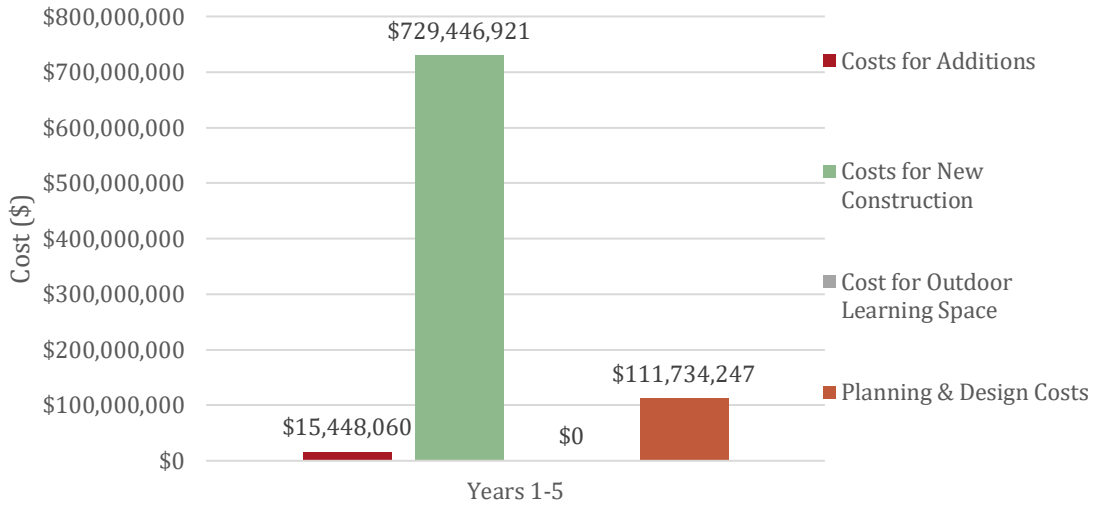


Figure 5.2: Years 1-5 Capital Cost Requirement for Schools

5.1.3 Years 6 to 10

In this section the needs of the schools are presented for years 6 to 10, and the costing associated with both additions and new construction is calculated. The following data illustrates the costing needs for all 391 schools, to expand existing schools or replace aged schools to meet the floor area requirements of the SSAS based on the projected nominal roll.

In this analysis, all existing school buildings that were eligible for additional space in years 6 to 10 were allocated the amount of required space that they are eligible for in year 20 (using the tenth year of occupancy). The data below illustrates that the capital needs in years 6 to 10 for these schools is significant, due to many of the existing buildings either requiring replacement or being eligible for additional space. The data in Figure 5.3 illustrates that the cost for new construction is higher than the costs for required additions in years 6 to 10. Requirements for school replacement considered both the age of each facility as well the reported estimated remaining life from the most recent ACRS inspection.

Table 5.3: Years 6-10 Capital Cost Requirement for Schools

Phase	Type	Costing
Years 6-10	Additions	\$16,793,624
	New Construction	\$1,239,888,560
	Outdoor Learning Space	\$0
	Planning & Design	\$188,502,328



Costing for School Additions and Replacement (Years 6-10)

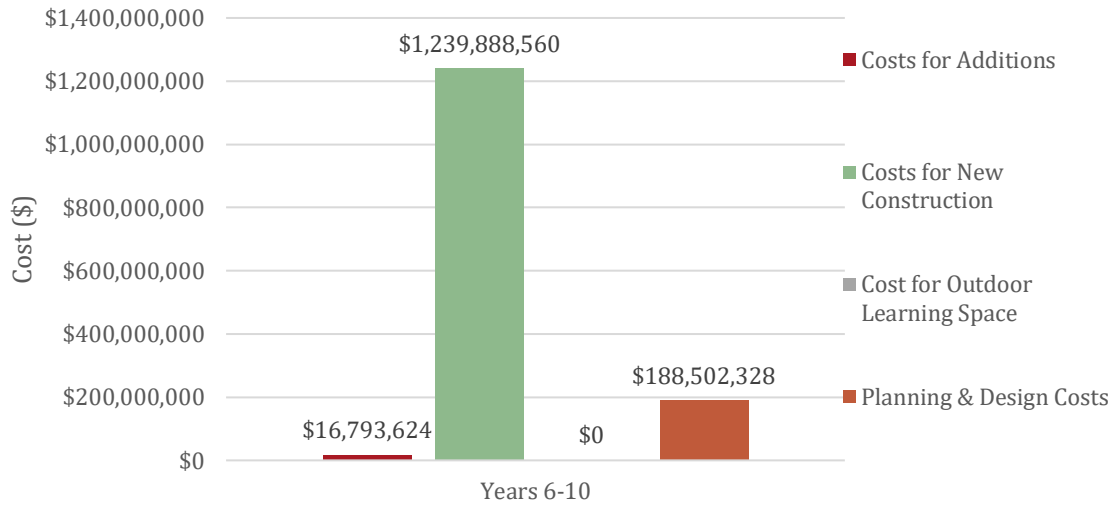


Figure 5.3: Years 6-10 Capital Cost Requirement for Schools

5.1.4 Years 11 to 15

In this section the needs of the schools are presented for years 11 to 15, and the costing associated with both additions and new construction is calculated. The following data illustrates the costing needs for all 391 schools, to expand existing schools or replace aged schools to meet the floor area requirements of the SSAS based on the projected nominal roll.

In this analysis, all existing school buildings that were eligible for additional space in years 11 to 15 were allocated the amount of required space that they are eligible for in year 25 (using the tenth year of occupancy). The data below illustrates that the capital needs in years 11 to 15 for these schools is significant, due to many of the existing buildings either requiring replacement or being eligible for additional space. The data in Figure 5.4 illustrates that the cost for new construction is higher than the costs for required additions in years 11 to 15. Requirements for school replacement considered both the age of each facility as well the reported estimated remaining life from the most recent ACRS inspection.

Table 5.4: Years 11-15 Capital Cost Requirement for Schools

Phase	Type	Costing
Years 11-15	Additions	\$311,112,327
	New Construction	\$2,380,972,699
	Outdoor Learning Space	\$1,452,528
	Planning & Design	\$404,030,633



Costing for School Additions and Replacement (Years 11-15)

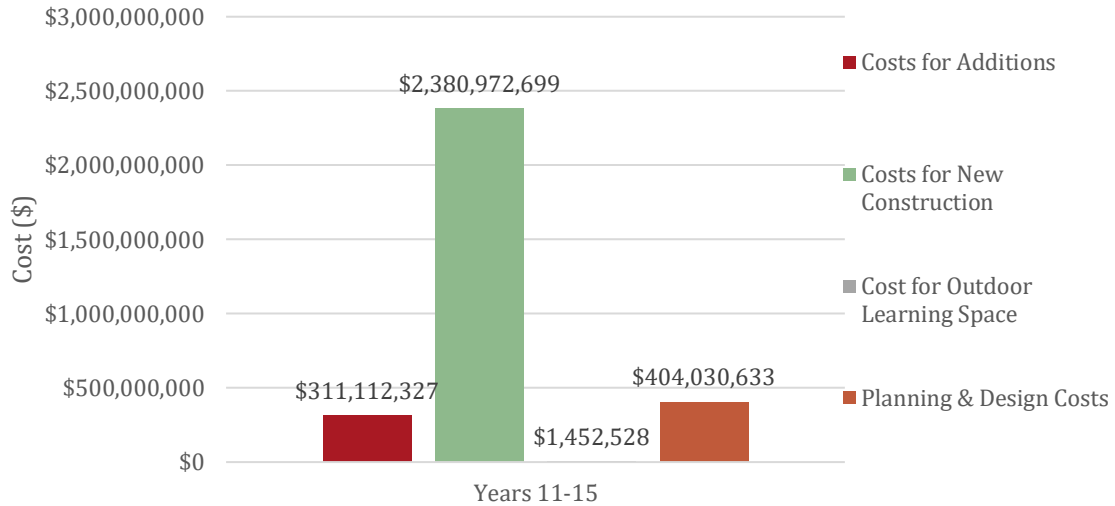


Figure 5.4: Years 11-15 Capital Cost Requirement for Schools

5.1.5 Years 16 to 20

In this section the needs of the schools are presented for years 16 to 20, and the costing associated with both additions and new construction is calculated. The following data illustrates the costing needs for all 391 schools, to expand existing schools or replace aged schools to meet the floor area requirements of the SSAS based on the projected nominal roll.

In this analysis, all existing school buildings that were eligible for additional space in years 16 to 20 were allocated the amount of required space that they are eligible for in year 30 (using the tenth year of occupancy). The data below illustrates that the capital needs in years 16 to 20 for these schools is significant, due to many of the existing buildings either requiring replacement or being eligible for additional space. The data in Figure 5.5 illustrates that the cost for new construction is higher than the costs for required additions in years 16 to 20. Requirements for school replacement considered both the age of each facility as well the reported estimated remaining life from the most recent ACRS inspection.

Table 5.5: Years 16-20 Capital Cost Requirement for Schools

Phase	Type	Costing
Years 16-20	Additions	\$157,354,368
	New Construction	\$2,317,345,624
	Outdoor Learning Space	\$1,156,299
	Planning & Design	\$371,378,444



Costing for School Additions and Replacement (Years 16-20)

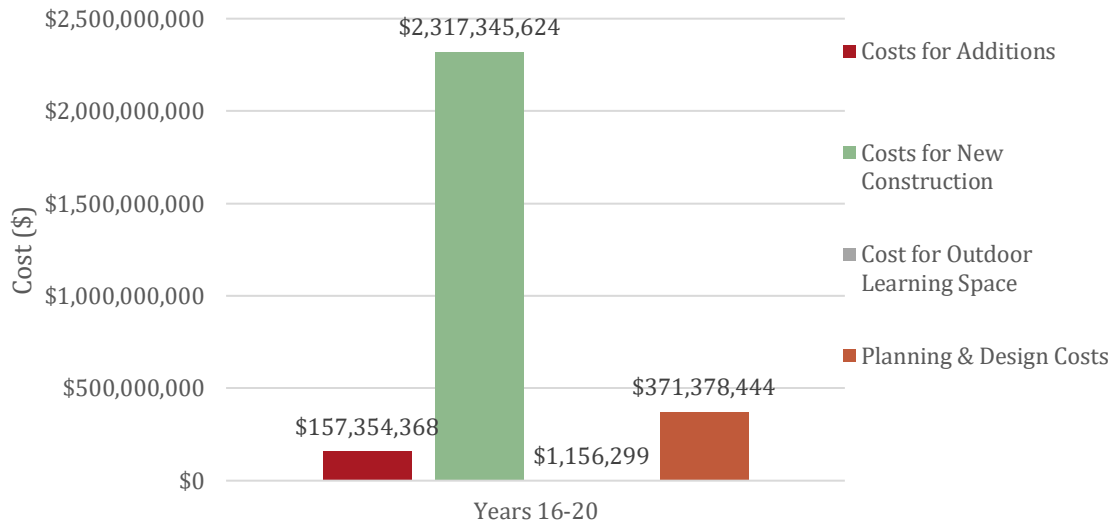


Figure 5.5: Years 16-20 Capital Cost Requirement for Schools

5.1.6 School Summary

This section provides a summary of additions and new construction costs for schools in all phases, including immediate needs, as well as capital needs for years 1 to 5, years 6 to 10, years 11 to 15, and years 16 to 20. The total capital costs for all 391 schools was determined to be \$11,185,370,884 taking into consideration the space a school was eligible for, what zone the school was located, as well as a 2% inflation of construction costs over each year of the planning period. The results illustrated in Figure 5.6 below show that the immediate needs of all schools are extensive, and both additions and new construction are required. It can also be seen that the capital costs for new construction in years 11 to 15 and 16 to 20 are much higher than the other phases. This is associated with the age and condition of the school facilities.

Table 5.6: Total Capital Cost Requirement for Schools

Phase	Type	Costing
Immediate	Additions	\$1,444,143,700
	New Construction	\$1,069,671,502
	Outdoor Learning Space	\$41,623,250
	Planning & Design	\$383,315,768
Years 1-5	Additions	\$15,448,060
	New Construction	\$729,446,921
	Outdoor Learning Space	\$0
	Planning & Design	\$111,734,247



Years 6-10	Additions	\$16,793,624
	New Construction	\$1,239,888,560
	Outdoor Learning Space	\$0
	Planning & Design	\$188,502,328
Years 11-15	Additions	\$311,112,327
	New Construction	\$2,380,972,699
	Outdoor Learning Space	\$1,452,528
	Planning & Design	\$404,030,633
Years 16-20	Additions	\$157,354,368
	New Construction	\$2,317,345,624
	Outdoor Learning Space	\$1,156,299
	Planning & Design	\$371,378,444
Total - All Years	All Types	\$11,185,370,884

Capital Estimates for Schools

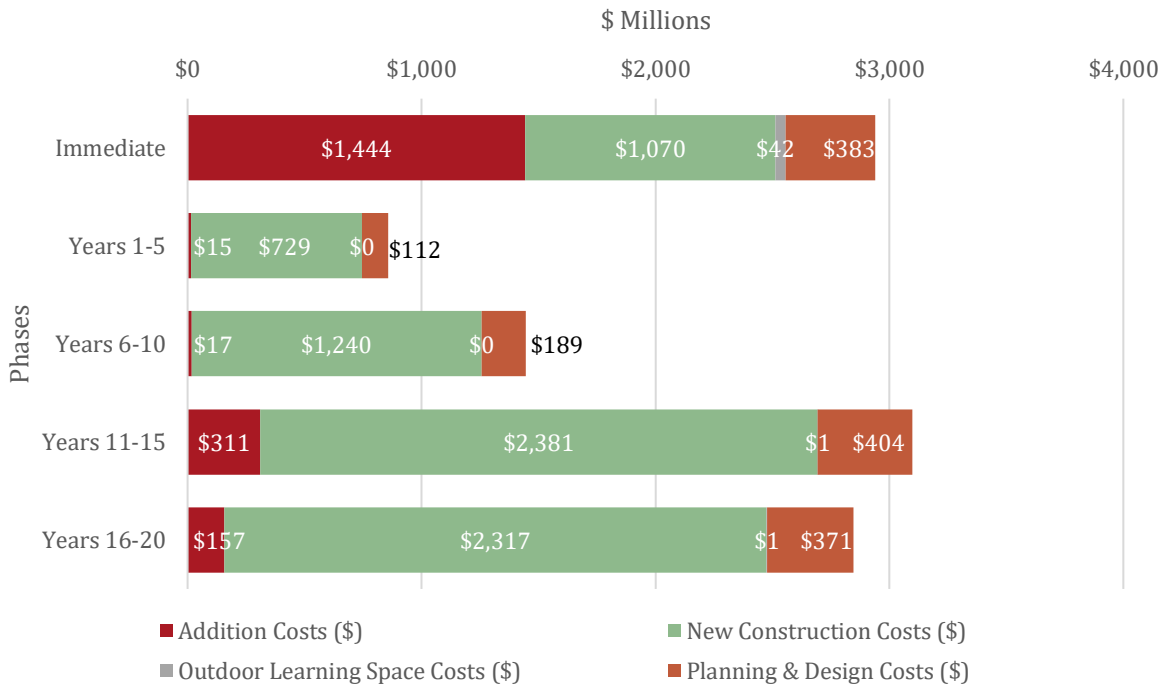


Figure 5.6: Total Capital Cost Requirement for Schools



In the immediate term, two hundred and two (202) schools qualify for additions in order to meet the 2021 SSAS allowable floor area for the 2021 nominal roll, and fifty-six (56) schools qualify for immediate replacement based on the facility age and/or reported condition. This information can be broken down further as follows:

- Among Zone 1 First Nations, 21 schools require replacement in year 0 (in total 51,149 m² of new construction)
- Among Zone 2 First Nations, 23 schools require replacement in year 0 (in total 80,389 m² of new construction)
- Among Zone 3 First Nations, 1 school requires replacement in year 0 (in total 4,837 m² of new construction)
- Among Zone 4 First Nations, 11 schools require replacement in year 0 (in total 42,982 m² of new construction)
- Among Zone 1 First Nations, 41 schools require additions in year 0 (in total 43,475 m² of additions)
- Among Zone 2 First Nations, 102 schools require additions in year 0 (in total 110,354 m² of additions)
- Among Zone 3 First Nations, 5 schools require additions in year 0 (in total 2,923 m² of additions)
- Among Zone 4 First Nations, 54 schools require additions in year 0 (in total 74,437 m² of additions)

5.1.7 Schools Costing Summary by Zone

This section illustrates the capital needs of schools associated with their zone, for both new construction and additions, and the resulting costs for these upgrades. The results are shown separated by phase including immediate needs (year 0), years 1 to 5, years 6 to 10, years 11 to 15, and years 16 to 20.



5.1.7.1 Immediate Needs

The following data illustrates the total costing for both additions and new construction in year 0 in relation to the corresponding zone. Figure 5.7 presents the immediate capital needs for schools across all zones.

Table 5.7: Immediate Capital Cost Requirement by Zone for Schools

Immediate		
Zone Number	Type	Costing
Zone 1	Additions	\$198,639,548
	New Construction	\$233,706,890
	Outdoor Learning Space	\$7,455,750
	Planning & Design	\$65,970,328
Zone 2	Additions	\$630,274,706
	New Construction	\$459,132,102
	Outdoor Learning Space	\$19,191,250
	Planning & Design	\$166,289,709
Zone 3	Additions	\$20,032,007
	New Construction	\$33,150,668
	Outdoor Learning Space	\$1,279,875
	Planning & Design	\$8,169,382
Zone 4	Additions	\$595,197,439
	New Construction	\$343,681,843
	Outdoor Learning Space	\$13,696,375
	Planning & Design	\$142,886,349
Total - All Zones	All Types	\$2,938,754,220

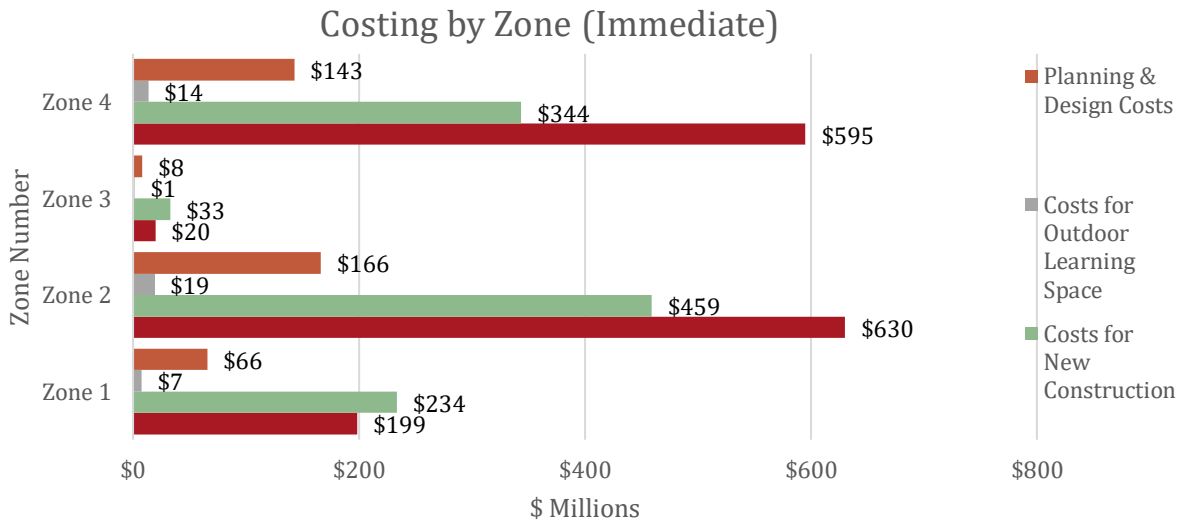


Figure 5.7: Immediate Capital Cost Requirement by Zone for Schools



5.1.7.2 Years 1 to 5

The following data illustrates the total costing for both additions and new construction in years 1 to 5 in relation to the corresponding zone. Figure 5.8 presents the capital needs for schools across all zones in years 1 to 5.

Table 5.8: Years 1-5 Capital Cost Requirement by Zone for Schools

Years 1-5		
Zone Number	Type	Costing
Zone 1	Additions	\$5,527,748
	New Construction	\$193,133,748
	Outdoor Learning Space	\$0
	Planning & Design	\$29,799,224
Zone 2	Additions	\$9,920,311
	New Construction	\$414,763,943
	Outdoor Learning Space	\$0
	Planning & Design	\$63,702,638
Zone 3	Additions	\$0
	New Construction	\$11,545,857
	Outdoor Learning Space	\$0
	Planning & Design	\$1,731,879
Zone 4	Additions	\$0
	New Construction	\$110,003,372
	Outdoor Learning Space	\$0
	Planning & Design	\$16,500,506
Total - All Zones	All Types	\$856,629,228

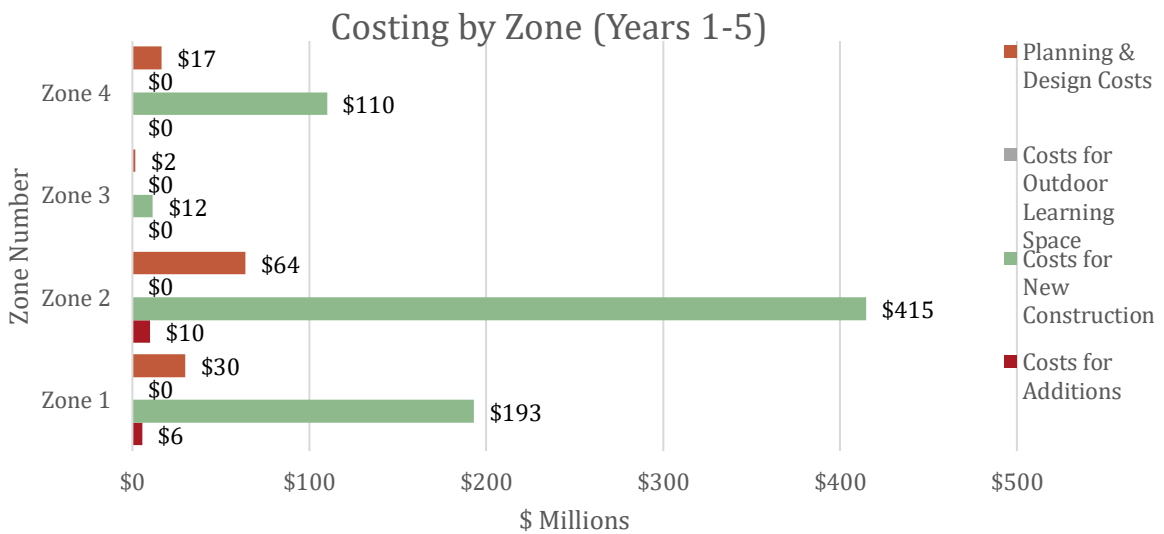


Figure 5.8: Years 1-5 Capital Cost Requirement by Zone for Schools



5.1.7.3 Years 6 to 10

The following data illustrates the total costing for both additions and new construction in years 6 to 10 in relation to the corresponding zone. Figure 5.9 presents the capital needs for schools across all zones in years 6 to 10.

Table 5.9: Years 6-10 Capital Cost Requirement by Zone for Schools

Years 6-10		
Zone Number	Type	Costing
Zone 1	Additions	\$0
	New Construction	\$221,601,036
	Outdoor Learning Space	\$0
	Planning & Design	\$33,240,155
Zone 2	Additions	\$9,691,338
	New Construction	\$709,004,406
	Outdoor Learning Space	\$0
	Planning & Design	\$107,804,362
Zone 3	Additions	\$0
	New Construction	\$22,579,092
	Outdoor Learning Space	\$0
	Planning & Design	\$3,386,864
Zone 4	Additions	\$7,102,286
	New Construction	\$286,704,026
	Outdoor Learning Space	\$0
	Planning & Design	\$44,070,947
Total - All Zones	All Types	\$1,445,184,512

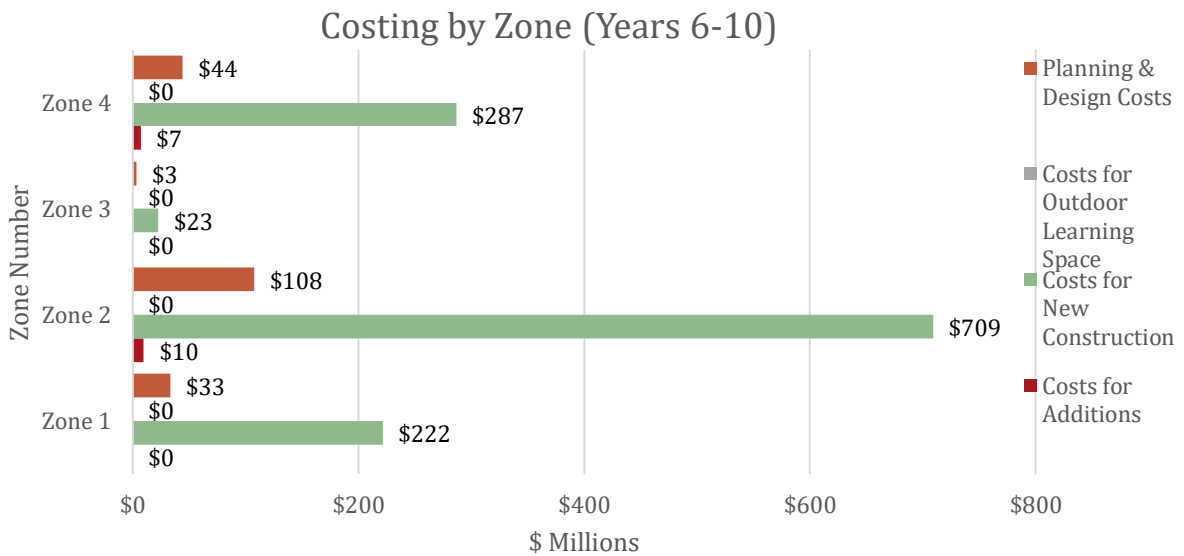


Figure 5.9: Years 6-10 Capital Cost Requirement by Zone for Schools



5.1.7.4 Years 11 to 15

The following data illustrates the total costing for both additions and new construction in years 11 to 15 in relation to the corresponding zone. Figure 5.10 presents the capital needs for schools across all zones in years 11 to 15.

Table 5.10: Years 11-15 Capital Cost Requirement by Zone for Schools

Years 11-15		
Zone Number	Type	Costing
Zone 1	Additions	\$46,795,249
	New Construction	\$328,550,859
	Outdoor Learning Space	\$124,156
	Planning & Design	\$56,320,540
Zone 2	Additions	\$134,702,159
	New Construction	\$952,597,793
	Outdoor Learning Space	\$607,954
	Planning & Design	\$163,186,186
Zone 3	Additions	\$12,855,909
	New Construction	\$89,689,346
	Outdoor Learning Space	\$0
	Planning & Design	\$15,381,788
Zone 4	Additions	\$116,759,010
	New Construction	\$1,010,134,701
	Outdoor Learning Space	\$720,418
	Planning & Design	\$169,142,119
Total - All Zones	All Types	\$3,097,568,189

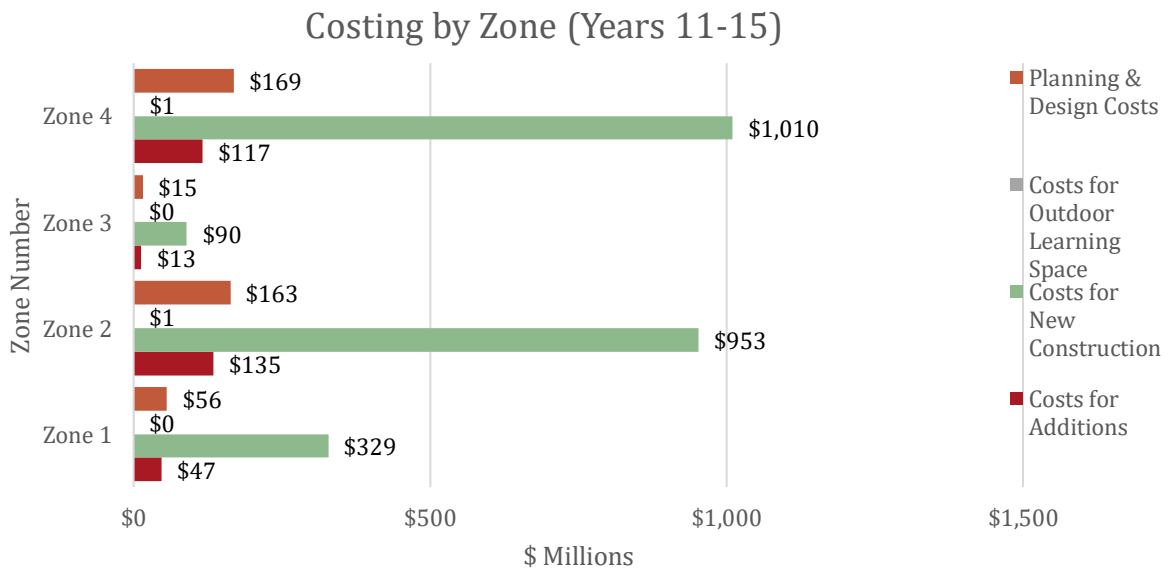


Figure 5.10: Years 11-15 Capital Cost Requirement by Zone for Schools



5.1.7.5 Years 16 to 20

The following data illustrates the total costing for both additions and new construction in years 16 to 20 in relation to the corresponding zone. Figure 5.11 presents the capital needs for schools across all zones in years 16 to 20.

Table 5.11: Years 16-20 Capital Cost Requirement by Zone for Schools

Years 16-20		
Zone Number	Type	Costing
Zone 1	Additions	\$44,111,020
	New Construction	\$309,092,128
	Outdoor Learning Space	\$196,517
	Planning & Design	\$53,009,950
Zone 2	Additions	\$80,200,382
	New Construction	\$1,054,703,942
	Outdoor Learning Space	\$516,599
	Planning & Design	\$170,313,138
Zone 3	Additions	\$0
	New Construction	\$95,110,062
	Outdoor Learning Space	\$45,971
	Planning & Design	\$14,273,405
Zone 4	Additions	\$33,042,966
	New Construction	\$858,439,492
	Outdoor Learning Space	\$397,212
	Planning & Design	\$133,781,950
Total - All Zones	All Types	\$2,847,234,736

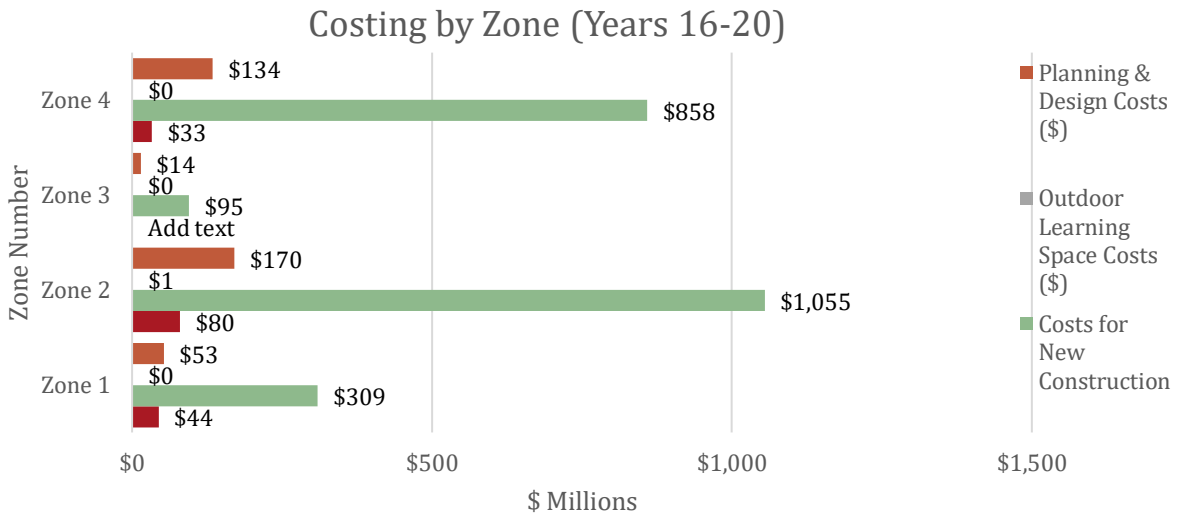


Figure 5.11: Years 16-20 Capital Cost Requirement by Zone for Schools



5.2 Capital Cost Requirements for Teacherages

The capital costing needs for all 1026 on reserve First Nation teacherages are calculated in accordance with the Level of Service Standards and Management of Teacherages on Reserve guidelines by using projected enrolment data over the twenty-year planning period. Sections 5.2.1, 5.2.2, 5.2.3, 5.2.4, and 5.2.5 present the results for the capital requirements for teacherages in the immediate, years 1 to 5, years 6 to 10, years 11 to 15, and years 16 to 20 phases, respectively. Section 5.2.6 presents a summary of the capital costs for all phases, and Section 5.2.7 presents a breakdown of costs according to zones.

5.2.1 Immediate Needs

In this section the immediate needs of the teacherages are presented, and the costing associated with both additions and new construction is calculated. The following data illustrates the immediate costing needs for all 1026 teacherages in year 0, to expand existing teacherages or replace aged teacherages to meet the floor area requirements of the Level of Service Standards and Management of Teacherages on Reserve guidelines based on the 2021 nominal roll.

The data below illustrates that the immediate capital needs for these teacherages is significant, due to many of the existing buildings either requiring replacement or being eligible for additional space. The data in Figure 5.12 illustrates that the cost for new construction is higher than the costs for required additions in year 0. Requirements for teacherage replacement considered the age of each facility as well the reported estimated remaining life from the most recent ACRS inspection.

Table 5.12: Immediate Capital Cost Requirement for Teacherages

Phase	Type	Costing
Immediate	Additions	\$271,013,022
	New Construction	\$300,997,668
	Planning & Design	\$85,801,604

Costing for Teacherages Additions and Replacement (Immediate)

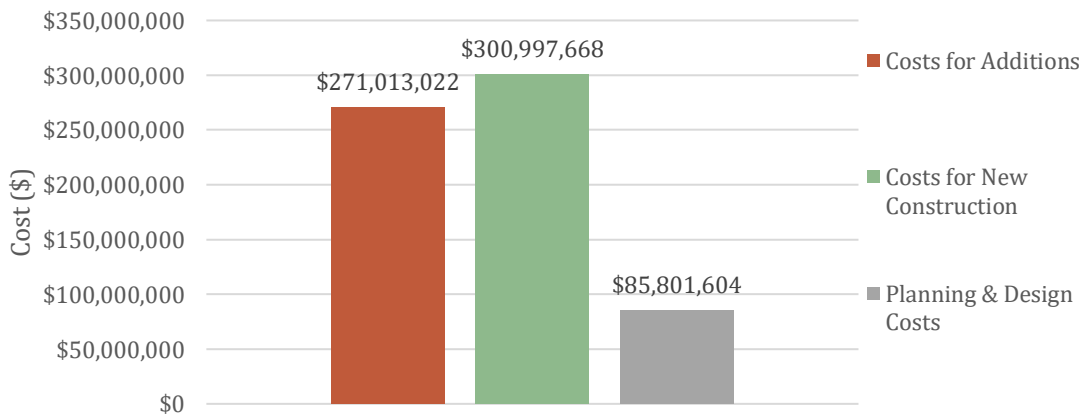


Figure 5.12: Immediate Capital Cost Requirement for Teacherages



5.2.2 Years 1 to 5

In this section the needs of the teacherages in years 1 to 5 are presented, and the costing associated with both additions and new construction is calculated. The following data illustrates the costing needs for all 1026 teacherages in years 1 to 5, to expand existing teacherages or replace aged teacherages to meet the floor area requirements of the Level of Service Standards and Management of Teacherages on Reserve guidelines based on the projected nominal roll.

The data below illustrates that the capital needs in years 1 to 5 for these teacherages is significant, mostly due to many of the existing buildings requiring. The data in Figure 5.13 illustrates that the cost for new construction is significantly higher than the costs for required additions in years 1 to 5. Requirements for teacherage replacement considered the age of each facility as well the reported estimated remaining life from the most recent ACRS inspection.

Table 5.13: Years 1-5 Capital Cost Requirement for Teacherages

Phase	Type	Costing
Years 1-5	Additions	\$27,227,873
	New Construction	\$250,024,423
	Planning & Design	\$41,587,844

Costing for Teacherages Additions and Replacement (Years 1-5)

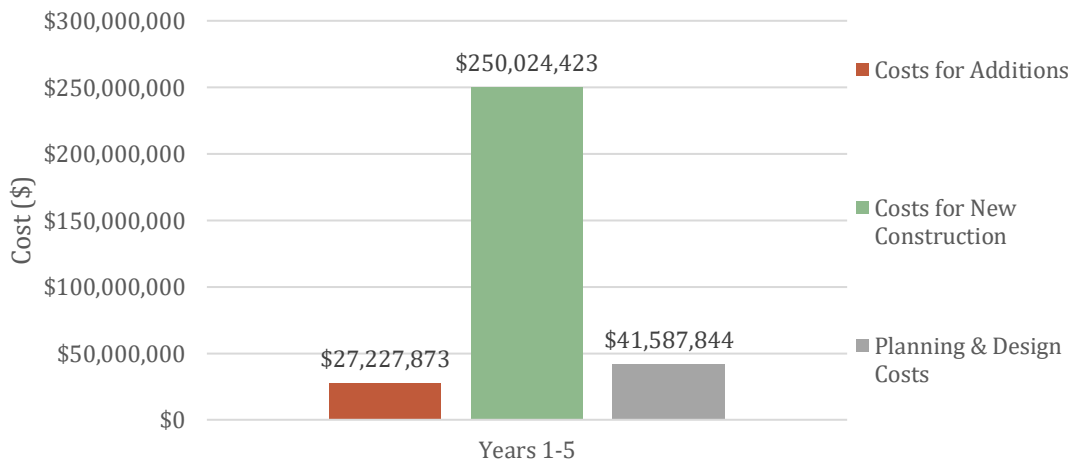


Figure 5.13: Years 1-5 Capital Cost Requirement for Teacherages

5.2.3 Years 6 to 10

In this section the needs of the teacherages for years 6 to 10 are presented, and the costing associated with both additions and new construction is calculated. The following data illustrates the costing needs for all 1026 teacherages in years 6 to 10, to expand existing teacherages or replace aged teacherages to meet the floor area requirements of the Level of Service Standards and Management of Teacherages on Reserve guidelines based on the projected nominal roll.



The data below illustrates that the capital needs in years 6 to 10 for these teacherages is significant, due to many of the existing buildings either requiring replacement or being eligible for additional space. The data in Figure 5.14 illustrates that the cost for new construction is higher than the costs for required additions in years 6 to 10. Requirements for teacherage replacement considered the age of each facility as well the reported estimated remaining life from the most recent ACRS inspection.

Table 5.14: Years 6-10 Capital Cost Requirement for Teacherages

Phase	Type	Costing
Years 6-10	Additions	\$36,630,431
	New Construction	\$194,169,638
	Planning & Design	\$34,620,010

Costing for Teacherages Additions and Replacement (Years 6-10)

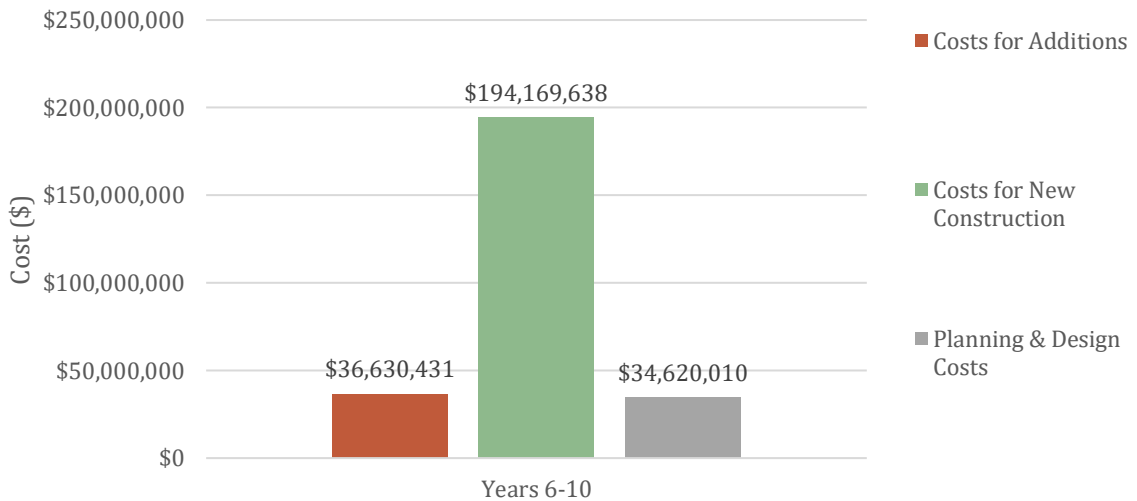


Figure 5.14: Years 6-10 Capital Cost Requirement for Teacherages

5.2.4 Years 11 to 15

In this section the needs of the teacherages for years 11 to 15 are presented, and the costing associated with both additions and new construction is calculated. The following data illustrates the costing needs for all 1026 teacherages in years 11 to 15, to expand existing teacherages or replace aged teacherages to meet the floor area requirements of the Level of Service Standards and Management of Teacherages on Reserve guidelines based on the projected nominal roll.

The data below illustrates that the capital needs in years 11 to 15 for these teacherages is significant, due to many of the existing buildings either requiring replacement or being eligible for additional space. The data in Figure 5.15 illustrates that the cost for new construction is higher than the costs for required additions in years 11 to 15. Requirements for teacherage replacement considered the age of each facility as well the reported estimated remaining life from the most recent ACRS inspection.



Table 5.15: Years 11-15 Capital Cost Requirement for Teacherages

Phase	Type	Costing
Years 11-15	Additions	\$41,405,631
	New Construction	\$133,633,118
	Planning & Design	\$26,255,812

Costing for Teacherages Additions and Replacement (Years 11-15)

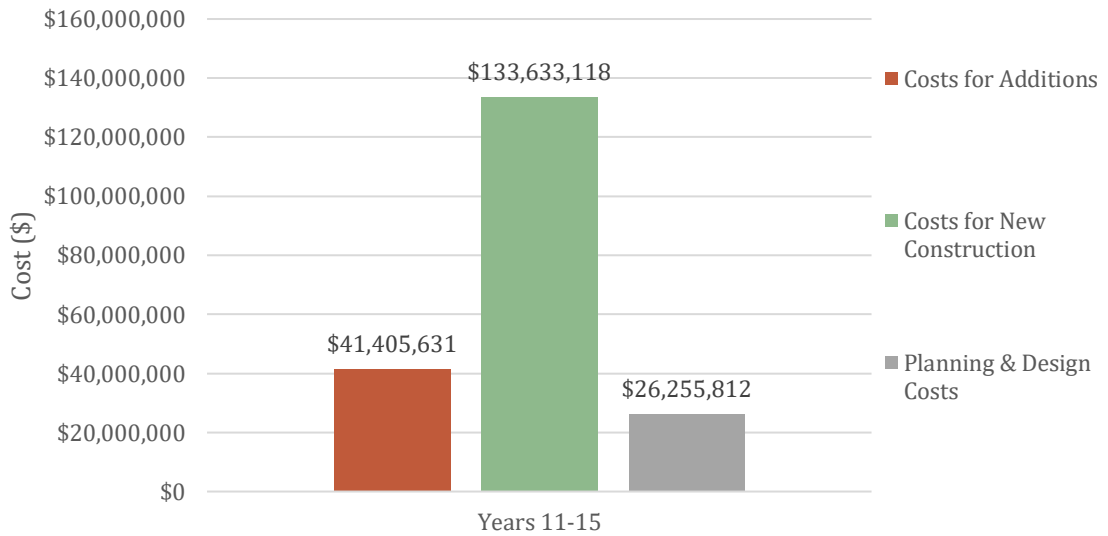


Figure 5.15: Years 11-15 Capital Cost Requirement for Teacherages

5.2.5 Years 16 to 20

In this section the needs of the teacherages for years 16 to 20 are presented, and the costing associated with both additions and new construction is calculated. The following data illustrates the costing needs for all 1026 teacherages in years 16 to 20, to expand existing teacherages or replace aged teacherages to meet the floor area requirements of the Level of Service Standards and Management of Teacherages on Reserve guidelines based on the projected nominal roll.

The data below illustrates that the capital needs in years 16 to 20 for these teacherages is significant, due to many of the existing buildings either requiring replacement or being eligible for additional space. The data in Figure 5.16 illustrates that the cost for new construction is higher than the costs for required additions in years 16 to 20. Requirements for teacherage replacement considered the age of each facility as well the reported estimated remaining life from the most recent ACRS inspection.



Table 5.16: Years 16-20 Capital Cost Requirement for Teacherages

Phase	Type	Costing
Years 16-20	Additions	\$53,572,342
	New Construction	\$60,612,347
	Planning & Design	\$17,127,703

Costing for Teacherages Additions and Replacement (Years 16 - 20)

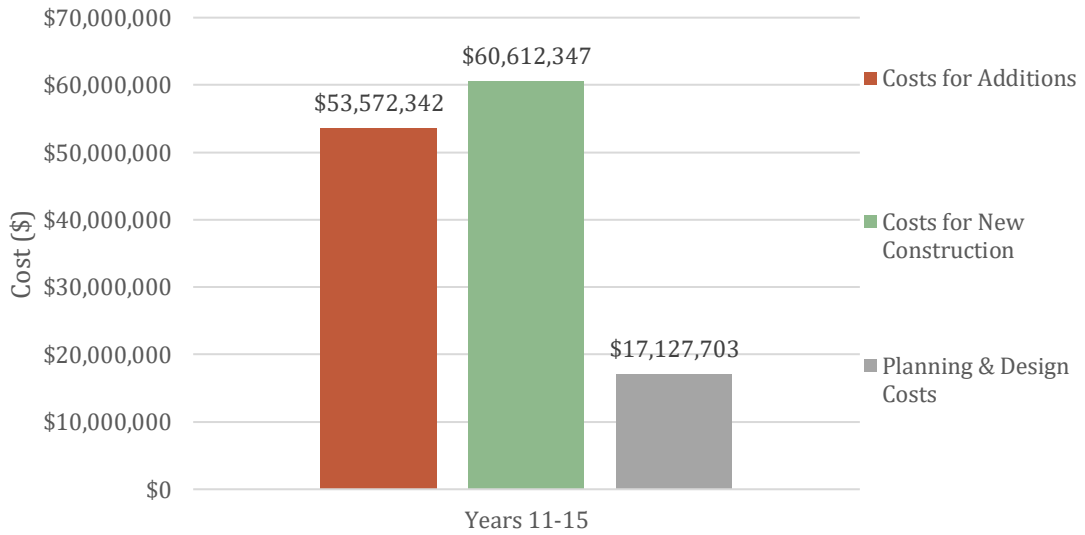


Figure 5.16: Years 16-20 Capital Cost Requirement for Teacherages

5.2.6 Teacherages Summary

This section provides a summary of additions and new construction costs for teacherages in all phases, including immediate needs, as well as capital needs for the years 1 to 5, years 6 to 10, years 11 to 15, and years 16 to 20 phases. The total capital costs for all 1026 teacherages was determined to be \$1,574,679,465 taking into consideration the space a teacherage was eligible for, what zone the teacherage was located, as well as a 2% inflation of construction costs over each year of the planning period. The results illustrated in Figure 5.17 below show that the immediate needs of all teacherages are extensive, and both additions and new construction are required.

Table 5.17: Total Capital Cost Requirement for Teacherages

Phase	Type	Costing
Immediate	Additions	\$271,013,022
	New Construction	\$300,997,668
	Planning & Design	\$85,801,604



Years 1-5	Additions	\$27,227,873
	New Construction	\$250,024,423
	Planning & Design	\$41,587,844
Years 6-10	Additions	\$36,630,431
	New Construction	\$194,169,638
	Planning & Design	\$34,620,010
Years 11-15	Additions	\$41,405,631
	New Construction	\$133,633,118
	Planning & Design	\$26,255,812
Years 16-20	Additions	\$53,572,342
	New Construction	\$60,612,347
	Planning & Design	\$17,127,703
Total - All Years	All Types	\$1,574,679,465

Capital Estimate for Teacherages

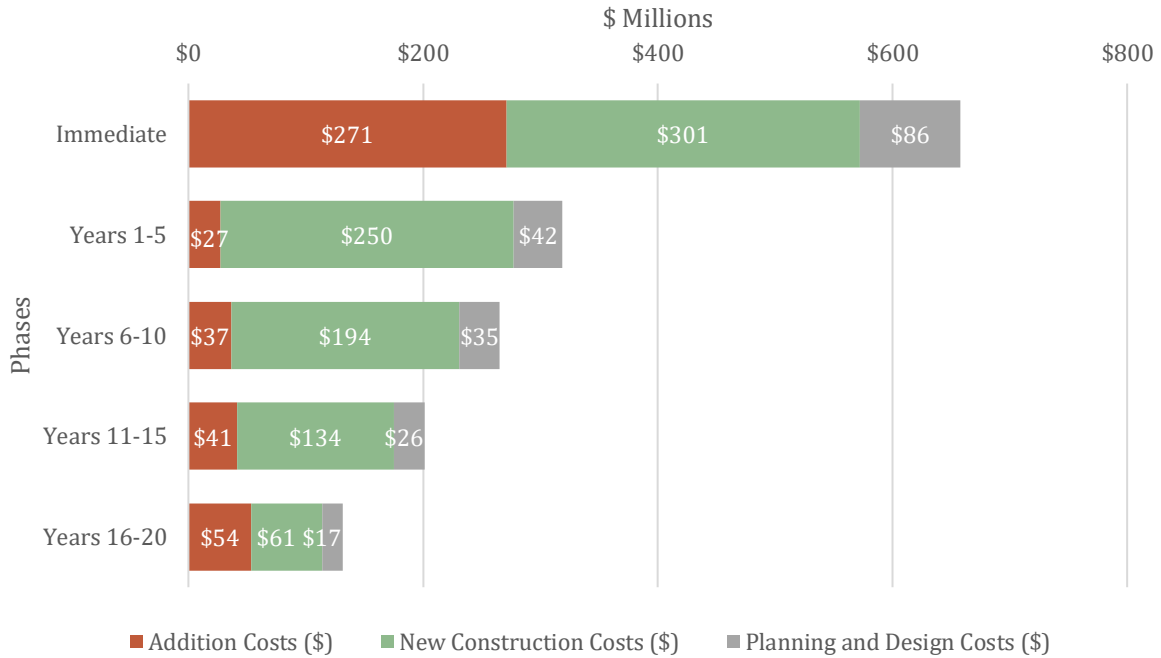


Figure 5.17: Total Capital Cost Requirement for Teacherages



In the immediate term, seventy (70) First Nations qualify for additional teacherages in order to meet the ISC standards concerning teacherages on reserve, and eighty-two (82) First Nations have one or more of existing teacherages which qualify for immediate replacement based on the facility age and/or reported condition. This information can be broken down further as follows:

- Among Zone 1 First Nations, 2 First Nations require additional teacherages in year 0 (in total 1,290 m² of additional teacherage space)
- Among Zone 2 First Nations, 38 First Nations require additional teacherages in year 0 (in total 22,095 m² of additional teacherage space)
- Among Zone 3 First Nations, 1 First Nation requires additional teacherages in year 0 (in total 616 m² of additional teacherage space)
- Among Zone 4 First Nations, 29 First Nations require additional teacherages in year 0 (in total 22,143 m² of additional teacherage space)
- Among Zone 1 First Nations, 2 First Nations require replacement of one or more existing teacherages in year 0 (in total 425 m² of new construction to replace aged facilities)
- Among Zone 2 First Nations, 39 First Nations require replacement of one or more existing teacherages in year 0 (in total 28,137 m² of new construction to replace aged facilities)
- Among Zone 3 First Nations, 4 First Nations require replacement of one or more existing teacherages in year 0 (in total 1,799 m² of new construction to replace aged facilities)
- Among Zone 4 First Nations, 37 First Nations require replacement of one or more existing teacherages in year 0 (in total 21,808 m² of new construction to replace aged facilities)

5.2.7 Teacherage Costing Summary by Zone

This section illustrates the capital needs of teacherages associated with their zone, for both new construction and additions, and the resulting costs for these upgrades. The results are shown separated by phase including immediate needs (year 0), as well as needs for years 1 to 5, years 6 to 10, years 11 to 15, and years 16 to 20.



5.2.7.1 Immediate Needs

The following data illustrates the total costing for both additions and new construction in year 0 in relation to the corresponding zone. Figure 5.18 presents the immediate capital needs for teacherages across all zones.

Table 5.18: Immediate Capital Cost Requirement by Zone for Teacherages

Immediate		
Zone Number	Type	Costing
Zone 1	Additions	\$4,438,061
	New Construction	\$1,463,645
	Planning & Design	\$885,256
Zone 2	Additions	\$103,646,620
	New Construction	\$131,986,994
	Planning & Design	\$35,345,042
Zone 3	Additions	\$3,660,143
	New Construction	\$10,690,471
	Planning & Design	\$2,152,592
Zone 4	Additions	\$159,268,197
	New Construction	\$156,856,558
	Planning & Design	\$47,418,713
Total - All Zones	All Types	\$657,812,294

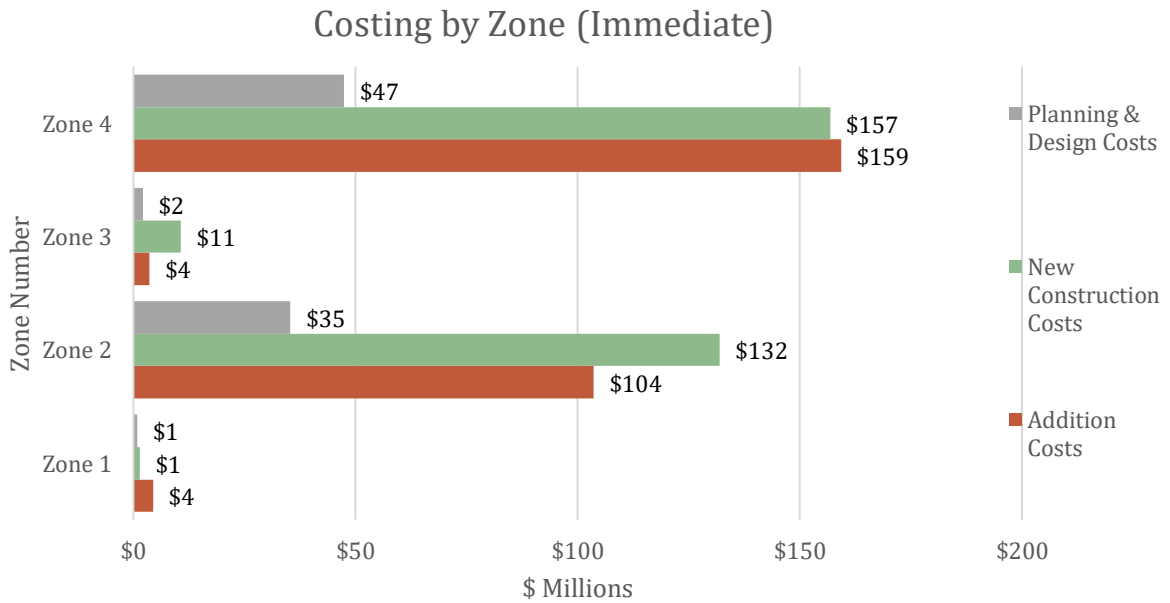


Figure 5.18: Immediate Capital Cost Requirement by Zone for Teacherages



5.2.7.2 Years 1 to 5

The following data illustrates the total costing for both additions and new construction in years 1 to 5 in relation to the corresponding zone. Figure 5.19 presents the capital needs for teacherages across all zones.

Table 5.19: Years 1-5 Capital Cost Requirement by Zone for Teacherages

Years 1-5		
Zone Number	Type	Costing
Zone 1	Additions	\$873,545
	New Construction	\$634,573
	Planning & Design	\$226,218
Zone 2	Additions	\$10,922,762
	New Construction	\$61,192,588
	Planning & Design	\$10,817,303
Zone 3	Additions	\$0
	New Construction	\$23,706,002
	Planning & Design	\$3,555,900
Zone 4	Additions	\$15,431,565
	New Construction	\$164,491,259
	Planning & Design	\$26,988,424
Total - All Zones	All Types	\$318,840,140

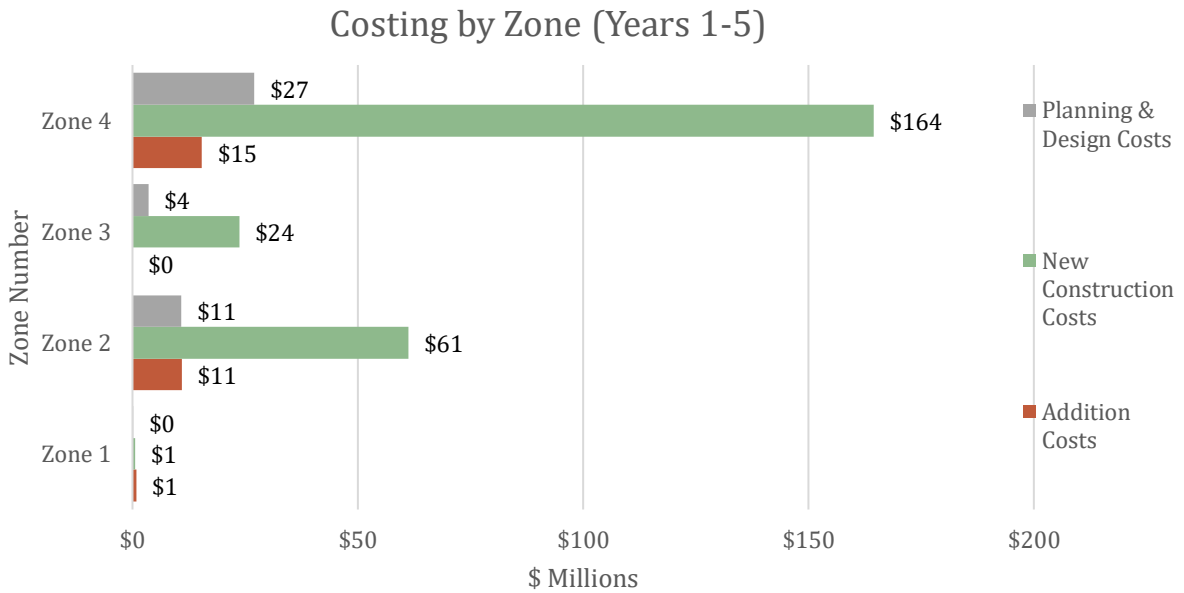


Figure 5.19: Years 1-5 Capital Cost Requirement by Zone for Teacherages



5.2.7.3 Years 6 to 10

The following data illustrates the total costing for both additions and new construction in years 6 to 10 in relation to the corresponding zone. Figure 5.20 presents the capital needs for teacherages across all zones.

Table 5.20: Years 6-10 Capital Cost Requirement by Zone for Teacherages

Years 6-10		
Zone Number	Type	Costing
Zone 1	Additions	\$0
	New Construction	\$1,743,164
	Planning & Design	\$261,475
Zone 2	Additions	\$17,094,743
	New Construction	\$80,935,151
	Planning & Design	\$14,704,484
Zone 3	Additions	\$1,305,915
	New Construction	\$9,768,865
	Planning & Design	\$1,661,217
Zone 4	Additions	\$18,229,773
	New Construction	\$101,722,457
	Planning & Design	\$17,992,835
Total - All Zones	All Types	\$265,420,079

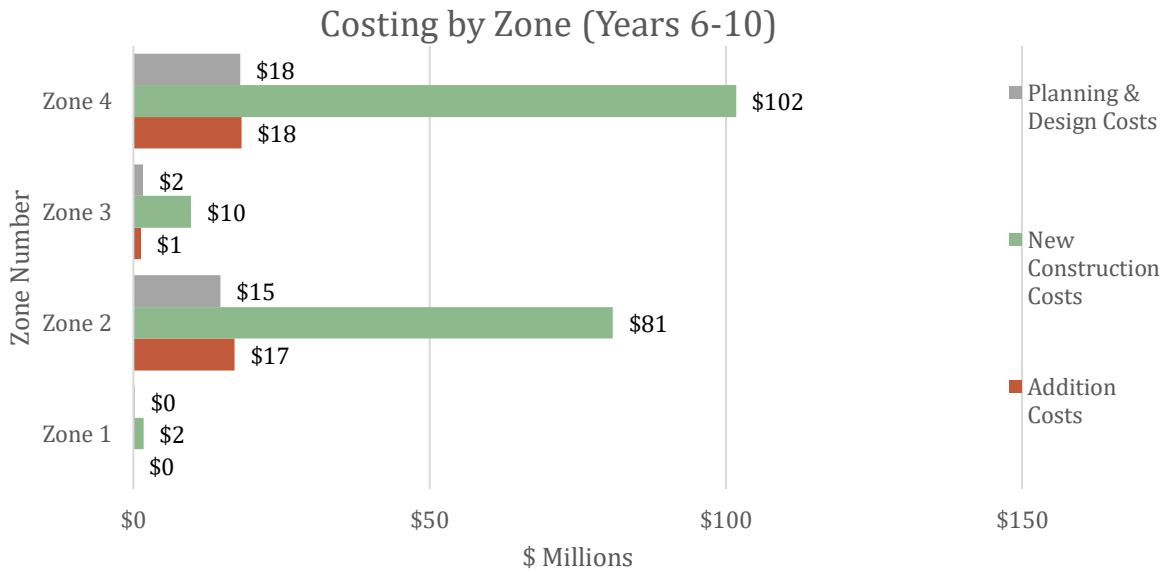


Figure 5.20: Years 6-10 Capital Cost Requirement by Zone for Teacherages



5.2.7.4 Years 11 to 15

The following data illustrates the total costing for both additions and new construction in years 11 to 15 in relation to the corresponding zone. Figure 5.21 presents the capital needs for teacherages across all zones.

Table 5.21: Years 11-15 Capital Cost Requirement by Zone for Teacherages

Years 11-15		
Zone Number	Type	Costing
Zone 1	Additions	\$532,423
	New Construction	\$1,975,058
	Planning & Design	\$376,122
Zone 2	Additions	\$21,843,826
	New Construction	\$76,944,250
	Planning & Design	\$14,818,211
Zone 3	Additions	\$0
	New Construction	\$2,816,497
	Planning & Design	\$422,475
Zone 4	Additions	\$19,029,382
	New Construction	\$51,897,312
	Planning & Design	\$10,639,004
Total - All Zones	All Types	\$201,294,561

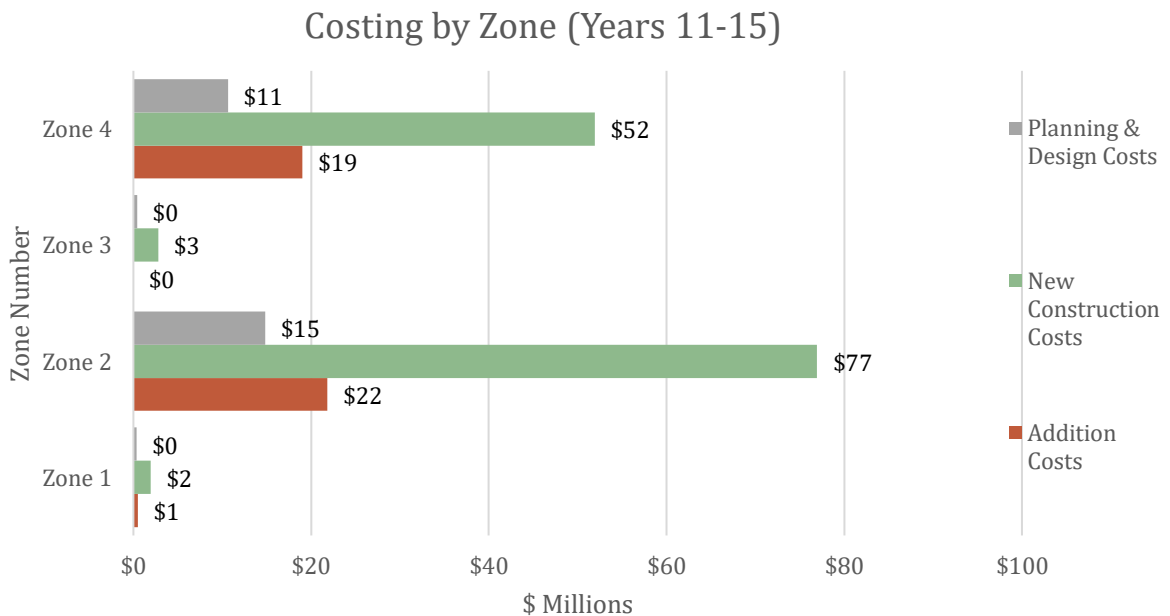


Figure 5.21: Years 11-15 Capital Cost Requirement by Zone for Teacherages



5.2.7.5 Years 16 to 20

The following data illustrates the total costing for both additions and new construction in years 16 to 20 in relation to the corresponding zone. Figure 5.22 presents the capital needs for teacherages across all zones.

Table 5.22: Years 16-20 Capital Cost Requirement by Zone for Teacherages

Years 16-20		
Zone Number	Type	Costing
Zone 1	Additions	\$587,838
	New Construction	\$0
	Planning & Design	\$88,176
Zone 2	Additions	\$18,633,167
	New Construction	\$25,048,247
	Planning & Design	\$6,552,212
Zone 3	Additions	\$0
	New Construction	\$0
	Planning & Design	\$0
Zone 4	Additions	\$34,351,336
	New Construction	\$35,564,100
	Planning & Design	\$10,487,315
Total - All Zones	All Types	\$131,312,391

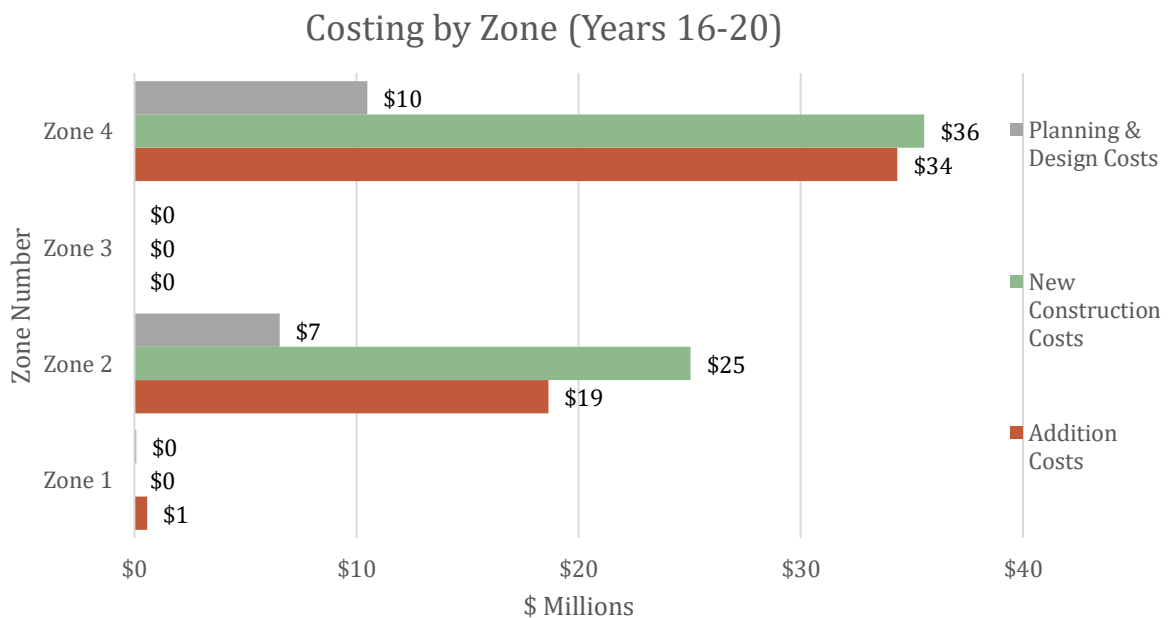


Figure 5.22: Years 16-20 Capital Cost Requirement by Zone for Teacherages



6.0 Northern and Remote Considerations

There are numerous factors influencing northern and remote First Nations that result in particular challenges regarding education infrastructure. This study has included a summary of the condition of existing schools and teacherages in Zone 3 and 4 communities, as well as the costs associated with replacing and renovating schools and teacherages over the planning period. This section discusses further considerations uniquely impacting remote communities' education infrastructure.

Northern and remote First Nations are spread across the country, and since they face different geographic and economic circumstances, each community has unique challenges [13]. That being said, there are some common challenges that affect many northern and remote communities, which are identified and discussed below. Each of these factors has an impact on education infrastructure, whether on the condition or quality of existing infrastructure, and/or the cost of maintaining or constructing new infrastructure. These common factors include, but are not limited to:

- Construction costs and quality
- Energy supply concerns
- Internet connectivity challenges
- Access to qualified maintenance personnel such as O&M technicians
- Challenges facing students with special education needs
- Schools with limited grades offered

This discussion is limited in scope to education *infrastructure* only, and therefore does not discuss additional challenges faced by northern and remote First Nations with regards to education programming and service delivery, such as recruitment and retention of faculty.

6.1 Quality & Cost of Construction

Northern and remote First Nations face additional obstacles to constructing quality education infrastructure due to their remoteness, short building season, and sometimes challenging terrain. Climate change exacerbates some of these factors.

Zone 4 communities have no year-round road access, which means relying on transport over water or by freight plane during warmer months, and often winter roads over the coldest months. These transportation options result in elevated costs to transport construction materials and equipment, and in cases where the winter road is relied on for bringing in construction supplies or heavy equipment, First Nations often have a narrow window of time in which to coordinate and complete all necessary transportation. Missing this window, due to warmer winter days for example, may result in a construction project being delayed until the following year. An example of the effects of winter road conditions on education infrastructure is a northern First Nation whose winter road was affected by warmer than usual weather during the 2020 winter months, resulting in winter road closures which threatened the safe transport of 70 truckloads of construction materials needed to build the new school [14].

Climate change continues to threaten the winter road season; it was estimated that the 2020 winter roads were a month behind where they historically would have been [15]. Predictions about global warming suggest further degradation to winter transportation to come [16]. In addition to variable winter road seasons conditions, other challenges facing northern First Nations with winter road reliance include lack of redundancy on the winter road network, inconsistent winter road corridor



quality and timing, inconsistent and inadequate winter road signage, and safety and security concerns for road users [17].

As described in the 2014 *Study on Addressing the Infrastructure Needs of Northern Aboriginal Communities*, “the physical integrity of infrastructure across the North is being undermined due to such ecological forces as permafrost reduction, which is causing ground subsidence, and severe weather events, which are affecting seaside infrastructure through coastal erosion. As a result, there is a need not only for new Capital investments and repairs, but also for new technologies, structural designs, and climate adaptations [18]”.

Another important consideration regarding construction of education infrastructure in Northern and Remote First Nations is the role of standards and regulations. Some facilities in Northern climates require different building materials for a well-coded building, however enforcement of this is not always included in project oversight and implementation. For example, in the Yukon *Building Standards Act*, the *Building Code Modifications Regulation* is made, which outlines certain modifications that Yukon has adopted as part of its building code, which may be over and above or contrary to what is contained in the *National Building Code* [19].

Members of the Unique Needs of Northern and Remote Communities Task Team have shared anecdotes of past projects where, for example, building materials with superior insulating properties were requested for a school building, in accordance with local building codes, and yet these were not included in the final building construction [20]. A combination of factors may contribute to these challenges, including a limited quantity of quality contractors, as well as current ISC tendering policies which have resulted in the lowest bidder being awarded the project. Overall, this illustrates the challenge of designing and constructing education facilities to the applicable local building standards in order to ensure that infrastructure is suitable for the specific climate for which it is built.

Geographical remoteness also impacts the cost of construction, not only due to transportation challenges and fees, but also due to the cost escalation associated with bringing in outside contractors from a significant distance. The distance and isolation, combined with extreme cold conditions, increases construction (and operation) costs [21]. Being rural, northern, and remote results in all construction projects being more expensive, and at higher risk for overruns and time delays [22]. Availability of contractors during the narrow construction season window can also lead to higher construction costs. Project delays resulting in spring project approvals also impacts contractor availability; “communities often hire inexperienced contractors at a higher cost because approvals are granted in late spring...the inability to re-profile funding to the next fiscal year also forces communities to pay more for winter and overtime work” [23]. While these project approval timing issues affect all First Nations communities, the consequences for northern and remote communities are increased due to the shorter construction season.

6.2 Power Supply

A significant infrastructure challenge facing many northern and remote communities is power supply adequacy. The ISC 2011 report on the *Status of Remote/Off-Grid Communities in Canada* defines “remote” as any community not currently connected to the North-American electrical grid nor to the piped natural gas network [24].



Power supply challenges facing remote communities include limited access to fuel, higher fuel costs associated with transport, and challenging fuel logistics including the need to purchase and store large excess fuel volumes [13]. The more remote a community is, particularly if it does not have year-round road access, the higher the costs to transport fuel are, and the more the community needs to store fuel locally [13]. Power supply costs are also higher due to the greater electricity demands associated with colder climates in northern communities.

Many remote communities rely on diesel generators, which have higher operational costs in addition to the poor economies of scale which already contribute to higher generation costs [13]. Since many northern and remote communities are small, they face the added challenge of large variation between peaks and troughs of electricity demand. This variation in demand necessitates larger diesel generators, which most of the time operate well below capacity, in turn decreasing fuel efficiency and driving energy generation costs up even higher [13].

While some northern and remote communities are investigating or adopting sustainable energy sources such as wind or geothermal, cold climates affecting many of these First Nations make it challenging for many forms of electricity generation technologies to operate, especially in winter [13].

Due to subsidies, the cost of energy supply may not be a significant challenge for all northern and remote communities, however other factors such as power supply availability and reliability may pose challenges to education infrastructure. Remote communities that rely on diesel fuel that brought in only once or twice a year are vulnerable to running out of fuel and being unable to access it for long periods [13]. Further, black-outs may often occur in remote First Nations, especially if diesel generators break down or are not properly maintained [24].

Power supply challenges affect the whole community, but can have a specific significant impact on education infrastructure as well. The often expensive and sometimes unreliable power supply issues discussed above results in increased maintenance costs for schools and teacherages, as well as health & safety risks if the community relies on the school as an emergency shelter.

6.3 Internet & Connectivity

A significant infrastructure challenge impacting education infrastructure in northern and remote First Nations is access to reliable and adequate internet servicing. It has been well reported that there is a connectivity infrastructure gap between First Nations communities in Canada and the rest of the country. The Canadian Radio-Television and Telecommunications Commission (CRTC) 2019 report on Communications Monitoring found that 1.5 Mbps broadband availability was much lower in First Nation reserve areas in the North [25]. THE CRTC target for broadband (50 Mbps download and 10 Mbps upload with an option for unlimited monthly data transfer) is currently available to 85.7% of Canadian households. By contrast, only 31.3% of First Nation reserves meet this target, which is even lower than the rate of 40.8% for rural households across the country. First Nation reserves in Saskatchewan, Newfoundland and Labrador, Yukon, and Northwest Territories have no access at all to the target 50/10/unlimited service (these regions all have less than 10 Mbps service) [25].

The lack of adequate internet connectivity is exacerbated in northern and remote communities. In Yukon, Northwest Territories, and Nunavut, 50/10 Mbps unlimited broadband is unavailable altogether [25]. The situation is worse for First Nations; whereas approximately 90% of all Yukon



residents have 1.5 Mbps broadband service availability, but less than 50% of First Nations communities in Yukon have access to that same broadband service. Digital infrastructure costs are much higher in northern and remote communities than elsewhere in Canada, and many remote Indigenous communities may be struggling to pay the high costs of using digital technologies [26].

The importance of adequate connectivity for education is significant. The 2018 article *Indigenous peoples and empowerment via technology* notes that “increased access to communications technology has the power to address some of the challenges in education. Greater availability of computers in schools and in the community would provide access to distance learning, permitting residents to remain in their communities, and to gain the necessary training to meet individual and community needs [27]”. During the 2017 Indigenous Connectivity Summit, participants shared how connectivity helped facilitate distance education in communities without high schools or post-secondary institutions, allowing students to complete their studies while maintaining critical connections with family, community, and land [28].

In schools with strong connectivity infrastructure, educators use email daily, including communicating with parents and the community. In the classrooms they and the students can use SMART boards, e-Learning programs, various multimedia programs, videos, laptops and iPads [26]. Adequate bandwidth allows teachers to integrate digital technologies into the classroom, such as accessing websites with interactive science resources or online cloud library services. Other benefits of connectivity infrastructure to education include the ability for faculty and staff to access videoconferencing, data transfer, and voice services. Teachers may also access courses via the internet to allow them to maintain certifications and access professional development opportunities. School administrators in one remote community in Labrador reported constant frustration in carrying out basic tasks now done online, such as attendance tracking which may take exponentially longer due to a weak internet connection [26].

A Canadian teacher who won a Global Teaching Prize for her success as an educator in Nunavik made the key insight that while Western cultures value isolated, abstract learning that takes place in schools where families are not involved, the Inuit model of learning is applied learning incorporated into the fabric of family and community. It has similarly been noted that many First Nations cultures had pedagogical approaches that emphasized learning through observing and doing, and learning through authentic experiences, and that meaning is often found in the social world of individuals, families, and communities. Considering these cultural values and approaches, “providing free, high-speed access to technology in a community meeting place that unifies learning, meetings with elders, children’s centers etc. can strengthen rather than undermine Indigenous cultures. It can further provide additional opportunities for Indigenous peoples to bridge distance divides, develop economic opportunities, and otherwise utilize technology in a way consistent with self-determination [27]”.

Another important value that technology in education can bring is the potential ability to incorporate Indigenous languages into the classroom to a greater degree. Education in one’s native language is recognized by the United Nations as an Indigenous right, and students educated in a system that includes their language and culture do better academically and are more likely to stay in school [27].



6.4 Access to Qualified Maintenance Personnel

Another challenge facing many northern and remote First Nations is the availability of qualified facility maintenance personnel, including O&M technicians. As described in the 2014 *Study on Addressing the Infrastructure Needs of Northern Aboriginal Communities*, “one cannot assess the cost of building and maintaining infrastructure in Northern Aboriginal communities without first considering the longstanding logistical challenge of geographical remoteness. Moreover, such relatively hard factors are compounded by softer challenges such as the lack of capacity within many Northern Aboriginal communities to manage the construction, operation, and maintenance of local and regional infrastructure. The relative absence of various technical skill sets can prove a challenge for both sustaining infrastructure in the field and for developing the required but increasingly complex financing arrangements to support its sustainability” [18].

Access to technical capacity regarding facility maintenance is a crucial aspect of education asset management. In remote communities which may lack some of these technical skills, school and teacherage maintenance programs may suffer, either from lack of preventative maintenance activities performed on a regular basis, and/or from the greater costs associated with bringing in outside contractors to perform maintenance activities at an elevated cost due to the geographical remoteness.

A separate and related human resource challenge facing northern and remote communities is an undersupply of labour to support the construction of education infrastructure [21].

6.5 Challenges Facing Students with Special Education Needs

There are many barriers faced by students with special education needs, especially in the First Nations education context, where the special education needs are greater and the resources significantly fewer [29]. While a fulsome discussion of these needs is outside of the scope of this report, it is worth highlighting some particular challenges concerning education infrastructure that affect students with special education needs who reside in northern and remote First Nations. A large number of children and youth with special needs in northern and remote First Nations are not attending school [30], and while the reasons for this are many and complex, adequate education infrastructure is one important component.

Being limited by Indigenous Services Canada formulas, existing schools on reserve have not been able to provide sufficient infrastructure for students with special education needs. Special education infrastructure needs include both student and teacher dedicated spaces, such as dedicated space for one-to-one assistance, and a safe space for reducing sensory stimulation.

These infrastructure needs are significantly greater in the northern and remote context, particularly regarding access to professionals and paraprofessionals needed to assess and support students with special education needs. Students need access to specialists for assessment and intervention, which often currently requires travel away from the home. Adequate infrastructure in the community, including appropriate lodging and temporary office space in the school, could help facilitate those professionals visiting remote or isolated First Nations.

A Nishnawbe Aski Nation report on special education needs [30] also identified the potential requirement for northern First Nations to have a dedicated “community special needs centre” to



provide wrap-around, holistic services for special needs students. This centre would facilitate the work of a trained, local, community-based team for coordination of referrals, assessments, physiotherapy, and occupational therapy, as well as provide housing for adults with special needs. The report also identified a lack of adequate education infrastructure in other areas, including spaces for special needs programs, daycare, and confidential office space for front line workers [30].

6.6 Schools with Limited Grades Offered

A significant challenge affecting many northern and remote First Nations schools is the limitation of grades being offered. Some northern and remote First Nations do not have a high school on reserve at all, or if existing schools offer some high school, it may only be up to grade 9, 10, or 11. This is a well-established reality, such as in Ontario, where hundreds of First Nations youth must leave their homes to attend school in Sioux Lookout or Thunder Bay, at one of two First Nations schools run by the Northern Nishnawbe Education Council [31].

At the other end of the education spectrum for children and youth, many First Nations also lack adequate early childhood education infrastructure. Where daycares are available, spaces are often limited, resulting in most young children in northern First Nations lacking access to daycare facilities. This is especially important to consider in the context of students with special education needs, as early screening and intervention can be critical to a student's success [32]. Due to these challenges, students with special education needs could start their formal education in kindergarten or grade 1 with undiagnosed serious special needs, and schools may not have the adequate space, equipment, and staff resources to identify these needs or adequately support these students.



7.0 Conclusion

7.1 School Capital Costs

A capital cost estimate was developed for on reserve First Nation school facilities across Canada using the 2021 SSAS guidelines with projected enrolment data, and using the tenth year of occupancy to determine eligible space. The enrolment projections are estimated based on the calculated 2021 nominal roll, along with a projected growth rate of 0.8% per year. The total school capital estimate for the immediate, years 1 to 5, years 6 to 10, years 11 to 15, and years 16 to 20 phases was determined to be \$11,185,370,884 over the 20-year planning period. This value was calculated taking into consideration the space a school was eligible for, what zone the school was located in, as well as an estimated 2% inflation rate of construction costs.

7.2 Teacherage Capital Costs

A capital cost estimate was developed for teacherages using the Level of Service Standards and Management of Teacherages on Reserve guidelines with the projected enrolment data. The enrolment data is estimated based on the calculated 2021 nominal roll and a projected growth rate of 0.8% per year. This total teacherage capital cost estimate for the immediate, years 1 to 5, years 6 to 10, years 11 to 15, and years 16 to 20 phases was determined to be \$1,574,679,465 over the 20-year planning period. This value was calculated taking into consideration the teacherage floor space requirement each First Nation was eligible for, what zone the community was located, as well as an estimated 2% inflation rate of construction costs.

7.3 2021 School Space Accommodation Standards

The results contained within this report are calculated in accordance with the guidelines of the 2021 School Space Accommodation Standards. While the 2021 SSAS does not yet incorporate planning based on the projected 10th year of occupancy, it is expected that updated standards to come will include this change. As such, the 10th year of occupancy has been assumed for this report. We recognize that the SSAS is an evergreen document. The spreadsheets prepared by FNESL for this analysis have been developed so as to facilitate a future update of these results as efficiently as possible, should future versions of the SSAS necessitate this.

7.4 Operation and Maintenance (O&M)

Operation and Maintenance (O&M) cost requirements were not included in the scope of this study. As recognized by AFN, it is important to consider O&M requirements when completing an infrastructure Needs Assessment. An O&M Needs Assessment for First Nations Education Infrastructure is currently underway, which will serve as an accompaniment to this report.

7.5 Asset Management Planning

When considering replacement of existing infrastructure within a First Nation, such as a school or teacherage, it is important to consider Asset Management Planning (AMP). It is crucial to maintain an AMP lens in any infrastructure analysis, and to recognize the ways in which education infrastructure is interconnected with other community infrastructure, including water, wastewater, internet and more.



8.0 Limitations of Report

As described above, this report followed the Indigenous Services Canada current School Space Accommodation Standards (except using the 10th year of occupancy) to calculate eligible floor space and outdoor learning areas for each First Nation school included in the dataset. It is therefore worth stating (or restating) some limitations of the findings of this report regarding the capital needs of education infrastructure:

- The findings are for the 391 schools included in the data set, as compared to the estimated 526 schools on reserve in Canada. The capital needs of federal schools, private schools, schools in self-governing First Nations communities, and schools whose education programming is delivered by the province are not addressed in this analysis.
- This needs assessment assumed that the same grades currently offered by schools would continue to be offered over the planning period. The capital costs contained in this report, therefore, do not include the provision of adequate education facilities for all students on reserve, as many existing schools, particularly in northern and remote First Nations, do not provide education up to grade 12.
- Schools and teacherages rely on supporting infrastructure to function, including suitable land area, water servicing, wastewater servicing, electrical supply systems, solid waste management systems, and connectivity infrastructure. The availability of supporting infrastructure and the cost to improve these infrastructure categories are excluded from this report.
- The costs reflected in this report do not include equipment and furnishing costs, including specialized equipment that may be required to support students with special needs, such as assistive devices and sensory equipment.
- The unit costs used for various zones used in this analysis are estimates based on current Indigenous Services Canada formulas, as well as a limited sample of tender cost data. Further investigation is warranted into the appropriate zone multipliers to use to account for escalating costs associated with remoteness. Costs associated with remoteness, isolation, and school size may be higher than the estimates captured here.
- The infrastructure requirements to support students with special needs are not adequately represented in this analysis. As reported in the *AFN High Cost Special Education (HCSE) Program Review* [29], regional discussions have identified the lack of dedicated space and equipment for HCSE students.
 - Required renovations to existing facilities to meet accessibility standards have not been identified or quantified in this report, including structural adaptations (such as ramps, lifts, remote door openers) that remove or reduce physical barriers for an individual with a disability.



- Many students with special needs require one-to-one assistance, which for some can be accommodated with sufficient space in the classroom, and for others may necessitate a separate quiet space. This assessment has not confirmed whether calculated floor areas are sufficient to accommodate this space.
- An important infrastructure requirement for some students with special needs is a safe space that reduces sensory stimulation. This assessment has not confirmed whether calculated floor areas are sufficient to accommodate this space.
- A significant challenge for students with special needs is access to allied health professionals, including psychologists, speech language pathologists, occupational therapists, etc. This needs assessment has not confirmed whether calculated floor areas are sufficient to accommodate these professionals, including providing sufficient office space.
- When considering the potential allocation of Gross Floor Area to the functions mentioned above, it is important to note that a clearly expressed need has been to protect and restrict funding generated by special education to be used only for special education [29].
- Some students with special needs may be unable to attend school full-time and may have infrastructure needs to support their learning in the home environment. This assessment has not included determination of the capital costs associated with ensuring adequate resources to address the physical accommodations and technology necessary to support students in their learning at home. These include, for example, structural adaptations that remove or reduce physical barriers for an individual with a disability.
- The COVID-19 pandemic highlighted that all students may require an appropriate environment with sufficient resources to attend school virtually from home. The infrastructure and costs associated with a remote learning model have not been assessed in this study. The new norm for education may be continuous change and adaptation to the needs of students and the environment [29], and this should be considered in needs assessments in the future.
- The capital costs calculated for teacherages follows the Indigenous Services Canada standards. These standards do not account for the additional lodging needs of professionals and paraprofessionals needed to support students with special needs. Transportation and lodging required to contract service providers is a key consideration for supporting students with special needs, and many First Nations lack the sufficient accommodation facilities for visiting professionals. Additional accommodations may also likely be required to provide year-round housing for special education staff, such as education assistants. Having access to appropriate lodging opportunities may also support the ongoing efforts to recruit and retain these professionals.
- Transportation costs have been excluded from this analysis, including the necessary transportation required for some special needs students to attend school. Also excluded are



the transportation costs for students with special needs to travel to access consultations and professional services. The significant cost driver of transportation for visiting professionals and paraprofessionals to attend First Nations schools is also excluded. While some transportation costs are better suited for an operations and maintenance (O&M) cost analysis, some capital cost considerations, such as the purchase of vehicles for student transportation on reserve, are worth noting as exclusions to this Education Infrastructure Capital Needs Assessment.



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