ALASKA DEPARTMENT OF NATURAL RESOURCES

# Carbon Offset Opportunity Evaluation

August 2022 Report

anew

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## Conditions of Use

This analysis represents Anew's good-faith effort to provide an objective and accurate summary of current and anticipated future market conditions, based on Anew's long-standing and extensive experience in such markets and third-party observations and data. Market conditions can change, however, at any time, and may (and likely will) be affected by multiple factors outside of Anew's control. Anew expressly disclaims any obligation to update this analysis.

Anew believes that all information in this report is accurate. However, Anew has, in some cases, relied on information obtained from third parties in preparing this analysis and makes no warranty as to the completeness or accuracy of information obtained from such third parties, nor can it accept responsibility for errors of such third parties, appearing in this analysis.

# 1.0 Introduction

Anew has been retained by the State of Alaska's Department of Natural Resources (the Department) to identify potential emission reduction projects that could be implemented for the purpose of generating carbon offsets. The State seeks to investigate the potential for a carbon offset credit program based on carbon sequestration on State lands.

The goal of this report is to identify the most promising opportunities in Alaska that could generate revenue for the Department. The scope of work specifically seeks to evaluate forestry-based carbon credit opportunities along with other feasible nature-based carbon offset opportunities using State lands. This report will look for potential offset project opportunities across a variety of sectors by reviewing the 350+ published voluntary and compliance/regulatory offset protocols. Project opportunities are grouped into five categories as requested by the Department:

- forestry,
- geologic sequestration,
- marine sequestration,
- soil carbon sequestration, and
- other.

For project activities where a protocol is readily available, the benefits and challenges associated with developing the offset project are discussed. High potential offset generating activities that do not have an available published protocol are identified and the protocol development process has been provided. Justification into high potential versus low potential projects is provided. This report does not identify specific suppliers, sites, or project partners, but rather recognizes project activity type that could reasonably be implemented in the State to generate revenue from the voluntary carbon market.

To complete this scope of work, published protocols, standards, and guidance documents were used to determine the most promising opportunities and provide the most accurate recommendations for the Department. Ease of implementation was determined in part by evaluating whether and how many times a protocol has been used on a registry, as well as through experience working with the protocols and registries in question.

The report is structured as follows, first a summary of the State's latest greenhouse gas (GHG) inventory is provided alongside an analysis of key sources and sinks. Next, an overview of the voluntary offset market is provided to provide background and context as to how credits are developed and priced. This is followed by a discussion of general offset principles and how these impact quality and price of offset credits. The bulk of the report is focused on identifying high potential offset project activities, including a deep dive into three projects that could be piloted by the State. The discussion of these pilot projects includes a carbon inventory estimate and an evaluation of the adequacy of existing data sources. The report concludes with key recommendations. The remaining sections identify protocols available in the non-forestry categories, evaluate additionality at a high level, and discuss key implementation considerations such as approximate timeline and ease of implementation. Procedure Guides for development of voluntary carbon offset projects are included in Appendix A and B.

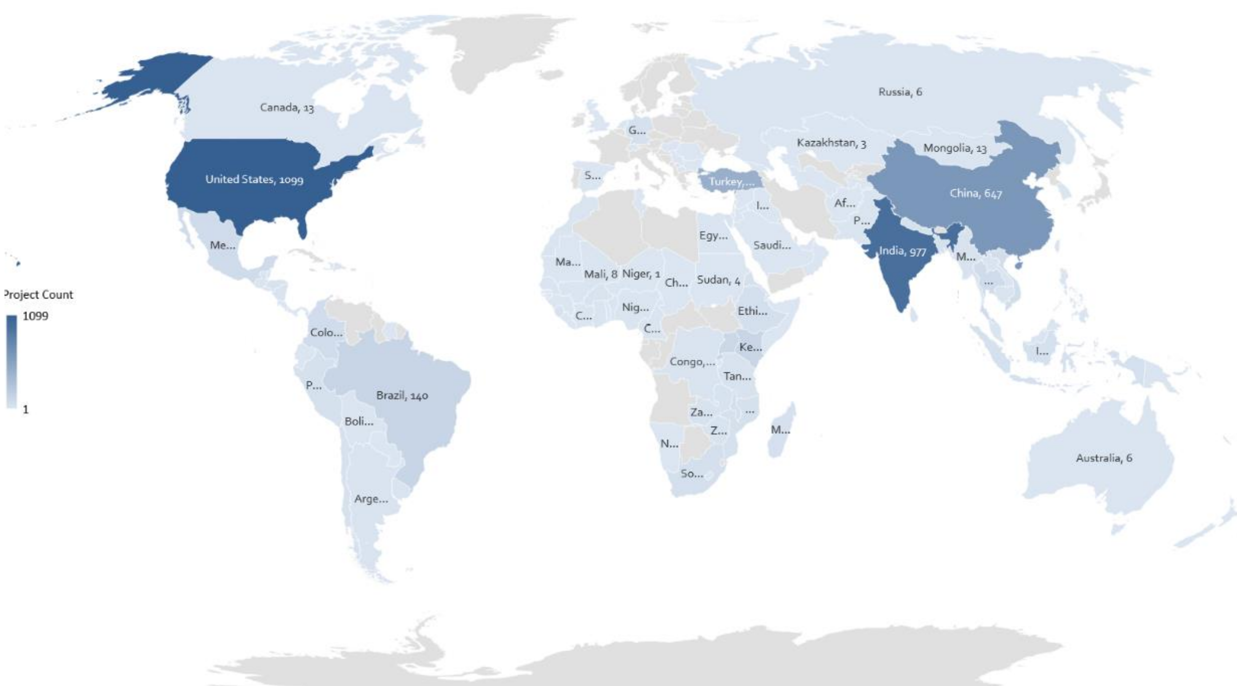
## 2.0 Voluntary Carbon Market Overview

The following section discusses key aspects and trends in the voluntary market with an emphasis on North America.

The voluntary carbon market refers to the disaggregated exchange for environmental credits – primarily carbon offsets – that are generated and purchased through voluntary actions that are not required by a law or regulation.

The voluntary carbon market has seen a sharp increase in both supply and demand in recent years. There is an increased recognition of the importance of climate action among private, public, and governmental organizations that has led to 100 million offset credits retired globally in 2020. The U.S. is the largest player in the voluntary carbon market. In 2020, nearly 77.5 million credits were retired from US-based projects, making up roughly 80% of the global 2020 retirements. The United States leads in voluntary offset project development as well, with a total of 1099 registered projects as shown in Figure 1: Voluntary Offset Projects by Country. In 2020, a total of 13 new American Carbon Registry (ACR) projects and 10 new Climate Action Reserve (CAR) projects, were issued credits in 2020 in the U.S.

*Figure 1: Voluntary Offset Projects by Country*

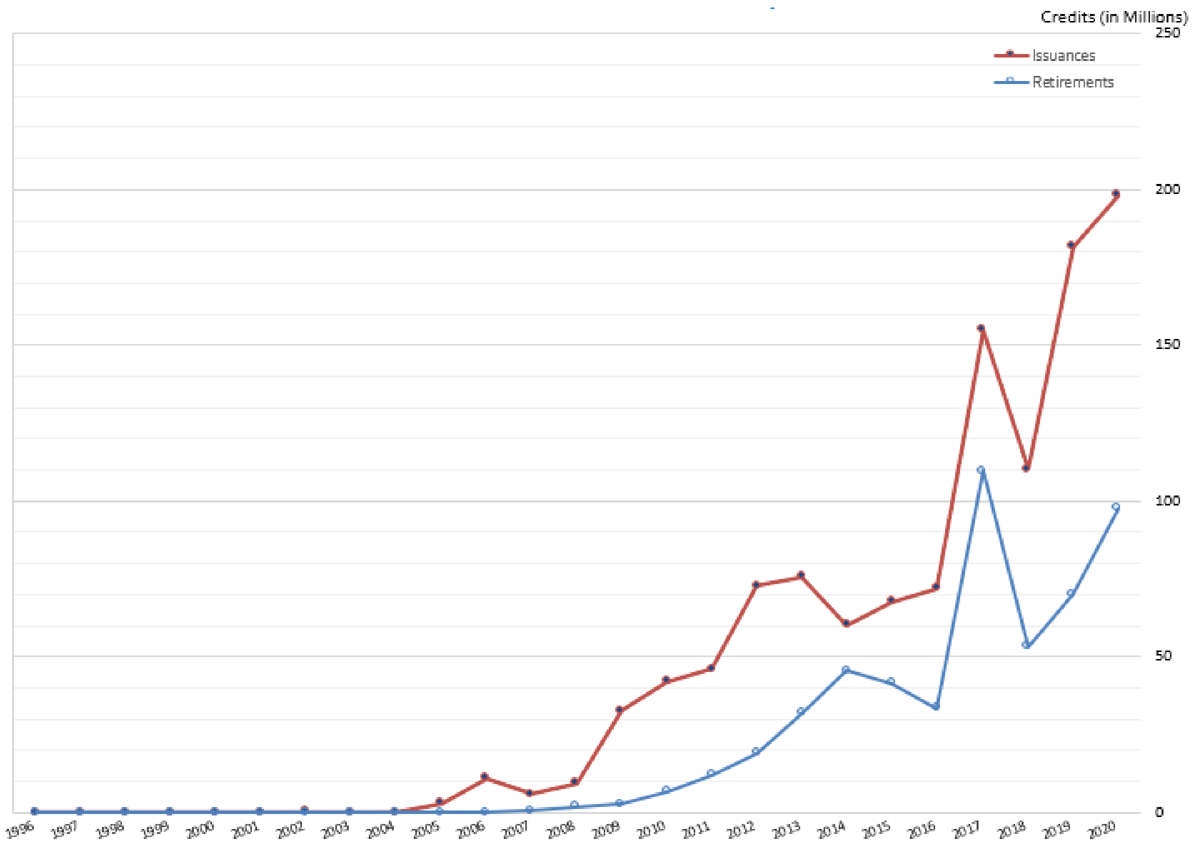



Source: University of California (Berkeley), 2021

Due in part to the lack of economy-wide carbon regulations in the U.S. (such as a carbon tax), many U.S.-based corporations have announced their own climate pledges such net-zero emissions by 2030 or 2050. As it is difficult – if not impossible – to operate many businesses with zero emissions, most of the companies with a net-zero goal will rely on offset credits to neutralize at least some of their operating emissions to achieve carbon neutrality.

With many of these net-zero targets set for 2040 or 2050, Anew anticipates a significant increase in demand for offset credits in the next decade. It therefore follows that there is an urgent need for high-quality, high-volume offset projects to be developed. Some market proponents are anticipating the market will need to scale at least 15x and potentially 160x to meet the growing demand.[1] The current scale of the market can be seen in Figure 2. The discrepancy in this figure between the issuance and retirements is thought to reflect credit banking. Data is not publicly available on credit sales or transfers, only issuances and retirements; therefore, since prices are continuing to increase for all credit types, it can be inferred that entities are banking credits, or at least purchasing credits without their immediate retirement. Overall, demand is increasing as the number, and types of participants in the market increases. Participants increasing demand by purchasing credits include corporations, crypto companies, financial institutions, and some governments.

*Figure 2: Historic Volume of Voluntary Offset Credits Issued and Retired by Year (Total Market)*




Source: University of California (Berkeley), 2021

The voluntary carbon market in North America is supported by four main registries:

- ACR
- Verra Registry (through the Verified Carbon Standard -VCS)
- CAR
- The Gold Standard (GS)

[1] Task Force on Scaling Voluntary Carbon Markets: https://www.iif.com/tsvcm

Each registry publishes and maintains its own standard which is used by offset Project Proponents to ensure the credits represent real emission reductions that are permanent, do not increase emissions elsewhere ("leakage"), have clear quantification parameters, and are verifiable by an independent third party. Offset protocols are developed by the registries and set out detailed procedures for quantifying the GHG benefits of an emission reduction project, and each protocol is specific to a certain project activity. These protocols are reviewed and updated or removed from the registry over time to reflect current conditions in regulatory requirements, accepted common practices that are no longer considered additional, and/or advances in technology and standards.

It is important to note that an offset project will be listed on whatever registry has published the applicable protocol. For example, a project using an ACR protocol must be registered on ACR.[2] Credits are not fungible between registries.

In addition to publishing guidance documents, the registries facilitate the trading of credits through the transparent listing of project information and a publicly available log of issued and retired credits. This is a cornerstone to ensuring credits are not double counted. Once a credit is retired, the emission reduction is formally claimed, and the credit may not be re-issued or re-sold.

While each offset credit represents one metric ton of carbon dioxide equivalent ($CO_2e$) reduced, avoided, or removed from the atmosphere, not all credits are created equal in the eyes of the buyer. There are various "co-benefits" and specific project types that buyers often desire when purchasing credits to meet a voluntary goal. Some of the desirable attributes that buyers look for include:

- Charismatic project types such as nature-based solutions
- Community benefits related to the buyer's corporate social responsibility (CSR) goals
- Direct application of one or more United Nations Sustainable Development Goals (SDGs)
- Location near the buyer's operations
- $CO_2$ Removals

Each of these will influence the price that buyers are willing to pay. Currently, there is a large demand for nature-based projects, like forestry or grasslands, and these credits often sell at a premium, ranging in price from $12-22 USD/credit.[3]

Conversely, there are also attributes that put downward pressure on the price of credits. Some of the less desirable characteristics include older vintage, industrial project types, and for North American buyers, projects located outside of the U.S. or Canada. While the projects considered in this report are located in the U.S., it is important to consider how the other attributes may impact price. Since buyers preferentially seek credits that are generated in the year of purchase, credits could become less valuable over time, the longer it takes to sell them. Finally, for many buyers, credits generated from oil and gas companies may be less desirable. This is especially true for buyers who are not in the energy industry themselves.

[2] Verra provides an exception to this rule and allows Project Proponents using Climate Action Reserve or Clean Development Mechanism protocols to register project on the Verra registry: https://verra.org/methodologies/
[3] EcoSystem Marketplace, 2020: https://share.hsforms.com/1FhYs1TapTE-qBxAxgy-jgg1yp8f

## 3.0 Offset Principles

There are several important factors that need to be considered when pursuing the development of carbon offset projects. These principles are upheld by the compliance offset programs, registries that develop offset methodologies and market observers, and are the basis of ensuring the offsets are high quality.[4] Offsets must address potential GHG leakage, be additional, verifiable, enforceable, real, permanent and use a credible offset registry.

**Leakage.** Leakage refers to an unintended increase in GHG emissions, or the shifting of emissions from one place to another due to the carbon offset project.

**Additional.** Offsets must represent an emission reduction that goes above and beyond "business as usual". Additionality can be determined in multiple ways for each project, but typically the project proponent is required to show their process is not a regulatory requirement, is not common practice, and/or prove there is a financial, technical, or institutional barrier. A financial barrier means that the project faces capital or investment return constraints that can be overcome with the additional revenues associated with the sale of GHG credits. A technical barrier means that the project faces technology related barriers to its implementation. An institutional barrier means that the project faces financial (other than the one mentioned earlier), organizational, cultural, or social barriers that the revenue stream can help overcome.

**Verifiable and Enforceable.** Offsets are verifiable and enforceable when they use a published protocol and are registered on an approved offset registry (such as CAR, ACR, or Verra). Without a protocol, the project cannot be verified as protocols form the basis for the quantification and monitoring of offset projects. The key reason that offsets must be registered on a registry is to ensure the emission reduction is not double counted. Once an offset is claimed by the buyer to neutralize an equivalent tonne of $CO_2e$ emitted, it must be retired to ensure the same emission reduction is not claimed twice. Registries provide the infrastructure necessary to track the status of offsets and ensure offsets are retired when the emission reduction is claimed.

**Real.** While it may sound obvious, an offset must represent a real emission reduction. This is aligned with the discussion around leakage and the importance of ensuring that the quantification is complete, accurate and considers all relevant emission sources and sinks. In the case of the development of an offset protocol, it is necessary to consider the full lifecycle emissions and ensure the real emission reduction is quantified.

A tenet of real emission reductions is that they must be measurable, and the baseline and project conditions must be defensible. Records of historic practice are commonly required to prove the baseline in offset projects. To ensure the emission reduction is real, the project proponent must prove the actual scenario that occurred before the project was implemented.

**Permanent.** Emission reductions must be permanent. Permanence is primarily a consideration for biologic type offsets where there is a chance that the sequestered carbon could be reversed such that the stored carbon is released to the atmosphere. Permanence can be addressed through the use of a buffer pool or insurance to account for accidental reversals.

**Offset Registry.** Offset credits should come from a credible, transparent, and publicly accessible offset registry.

[4] https://ghginstitute.org/wp-content/uploads/2010/01/OQI_Ensuring_Offset_Quality_Exec_Sum_Jul08.pdf

# 4.0 Project Identification

This section explores offset opportunities in the forestry, geologic, marine, and soil sequestration, as well as other categories where the State owns assets that could potentially generate credits. These categories were identified by the Department in the scope of work for this report. Three Improved Forest Management (IFM) pilot projects were identified and are discussed in section 4.1.

## 4.1 Option #1 – Forestry

Forests are the planet's largest above-ground pool of carbon, and they play a key role in regulating and storing GHGs from the atmosphere. How humans use forests determines whether they are a carbon source (timber harvesting) or a carbon sink (growth and preservation). Because humans have the ability to change forest management practices to influence this outcome, forests can play a significant role in reducing global emissions and slowing climate change. Alaska has approximately 126 million acres of forest land,[5] much of which can be optimized to provide additional benefit to the climate through enhanced sequestration activities.

When trees are kept standing, $CO_2$ is conserved in the biomass. This is $CO_2$ that would have been released at the end of the product lifecycle if the wood was harvested and turned into timber, paper, or fuel. Second, when trees are left to grow, they continue to remove $CO_2$ from the atmosphere as part of their natural growth process. This removal of $CO_2$ is critical to the fight against climate change as society is working to not just reduce and avoid emissions but also reverse the GHGs that have been put into the atmosphere anthropogenically. For these reasons, and in consideration of the co-benefits discussed in Section 4.1.3, forest carbon has been an increasingly popular offset project type in the last decade and is at the forefront of what is called "nature-based solutions" to climate change.

There are three types of forest carbon offset projects seen in the voluntary market:

- IFM
- Avoided Conversion
- Afforestation/Reforestation

IFM has been identified as the highest potential project type for the State as these types of projects can be broadly implemented across the State forest lands and are the least costly to implement. IFM projects can be implemented on existing forests with a varying levels of maturity. The carbon credits are generated from the increase of $CO_2$ sequestered in the biomass above-and-beyond what would have reasonably been expected to be sequestered in the absence of the project. Accurately measuring the baseline is the most important aspect of an IFM project so that there is a clear understanding of how aggressively the forest would have been harvested if it were not for the commitment of the landowner to register for the offset project. Sustainable harvesting is allowed under an IFM project, but credits will not be generated if enough harvesting occurs that the $CO_2$ stores are reduced year over year. Project-compatible harvest levels will be established for individual forested areas after the completion of carbon inventory collection and growth modeling. Forest acres enrolled in a carbon project are not mandated to maintain explicit harvest limits beyond assuring that total removals across a given project boundary do not exceed annual growth. Harvest levels are permitted to fluctuate substantially from year to year and, given that Alaskan

[5] https://rngr.net/publications/tpn/54-2/tree-planting-inalaska/at_download/file#:~:text=Under%20the%20Alaska%20Forest%20Resource,natural%20regeneration%20can%20be%20used.

State harvest practices have been very sustainable over recent decades (around 10% of the Annual Allowable Cut), harvest levels would need to materially increase for removals to exceed levels acceptable under the carbon program.

There are few to no opportunities available for avoided conversion (AC) in Alaska due to the nature of these project types. AC projects require proof that a specific plot of forest land would have been cleared and converted to alternative land use type (i.e., row crop agriculture, residential real estate, commercial real estate) if it were not for the offset project. In addition to providing sufficient evidence that the conversion activity was imminent, a perpetual conservation easement is required to be placed on the subject property, ensuring that it will forever be maintained as forest. This project type faces two consistent barriers which are the volume of credits and leakage. Offset projects have fixed costs associated with verification, registration, and credit issuance. This means there needs to be a minimum volume of credits generated from a project so that once sold, the revenue from credit sales can cover these fixed costs. A rule of thumb is that the minimum size of a forest required to cover these costs is approximately 5,000 acres. If the project proponent can prove that enough land is now protected by way of the AC offset project, it may be possible to proceed with credit generation, however, leakage must be adequately addressed. As defined in Section 3.0, leakage refers to a shift in emissions as a result of the offset project. If the Department avoids the conversion of a significant area of forest, it must be robustly proven that the avoided development activity has not simply shifted to a different land area outside of the project boundary. If this occurs, there is no net benefit to the carbon offset and no "real" emission reduction has occurred.

Afforestation/Reforestation (A/R) projects also have few opportunities in the State. The main barrier to implementing an A/R project is the extended timeframe from project start to credit issuance. The growth of trees represents real removals of $CO_2$ from the atmosphere; however, for some types of trees, it could take 20-30 years of growth before the volume of accumulated carbon can provide a meaningful source of credit revenue. This time period is affected by many factors in addition to tree type, including growing conditions, and climate. Growth rates in Alaska are not favourable for these types of projects and the majority of A/R projects registered in the voluntary market are located in Latin America or Asia where growing conditions tend to be more advantageous than in northern climates. Additionally, under the Alaska Forest Resource and Practices Act, reforestation is required within 7-years following commercial timber harvest. This means in order for an A/R project to have "regulatory surplus", it must be shown that the reforestation activity is above and beyond what is required by law and cannot be quantified for reforestation activities done to meet the minimum requirement in this regulation.

### 4.1.1 Protocol Availability

Across the voluntary registries, 17 protocols related to forest carbon were identified as potentially applicable in the State. The California Air Resources Board (ARB) compliance protocol for U.S. Forest Projects was also considered, but its requirements make projects on public lands non-viable. Methodologies related to urban forest management and mangroves, or that have geographic specifications (i.e., only eligible in Canada) were excluded from this analysis.[6] It should be noted that a soon-to-be-approved Avoided Wildfire Emissions (AWE) methodology will enable generation of a new type of carbon credits (FMUs) under Climate Action Reserve's Climate

[6] Urban forest management would not be under the control of the state, but rather under the municipal jurisdiction where they are growing. Mangrove forests do not grow in Alaska.

Forward Program through the reduction of future emission projected to be generated by wildfires. At present, only the 15 western continental US states will be eligible to enroll, but the calculation methods should allow for future versions of the methodology to include western Canada and Alaska. Eligible activities for participating in the AWE program include prescribed burns, thinning, pruning, and mastication. Table 1 shows the total number of projects listed under each protocol with a further breakdown of the projects registered in North America and Alaska. This data provides useful insight on the relative ease of use of each methodology.

*Table 1: Forest Carbon Protocols Potentially Applicable to the State*

| PROTOCOL (Identified by registry, protocol number and protocol name) | # Projects TOTAL | # Projects N. AMERICA | # Projects ALASKA |
|---|---|---|---|
| **ACR:** Improved forest management for non-federal U.S. forestlands | 51 | 51 | 7 |
| **CAR:** Forest Protocol[7] | 35 | 35 | 0 |
| **ACR:** Improved forest management on small non-industrial private forestlands | 10 | 10 | 2 |
| **VCS:** VM0012 Improved forest management in temperate and boreal forests | 6 | 4 | 1 |
| **VCS:** VM0003 Methodology for improved forest management through extension of rotation age | 4 | 3 | 0 |
| **VCS:** VM0010 Methodology for improved forest management: conversion from logged to protected forest | 42 | 2 | 0 |
| **ACR:** Afforestation and reforestation of degraded lands | 2 | 2 | 0 |
| **VCS:** VM0005 Methodology for conversion of low-productive forest to high-productive forest | 4 | 0 | 0 |
| **VCS:** VM0006 Methodology for carbon accounting for mosaic and landscape-scale REDD projects | 18 | 0 | 0 |
| **VCS:** VM0011 Methodology for calculating GHG benefits from preventing planned degradation | 2 | 0 | 0 |
| **VCS:** VM0015 Methodology for avoided unplanned deforestation | 54 | 0 | 0 |
| **VCS:** VM0029 Methodology for avoided forest degradation through fire management | 0 | 0 | 0 |
| **VCS:** VM0035 Methodology for improved forest management through reduced impact logging | 0 | 0 | 0 |
| **VCS:** VM0037 Methodology for implementation of REDD+ activities in landscapes affected by mosaic deforestation and degradation | 0 | 0 | 0 |

[7] Protocol only applicable for projects located in the U.S.

| PROTOCOL (Identified by registry, protocol number and protocol name) | # Projects TOTAL | # Projects N. AMERICA | # Projects ALASKA |
|---|---|---|---|
| **CDM:** AR-ACM0003 Afforestation and reforestation of lands except wetlands[8] | 105 | 0 | 0 |
| **Gold Standard:** Afforestation/reforestation GHG emission reduction and sequestration methodology | 0 | 0 | 0 |

The ACR IFM on Non-Federal U.S. Forestlands is the most commonly used methodology for voluntary forest carbon offset projects in the U.S. This is largely due to the methodology's best in class baseline design mechanics and its requirement for landowners to commit to a 40-year project term to help assure permanence. As seen Table 1, there are seven voluntary offset projects that have been registered in Alaska;[9] four of which have been developed by Anew.

### 4.1.2 Additionality and Implementation

To be considered additional, a project using ACR's IFM methodology must apply a three-prong additionality test to demonstrate all currently effective and enforced laws and regulations are exceeded; common practice in the forestry sector and geographic region are exceeded; and there is a financial barrier to implementation. Additionally, a project area must be merchantable, accessible, and operable.

### 4.1.3 Pilot Project Identification[10]

Several key factors were considered when assessing the Alaska State Forests for pilot carbon project viability including accessibility, operability, and current/future biomass content. Broad pilot project areas were identified that are accessible based on proximity to current infrastructure, previously harvested stands, and stands slated for future harvests. These areas were then queried for stands considered operable in the most current management plans/inventory reports (based on criteria such as land use, forest type, terrain, and legal restrictions). The identified areas were then cross referenced with a base map developed by Anew staff to help quantify carbon stocking across the forest landscape. The three areas of highest carbon stocking and best accessibility/operability were then selected for the full pilot project analyses under the ACR IFM for Non-federal U.S. Forestlands protocol. Pilot project areas were kept as contiguous as possible to minimize complexity and costs of project operations.

In 2022, ACR formalized a differentiation between types of credits produced by IFM projects. Explicitly, IFM credits are now designated into two categories, "Conservation Credits" and "Removal Credits." Conservation Credits result from the avoidance of emissions by reducing harvesting compared to timbering levels that could be financially justified if a landowner wanted to prioritize maximizing short-term revenue from wood products. Removal Credits stem from ongoing live tree growth that accumulates across the forest following the commencement of a forest carbon project. Though these two credit designations have the same impact on the climate,

[8] Values in table represent total number of project listings using the identified protocol on the associated registry.
[9] There are an additional 11 compliance-grade offset projects registered in Alaska as part of the California Cap-and-Trade program which is separate from the voluntary market.
[10] Pilot project identification is associated with Deliverable A as outlined in RFP 2022 10004963

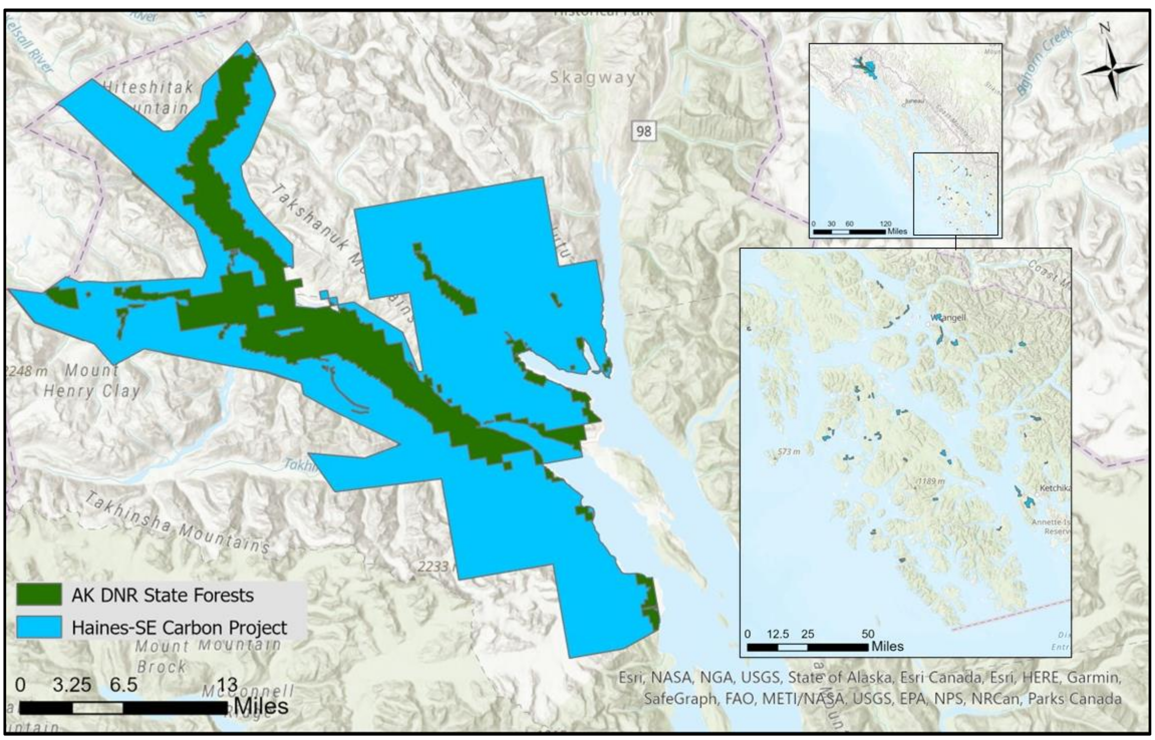
some buyers in today's voluntary carbon market prefer the carbon offsets generated from new growth and, as result, these buyers are willing to pay a premium for Removal Credits.

All assumptions made in these assessments are meant to be conservative yet as accurate as possible given the quality of the data provided. All assumptions are informed by experience with other Alaskan carbon projects and historic engagements working with other projects on state lands in the contiguous U.S.

## 1. Haines/SE Alaska

The Haines/SE State Forests contain some of the highest per-acre carbon levels in this analysis at 141 $tCO_2e$/ac. These lands are highly accessible, and operability is evidenced by the many past and planned harvests. Due to their size and proximity, combining these two management areas into a single carbon project is recommended. The Haines State Forest is used for multiple purposes, so it is recommended to constrain the project to those acres deemed accessible and operable in the Inventory Report (those acres managed by Haines State Forest). These areas also appear to be good candidates for near-term pre-commercial thins, which may be advantageous when developing an aggressive yet justifiable baseline harvesting scenario. Note that some of these "inoperable" areas are included in the Haines/SE Project Map (Figure 3) as shapefiles were not available for all units, but the acres were constrained in the analysis.

*Figure 3: Map of Haines/SE Carbon Project Area*




Source: Anew, 2022

According to management plans/inventory reports for these two areas, they could combine for approximately 76,900 acres of forested project area, with the potential to produce 1,334,000 carbon credits over the first decade of a project. At current carbon pricing projections, the first decade of crediting could be worth ~$33 million. This conservatively assumes 50% of growth will be cut per year across this land base (including precommercial and commercial harvest). This is higher than historic levels, meaning the State can continue its current sustainable practices with room to fluctuate while still cutting less than growth. Any amount of harvesting less than the modeled 50% of growth will result in higher carbon crediting. A summary of the crediting potential is shown in Table 2.

*Table 2: Haines/SE Crediting Table*

| Date | Conservation Credits | Removals Credits | Conservation Credit Price | Removal Credit Price | Gross Revenue | Project Expense | Net Revenue |
|---|---|---|---|---|---|---|---|
| **2023** | 67,000 | 84,000 | $15.00 | $25.00 | $3,105,000 | ($387,000) | $2,718,000 |
| **2024** | 67,000 | 84,000 | $16.00 | $26.00 | $3,256,000 | ($39,000) | $3,217,000 |
| **2025** | 67,000 | 84,000 | $17.00 | $27.00 | $3,407,000 | ($39,000) | $3,368,000 |
| **2026** | 67,000 | 84,000 | $18.00 | $28.00 | $3,558,000 | ($39,000) | $3,519,000 |
| **2027** | 67,000 | 84,000 | $19.00 | $29.00 | $3,709,000 | ($39,000) | $3,670,000 |
| **2028** | 67,000 | 84,000 | $20.00 | $30.00 | $3,860,000 | ($176,000) | $3,684,000 |
| **2029** | 67,000 | 84,000 | $21.00 | $31.00 | $4,011,000 | ($39,000) | $3,972,000 |
| **2030** | 25,000 | 84,000 | $22.00 | $32.00 | $3,238,000 | ($32,000) | $3,206,000 |
| **2031** | 0 | 84,000 | $23.00 | $33.00 | $2,772,000 | ($27,000) | $2,745,000 |
| **2032** | 0 | 84,000 | $24.00 | $34.00 | $2,856,000 | ($27,000) | $2,829,000 |
| TOTAL | 494,000 | 840,000 | $19.50 | $29.50 | $33,772,000 | ($844,000) | $32,928,0000 |

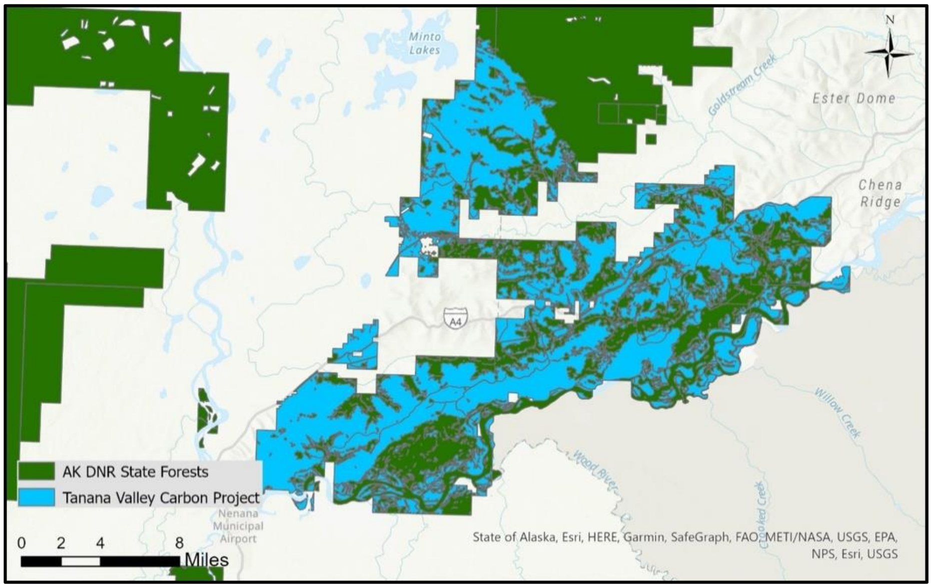
***40-Year Crediting Projections***

| Date | Conservation Credits | Removals Credits | Conservation Credit Price | Removal Credit Price | Gross Revenue | Project Expense | Net Revenue |
|---|---|---|---|---|---|---|---|
| **2023-2032** | 494,000 | 840,000 | $19.50 | $29.50 | $33,772,000 | ($844,000) | $32,928,000 |
| **2033-2042** | 0 | 810,000 | $25.00 | $34.00 | $27,540,000 | ($688,000) | $26,852,000 |
| **2043-2052** | 0 | 706,000 | $25.00 | $34.00 | $24,004,000 | ($670,000) | $23,334,000 |
| **2053-2062** | 0 | 630,000 | $25.00 | $34.00 | $21,420,000 | ($657,000) | $20,763,000 |
| TOTAL | 494,500 | 2,986,000 | $23.63 | $32.88 | $106,736,000 | $2,859,000 | $103,877,000 |

## 2. Tanana Valley (Fairbanks)

The Tanana Valley contains some of the largest contiguous tracts of State Forest in Alaska. The Fairbanks Resource Management zone was identified as the most accessible and operable region, particularly the south-central areas where a majority of past timber sales have occurred. Approximately 109,000 forested, operable acres were selected within the State Forest boundary using stand-level attributes in the Department's "Timber Types" shapefile as an overlay. "Dwarf" forests were excluded due to their low productivity and questionable merchantability; however, if these stands have merchantable potential they could be included in the project. 109,000 acres were selected to make estimates comparable to the other proposed areas, but this project could easily be expanded to include thousands more State Forest and Forest Classified stands. Note that the selected area was conservatively constrained within the current State Forest Boundary layer, as the State Forest boundaries may have more consistent borders and better-defined management plans (Figure 4). This could be expanded to include Forest Classified Lands or additional areas covered by the Timber Types shapefiles if deemed appropriate.

*Figure 4: Map of Tanana Valley – Fairbanks Carbon Project Area*




*Source: Anew, 2022*

At 104 $tCO_2e$/ac, the 109,000-acre project in south-central Fairbanks could produce ~830,000 credits over a decade, worth >$23.7 million in that time. This assumes a potentially conservative growth rate and assumes a higher harvest rate than current practices at 25% of growth cut annually. As was the case in the Haines/SE Alaska analysis, cutting less would result in greater credit generation. A summary of the project's crediting potential is shown in Table 3.

*Table 3: Tanana Valley -Fairbanks Crediting Table*

| Date | Conservation Credits | Removals Credits | Conservation Credit Price | Removal Credit Price | Gross Revenue | Project Expense | Net Revenue |
|---|---|---|---|---|---|---|---|
| **2023** | 0 | 83,000 | $15.00 | $25.00 | $2,075,000 | ($376,000) | $1,699,000 |
| **2024** | 0 | 83,000 | $16.00 | $26.00 | $2,158,000 | ($27,000) | $2,131,000 |
| **2025** | 0 | 83,000 | $17.00 | $27.00 | $2,241,000 | ($27,000) | $2,214,000 |
| **2026** | 0 | 83,000 | $18.00 | $28.00 | $2,324,000 | ($27,000) | $2,297,000 |
| **2027** | 0 | 83,000 | $19.00 | $29.00 | $2,407,000 | ($27,000) | $2,380,000 |
| **2028** | 0 | 83,000 | $20.00 | $30.00 | $2,490,000 | ($165,000) | $2,325,000 |
| **2029** | 0 | 83,000 | $21.00 | $31.00 | $2,573,000 | ($27,000) | $2,546,000 |
| **2030** | 0 | 83,000 | $22.00 | $32.00 | $2,656,000 | ($27,000) | $2,629,000 |

| Date | Conservation Credits | Removals Credits | Conservation Credit Price | Removal Credit Price | Gross Revenue | Project Expense | Net Revenue |
|---|---|---|---|---|---|---|---|
| **2031** | 0 | 83,000 | $23.00 | $33.00 | $2,739,000 | ($27,000) | $2,712,000 |
| **2032** | 0 | 83,000 | $24.00 | $34.00 | $2,822,000 | ($27,000) | $2,795,000 |
| **TOTAL** | **0** | **830,000** | **$19.50** | **$29.50** | **$24,485,000** | **($757,000)** | **$23,728,000** |

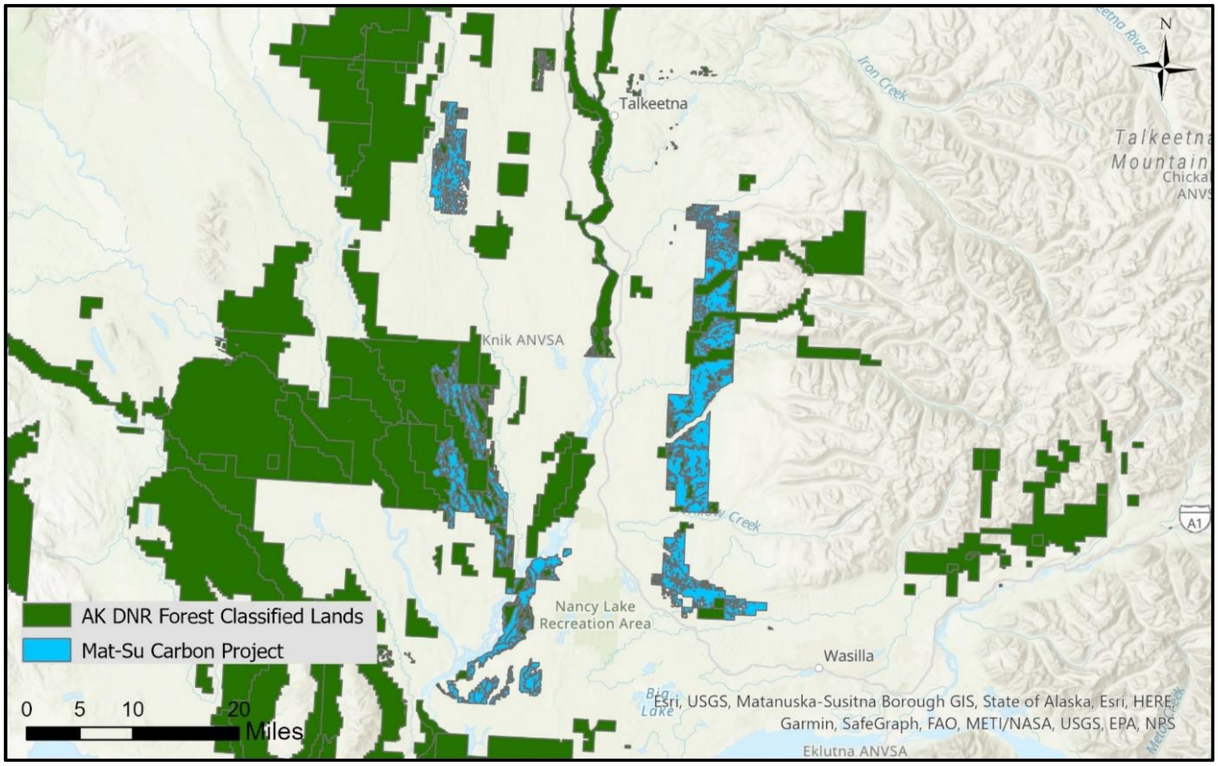
**40-Year Crediting Projections**

| Date | Conservation Credits | Removals Credits | Conservation Credit Price | Removal Credit Price | Gross Revenue | Project Expense | Net Revenue |
|---|---|---|---|---|---|---|---|
| **2023-2032** | 0 | 830,000 | $19.50 | $29.50 | $24,485,000 | ($757,000) | $23,728,000 |
| **2033-2042** | 0 | 806,000 | $25.00 | $34.00 | $27,404,000 | ($687,000) | $26,717,000 |
| **2043-2052** | 0 | 782,000 | $25.00 | $34.00 | $26,588,000 | ($683,000) | $25,905,000 |
| **2053-2062** | 0 | 753,000 | $25.00 | $34.00 | $25,602,000 | ($678,000) | $24,924,000 |
| **TOTAL** | **0** | **3,171,000** | **$23.63** | **$32.88** | **$104,079,000** | **$2,805,000** | **$101,274,000** |

## 3. Mat-Su

The Matanuska-Susitna (Mat-Su) region was selected for a pilot project due to its proximity to Anchorage, its existing infrastructure, and past harvest activities. Approximately 111,000 acres were selected along both sides of the Parks Highway that fell within both the Forest Classified Lands and Timber Types forested stands. The project could be expanded further within the Forest Classified Lands area. Westward expansion is recommended if the proposed State Forest designation is applied to the lands West of the Susitna River. The selected area averages 94.6 $tCO_2e/ac$.

*Figure 5: Map of Mat-Su Carbon Project Area*




Source: Anew, 2022

Analysis of Mat-Su was conservatively constrained similar to the Tanana Valley assessment and assumed 25% of growth would be harvested annually moving forward. Again, the modeled harvest levels are higher than current practices, as a measure of conservatism. A 111,000-acre project under these constraints could produce ~870,000 credits over the first ten years, worth $24.9 million in that time (Figure 5). A summary of the project's crediting potential is shown in Table 4.

*Table 4: Mat-Su Crediting Table*

| Date | Conservation Credits | Removals Credits | Conservation Credit Price | Removal Credit Price | Gross Revenue | Project Expense | Net Revenue |
|---|---|---|---|---|---|---|---|
| **2023** | 0 | 87,000 | $15.00 | $25.00 | $2,175,000 | ($376,000) | $1,799,000 |
| **2024** | 0 | 87,000 | $16.00 | $26.00 | $2,262,000 | ($28,000) | $2,234,000 |
| **2025** | 0 | 87,000 | $17.00 | $27.00 | $2,349,000 | ($28,000) | $2,321,000 |
| **2026** | 0 | 87,000 | $18.00 | $28.00 | $2,436,000 | ($28,000) | $2,408,000 |
| **2027** | 0 | 87,000 | $19.00 | $29.00 | $2,523,000 | ($28,000) | $2,495,000 |
| **2028** | 0 | 87,000 | $20.00 | $30.00 | $2,610,000 | ($165,000) | $2,445,000 |
| **2029** | 0 | 87,000 | $21.00 | $31.00 | $2,697,000 | ($28,000) | $2,669,000 |
| **2030** | 0 | 87,000 | $22.00 | $32.00 | $2,784,000 | ($28,000) | $2,756,000 |
| **2031** | 0 | 87,000 | $23.00 | $33.00 | $2,871,000 | ($28,000) | $2,843,000 |
| **2032** | 0 | 87,000 | $24.00 | $34.00 | $2,958,000 | ($28,000) | $2,930,000 |
| **TOTAL** | **0** | **870,000** | **$19.50** | **$29.50** | **$25,665,000** | **($765,000)** | **$24,900,000** |

*40-Year Crediting Projections*

| Date | Conservation Credits | Removals Credits | Conservation Credit Price | Removal Credit Price | Gross Revenue | Project Expense | Net Revenue |
|---|---|---|---|---|---|---|---|
| **2023-2032** | 0 | 870,000 | $19.50 | $29.50 | $25,665,000 | ($765,000) | $24,900,000 |
| **2033-2042** | 0 | 840,000 | $25.00 | $34.00 | $28,560,000 | ($693,000) | $27,867,000 |
| **2043-2052** | 0 | 810,000 | $25.00 | $34.00 | $27,540,000 | ($688,000) | $26,852,000 |
| **2053-2062** | 0 | 790,000 | $25.00 | $34.00 | $26,860,000 | ($684,000) | $26,176,000 |
| **TOTAL** | **0** | **3,310,000** | **$23.63** | **$32.88** | **$108,625,000** | **$2,830,000** | **$105,795,000** |

### 4.1.4 Carbon Inventory for Alaska State Forests[11]

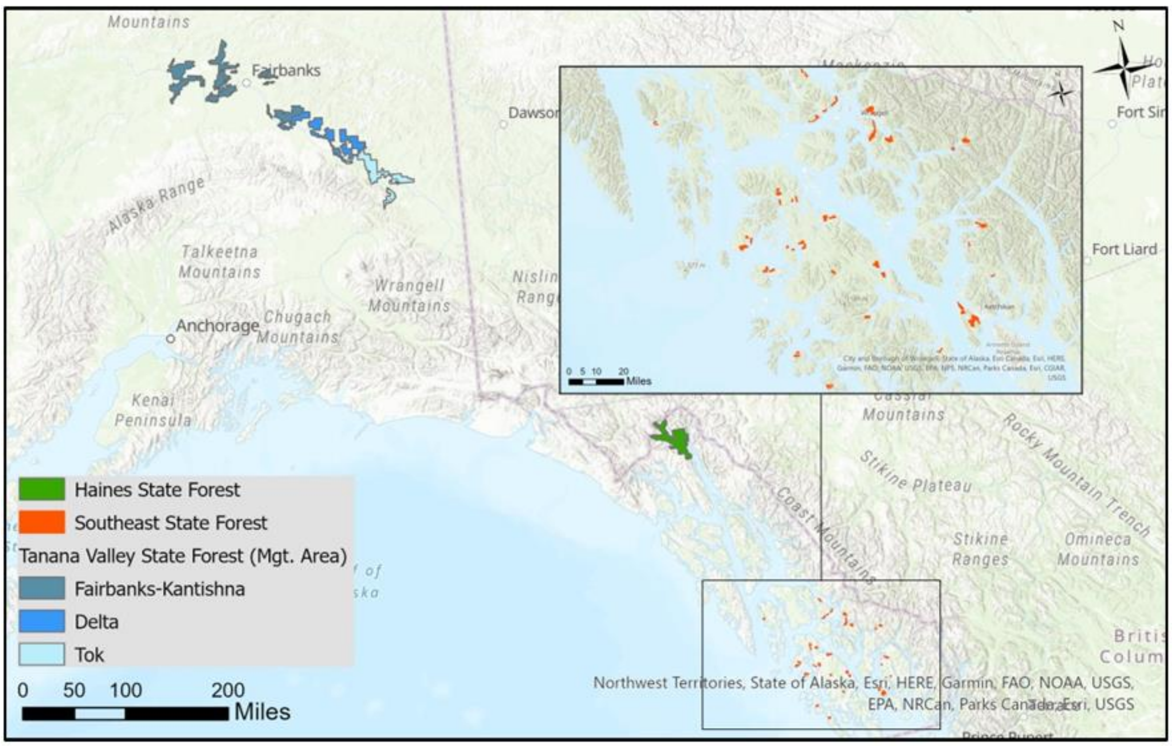
In addition to estimating carbon within the proposed project areas, carbon across the three major State Forests was estimated. Due to its size, the Tanana Valley was independently assessed within its major management units. As shown in Table 5 and Figure 6, the Tanana Valley State Forest is expansive relative to the Haines and SE forests, while averaging lower-stocked stands. Note that these are overall statistics, and these entire GIS-based acreages would not necessarily be eligible for a carbon project.

[11] Carbon inventory analysis is associated with Deliverable B as outlined in RFP 2022 10004963

*Table 5: Carbon Inventory for Alaska State Forests*

| Area | Management Area | Forested acres assessed | t $CO_2e$/ac |
|---|---|---|---|
| **SE** | SE | 44,000 | 130.7 |
| **Haines** | All Owners | 80,500 | 141.2 |
| **Tanana Valley** | Fairbanks-Kantishna | 671,000 | 68.3 |
| | Delta | 377,000 | 81.5 |
| | Tok | 304,000 | 61.8 |

*Figure 6: Map of Alaska State Forests*




Source: Anew, 2022

#### 4.1.5 Evaluation of Forestry Data Sources[12]

The Department's numerous forest inventory records provided adequate base data for quantifying carbon stocking across the State's forest land base. Ultimately, a combination of stand-level volume estimates, Interferometric Synthetic Aperture Radar (IFSAR) derived canopy

[12] Evaluation of forestry data sources is associated with Deliverable C as outlined in RFP 2022 10004963

height model, and existing forest plots to estimate current carbon content were used to assess the project opportunities.

Stand-level volume estimates from the "Timber Types" shapefiles were analyzed using species-specific, registry-approved biomass calculations and scale-up factors. The Timber Types stand-level variables also allowed us to query data for forest types, ownership, and operability; however, some of the non-forest boundaries may need further refining once a project is underway.

When it came to estimating eligible forests there were some minor discrepancies between the various sources (management plans vs. inventory reports vs. shapefiles). Since there is ample opportunity to expand project areas in the Tanana Valley and Mat-Su regions it was assumed that all areas designated as "Forest" vegetation class in the Timber Types shapefiles were accessible and eligible for harvest. "Dwarf" forests were excluded from the project areas due to their questionable merchantability. Since using the entirety of the SE/Haines forested area as a project area increases project efficiency, the assessment conservatively defaulted to the eligible forests specified in the respective management plans. As the SE/Haines forests differed slightly in the various shapefiles, it is likely this project could be expanded to include additional accessible/operable lands when more detailed data is available.

Advanced remote sensing techniques to estimate carbon stocks across State Forests were employed and a canopy height model (CHM) using IFSAR data was developed. IFSAR data is available for the full state of Alaska. The first application of the CHM was to conduct a preliminary removal of non-forest areas within potential carbon projects. If the Department moves forward with implementing a forest carbon project, a more refined removal of non-forest areas will be conducted. Once non-forest areas were removed, a machine learning random forest model was specified to estimate carbon stocks across the State Forests using the CHM as the explanatory variable. Inventory data from existing completed and validated projects in Alaska was inputted as training data.

If the Department pursues a carbon project one of the first steps will be to develop a network of permanently-monumented, fixed-area inventory plots to be installed in the project areas. The new inventory plot network is needed to ensure the carbon measurements/models can pass the mandatory and detailed verification process required by the methodology. These plots will be similar to USFS FIA plots but must include additional measurements to accurately calculate and model forest carbon (such as standing dead tree measurements, carbon defect in both live and dead trees, and site index derived from tree cores). The inventory must meet certain sampling error requirements to avoid a confidence deduction due to an inadequate number of inventory plots. Anew recommends installing plots in a systematic grid network, which is the most accurate and defensible inventory design. Plots will need to be monumented and well-marked to facilitate remeasurement during the verification process (see the Procedure Guide in Appendix A for additional detail on this process).[13]

### 4.2 Option #2 – Geologic Sequestration

Carbon capture and storage (CCS) is seen as playing an increasingly important role in meeting global energy and climate goals. CCS involves the capture of $CO_2$ from large stationary combustion sources such

[13] Procedure Guide is associated with Deliverables D and E as outlined in RFP 2022 10004963

as power generation or industrial facilities. The $CO_2$ may also be captured directly from the atmosphere through a process called Direct Air Capture (DAC); however, there are few DAC facilities currently in operation at commercial-scale. Once the $CO_2$ is captured, the gas is then compressed and transported by pipeline, ship, or truck before being permanently injected into deep geologic formations.

### 4.2.1 Protocol Availability

There are two broad categories of storage projects that are considered for voluntary offset credits: enhanced oil recovery (EOR), and saline aquifer storage. Currently there is only one CCS methodology available in the voluntary carbon market and it the American Carbon Registry's methodology for EOR, though Verra and ACR and Verra are both developing CCS methodologies for saline aquifer storage. ACR's published protocol is called the *Methodology for Greenhouse Gas Emission Reductions from Carbon Capture and Storage Projects* (version 1.1, September 2021). This protocol provides a path forward to pursue an EOR project in the US. It applies to projects where $CO_2$ is captured from industrial processes or DAC for use in EOR in the U.S. or Canada.

This methodology outlines three eligible $CO_2$ source types including, but not limited to:

- Electric power plants equipped with pre-combustion, post-combustion, or oxy-fired technologies; industrial facilities (for example, natural gas production, fertilizer manufacturing, and ethanol production);
- Polygeneration facilities (facilities producing electricity and one or more of other commercial grade byproducts); and
- DAC facilities.

The methodology requires the project proponent to attest that all emission reductions occur on the property owned and/or controlled by the project proponent(s). Default ownership is typically with the entity responsible for injection because that's where permanence is guaranteed. Said another way, if credit ownership resided with the $CO_2$ capturing entity and credits were calculated based on the amount of $CO_2$ captured, there is no guarantee that the $CO_2$ is actually sequestered underground. Since this project type is directly linked to oil production, the oil and gas company is considered to have ownership of the operations of the facility and reservoir where the oil is being produced from. Therefore, this methodology does not offer the Department an opportunity to generate voluntary offsets as the Department has operational control over neither the capture nor injection of the $CO_2$.

There are currently two methodologies being developed for voluntary offsets that sequester $CO_2$ in deep saline aquifers. ACR is developing a methodology specifically for saline aquifer storage and it is anticipated to be similar in scope to their published EOR methodology.[14] Verra's initiative, called CCS+, is being developed by a consortium of companies for global CCS use. CCS+ aims to create a suite of protocols that have separate modules for different capture, transportation, and storage situations. These methodologies may be more applicable to the Department where ownership of the saline aquifer pore space can be shown. It should be noted that the Department would still need to partner with a large $CO_2$ emitter on the capture side, and credits will likely need to be shared with that entity.

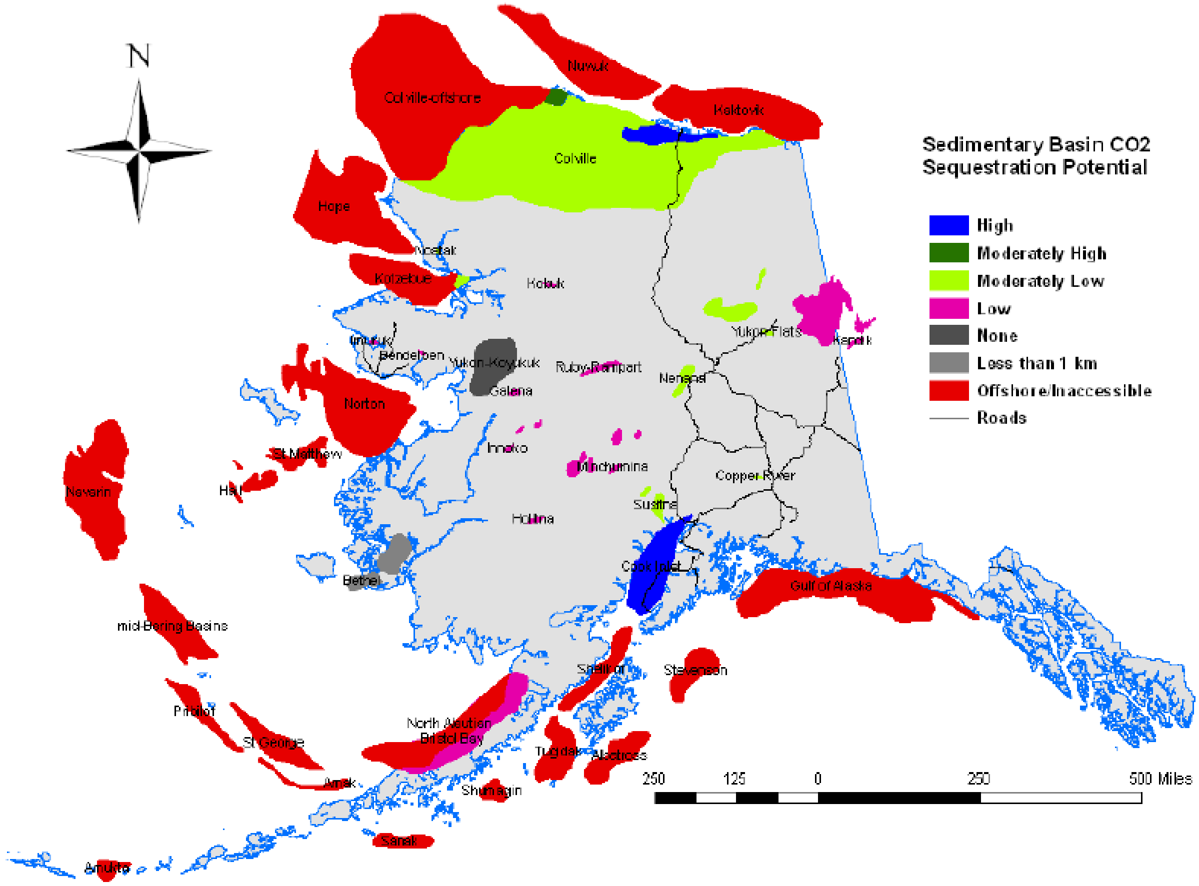
[14] The draft methodology is anticipated to be published in Summer 2022.

### 4.2.2 Additionality and Implementation

A 2011 study by the Department[15] suggests that the combined $CO_2$ storage capacity in onshore and offshore saline aquifers in the State is 16,700 Gt, and storage capacity in deep, non-mineable coal seams in three major Alaska coal basins is 120 Gt. However, logistical constraints and factors such as expected water salinity, tectonic environment, distance from infrastructure, coal rank, permafrost significantly constrain these estimates which are better approximated as 5,700 Gt and 49 Gt for saline storage and coal seams respectively. Based on the State's total emissions industrial processes and electricity generation, there is sufficient high potential storage basins to cover the $CO_2$ emissions at current and projected volumes through 2050. The highest potential storage areas are in Cook Inlet basin and along the North Slope, as shown in Figure 7. There are currently no methodologies published, or in development that can be used to quantify offsets for $CO_2$ sequestered in coal seams, so the Department would need to request a deviation from the appropriate registry or develop a new methodology to have this storage option be deemed eligible for crediting. Similarly, it is unclear how offshore saline aquifers will be treated under the pending ACR and Verra methodologies, and a deviation may be required to proceed with that type of storage facility.

[15] Alaska Geologic Carbon Sequestration Potential Estimate: Screening Saline Basins and Refining Coal Estimates, 2011, Alaska Department of Natural Resources

*Figure 7: Alaska Saline Sedimentary Basin $CO_2$ Storage Potential*




Source: Alaska Department of Natural Resources, 2011

Before pursuing a CCS project, the Department should consider the following.

**Long-term liability & permanence**. A common stakeholder concern is how permanence will be ensured for the sequestered $CO_2$, and the Department will need to be able to speak to long-term monitoring plans. With any saline aquifer project there are risks associated with geologic storage, such as physical leaks or migration of the $CO_2$ plume underground. These can be mitigated with thorough geological site studies prior to the project and careful monitoring once the project is operational. The methodologies will almost certainly have extensive monitoring requirements for the project, however, if the ACR EOR methodology is a reference, the monitoring requirements will align closely with the requirements set out by the Environmental Protection Agency in the Class VI well application that is required for $CO_2$ injection. Once the project is decommissioned, there is still a liability that the sequestered $CO_2$ will be unintentionally released into the atmosphere. This liability must be addressed. The province of Alberta, Canada may offer a useful reference in this regard as the Alberta government has committed to accepting the long-term liability for CCS offset projects once they have proven the sequestered plums is stable.[16]

[16] https://open.alberta.ca/publications/9780778572213

**Pore space ownership**. To develop an offset project, clear ownership of the underground pore space is required, and it is anticipated that this requirement will remain in any new or revised methodologies. Pore space, or the voids where minerals used to be before extraction, is a key consideration for a $CO_2$ storage project. Pore space can be assigned in one of two ways – either to the surface owner, dubbed the "American Rule" or to the owner of the mineral State, dubbed the "English Rule". A 2016 Alaska Supreme Court ruling[17] determined that the State follows the English Rule setting the precedent that the Department must obtain ownership of the mineral rights before developing an offset project.

**Additionality**. Additionality requirements will be outlined in the methodology, once published, however a preliminary additionality assessment can be completed based on the most typical additionality criteria for this project type. This includes regulatory surplus, a common practice test and a barriers analysis. A CCS project with saline aquifer storage is considered to have regulatory surplus at the both the State and federal level as there are no regulations, laws, directives, or statutes that require the capture and sequestration of $CO_2$, none of which currently exist in Alaska or the U.S. There are only 10 operational examples of CCS projects in the U.S., so this project type is not considered business-as-usual and passes the common practice test. Finally, both ACR and Verra require a project to overcome at least one of either a technical, institutional, or financial barrier to be considered additional.[18] Since a project developed by the Department would need to overcome technical barriers associated with first-of-kind $CO_2$ transportation and sequestration in the State, there is a strong case for additionality for this type of project.

## 4.3 Option #3 – Marine Sequestration

Oceans and coastlines are some of Earth's best climate regulators with coastal ecosystems such as mangroves, tidal marshes, and seagrass meadows acting as carbon reservoirs as well as protection from storm surge. When these ecosystems are damaged or destroyed, carbon sequestration is reduced (and climate resilience to sea level rise and extreme weather is undermined).

### 4.3.1 Protocol Availability

Action to improve coastal sequestration can also be quantified under several types of voluntary carbon protocols that cover a variety of habitats including mangrove forests, tidal marshes, and seagrass. In Alaska, marine carbon sequestration opportunities would fall under protocols for tidal salt marshes and seagrass forests, as there are no mangroves in the State. Two protocols exist which could apply in Alaska, Verra's VM0024 *Coastal Wetland Creation* and VM0033 *Tidal Wetland and Seagrass Restoration*. Both protocols, however, are likely to have very limited applicability based on land ownership, applicability conditions, and costs to project implementation.

[17] *City of Kenai v. Cook Inlet Natural Gas Storage Alaska, LLC*, 373 P.3d 473, 480-481 (Alaska 2016).

[18] Note that a financial barrier is not a standalone requirement in the published ACR methodology, but more emphasis may be placed on this as a test for additionality in future methodologies.

Nearly 80% of the wetland type in Alaska is upland wetland.[19] Only 0.5% of wetlands in the State are estuarine and marine of which a meaningful proportion is Federally owned.[20]

Applicability conditions in the protocols require the demonstration of restoration of degraded wetlands from anthropogenic activity. As the footprint of human activity within State-owned wetlands is low, the number of potential opportunities where the wetland conditions meet the protocol applicability conditions is expected to be very low. The Department would need to identify an area that is State-owned and has been degraded by human activity which is uncommon as there is minimal industrial or residential construction or infrastructure in these types of ecosystems. In addition, the costs of wetland restoration are high which limits the opportunities to generate positive net revenue from this type of offset project. To overcome the cost of developing a carbon project associated with wetland restoration, it is estimated the State would need to restore more than 8.9 acres[21] (3.6 ha) to realize positive net revenue from carbon credits.[22]

If a wetland restoration project site was identified, the State would need to demonstrate the site met all the protocol applicability criteria which, depending upon the protocol, may include ensuring there is no leakage to other areas as a result of the project, the project area has been abandoned for two or more years, and/or use of the area is not profitable as a result of salinity intrusion.

Each of the above factors limit the number of potential projects available for crediting opportunities for the State.

#### 4.3.2 Additionality and Implementation

To be considered additional, wetland restoration projects need to demonstrate they are not required by law, and they must meet the requirements of the positive list. There are currently no regulations in Alaska that require wetland restoration, making restoration activities an additional activity.

A project would also need to demonstrate that it met all the applicability conditions in the protocol which would put it on the "positive list", and therefore be additional. The Verra protocols use the positive list as an additionality measure based on the findings that the level of tidal wetland restoration in the U.S. was determined to be 2.74 percent of maximum potential (or lower), which is below the five percent threshold set by the Verra's rules for positive lists.[23] Therefore, all tidal wetland restoration meeting the applicability conditions and the regulatory surplus requirement qualifies for the positive list.

### 4.4 Option #4 – Soil Carbon Sequestration

Soil carbon sequestration protocols fall under two general categories: regenerative agricultural practices and grassland restoration/avoided conversion. Regenerative agricultural practices include reduced

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[19] Flagstad, L., Steer, A., Boucher, T., Aisu, M., Lema, P., 2018. Wetlands Across Alaska: Statewide Wetland Map and Assessment of Rare Wetland Ecosystems. Report prepared for Alaska Natural Heritage Program, Alaska Centre for Conservation Science. Table 2.

[20] Flagstad, L., et al., 2018. Table 2.

[21] This assumes between 170-400 kg of CO2/hectare/year can be stored, and the average credit price is $15 per ton of carbon dioxide equivalent ($tCO_2e$). The rate of carbon sequestered over time is likely to decrease as the wetland matures.

[22] Assuming restoration costs are $6000/acre, carbon sequestered per year is between 170 to 400 kg CO2e/ha/year, credit price is $15/t CO2e, and project costs are approximately $40,000 in the first year.

[23] https://verra.org/wp-content/uploads/2020/09/VMD0052-Demonstration-of-additionality-of-tidal-wetland-restoration-and-conservation-project-activities-ADD-AM-v2.0.pdf

fertilizer use, reduced and/or changed equipment use, improved soil management practices, and/or livestock grazing management, all serving to increase the sequestration of carbon in soil. Grassland projects include either restoration of grasslands from an alternate land use or avoid conversion of grasslands to another land use type (typically row-crop agriculture) which generally occur due to financial pressures associated with land development.

### 4.4.1 Protocol Availability

No protocols for soil carbon sequestration were identified as applicable in the State. Agricultural practices and/or grassland conversion to agriculture, fall under private landowners and not State-owned land in Alaska. There are limited grasslands that would have been converted to an alternate land-use, and in the cases where this would have occurred, it would generally be under private ownership or under municipally held lands.

### 4.4.2 Additionality & Implementation

Each protocol has its own test to determine additionality. In general, to demonstrate additionality for a soil carbon sequestration protocol the project would need to demonstrate that the practices being implemented or changed to reduce emissions and/or increase carbon storage are not common practice in the area or meet the requirements of a positive list. They may also need to demonstrate there is at least one technical or financial barrier to the project compared to a baseline scenario where the project is not being implemented.

There are no protocols currently available to the State for implementing a soil carbon sequestration project as they are mainly focused on agricultural activities. If the Department were to provide financial incentives to farmers to implement new practices and/or change their practices, and an aggregated project was implemented, it is still unlikely that a project is feasible due to the relatively small total agricultural land area in Alaska. Under a scenario where the Department provides financial incentives, the number and size[24] of farms are likely to still be too low to do a regenerative agriculture project, even when aggregated. In addition, in this circumstance the State could not share in the credits unless it was written into any financial incentive agreements that credit ownership belonged to the State.

## 4.5 Option #5 – Other

Anew identified and explored three additional project types for potential carbon crediting opportunities based on the dominant industrial activities owned by the State or activities that are conducted by the State and have the potential to release significant GHG emissions. These included oil and gas, transportation, and coal mine methane capture.

### 4.5.1 Oil & Gas

One protocol was identified as having future potential for the State with respect to the proposed Alaska Gas Development Corporation's LNG facility.

- AM0088 *Air separation using cryogenic energy recovered from the vaporization of LNG*

[24] In 2017, most farms were less than 50 acres in size and total cropland in the state was 83,732 acres. https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Alaska/cp99002.pdf

AM0088 may be applicable to the Department assuming the technology used in the proposed facility meets the exact applicability criteria of the protocol.[25] The protocol is applicable to new constructions of both an air separation plant and an LNG vaporization plant.

The eligibility criteria that must be met are:

- New air separation plants must meet cooling energy demand totally or partially from recovered cryogenic energy from an LNG vaporization plant.
- Purity of the oxygen and nitrogen produced by the new air separation plant must be equal to or higher than 99.5%.
- Any new air separation plant must be located at the same site as the LNG vaporization plant from which the cryogenic energy is recovered. As such, the cryogenic energy carrier must not be stored or freighted to a different site.
- A new air separation plant both can be operated with or without the use of cryogenic energy from the LNG vaporization plant.
- Any technology employed at the new air separation plant during periods when cryogenic energy from the LNG vaporization plant is not available should be the same technology as the one identified in the selection of the baseline scenario. Moreover, during these time periods, the air separation plant must provide the same amount and quality of air separation products as when operated with cryogenic energy from the LNG vaporization plant.
- If the LNG vaporization plant is new, it can be operated both with or without the recovery of cryogenic energy.
- Technology employed at the LNG vaporization plant during periods when cryogenic energy from the LNG vaporization plant is not utilized by the air separation plant should be the same technology as one identified in the baseline scenario.

To determine additionality, the AM0088 protocol require the project to demonstrate there are either investment barriers, technological barriers and/or other barriers that prevent the project from occurring. There is potential the new LNG system would require additional specialized training for implementation and operation, or that the system is seen as taking a greater investment risk compared to a traditional system. The capture of methane may require an investment that could make it additional.

Credit sharing opportunities may exist under this LNG protocol. If financial incentives are provided by the State to privately owned or federally owned sites to assist in the implementation of a project, the State may be able to negotiate the ownership of credits. In these cases, contracting of the credit ownership needs to be negotiated in advance of the project.

### 4.5.2 Transportation

The State of Alaska's vehicle fleet may be able to develop a project associated with Verra's Methodology for Improved Efficiency of Fleet Vehicles and Combustion Engines Including Mobile Machinery (VMR0004).[26] This would include activities such as:

- tire-rolling resistance measures,
- air conditioning system improvements,

[25] https://cdm.unfccc.int/methodologies/DB/8OT1457B4DM4ROLR4RWSHK9Z252LFO
[26] https://verra.org/methodology/vmr0004-revisions-to-ams-iii-bc-to-include-mobile-machinery-v1-0/

- using low viscosity oils, and/or
- installing idling stop devices.

Measures are limited to those that result in an emissions reduction of less than 60,000 t $CO_2e$ annually. As Alaska has a large fleet of vehicles and mobile equipment associated with road maintenance, this protocol may have crediting potential. However, as it is unlikely that all vehicles and mobile machinery would install all efficiency measures, the feasibility of the protocol should first be assessed to ensure the costs of project development are not greater than the resulting value of the potential credits associated with the project.

For vehicle energy efficiency measures, the project activity cannot be considered common place. If the market penetration for any of the activities is greater than 5% in the location of implementation, the activity is not considered additional.

### 4.5.3 Coal Mine Methane

Abandoned coal mines which release methane to the atmosphere, may be eligible to create carbon credits if the methane can be captured and flare. If the mines are State located on State land these credits could belong to the State. These mines may be eligible under Verra's revised Abatement of Methane from Coal Mines (VMR0002)[27] which quantifies emissions reductions generated by capturing and destroying methane from abandoned/decommissioned coal mines through flaring, flameless oxidation, or utilization through electricity, motive power, or thermal energy. None of the methane gas can be vented. This methodology cannot be applied to virgin coal bed methane and cannot be used if the abandoned or decommissioned coal mines are flooded in the baseline scenario. To be a viable project the mines would need to release enough methane to overcome the costs of project development. Accessible of the sites will also impact project development costs.

To determine additionality for capturing the coal methane emissions, the project needs to demonstrate the existence of investment barriers, technological barriers and/or other barriers that may prevent the project from occurring. In this case, it is likely at least an investment and technology barrier exists since there is unlikely to be infrastructure (i.e., roads, power) in place for implementation, and investment in infrastructure would not yield a return as the mines are no longer operational.

[27] https://verra.org/methodology/vmr0002-revisions-to-acm0008-to-include-methane-capture-and-destruction-from-abandoned-coal-mines-v1-0/

## 5.0 Conclusions and Recommendations

The purpose of this report is to evaluate carbon offset opportunities in the State of Alaska that can generate revenue for the Department. To complete this work, Anew identified and evaluated project opportunities in the categories of forestry, geologic sequestration, marine sequestration, and soil carbon sequestration, as well as project opportunities from technology-based solutions such as oil and gas, transportation, and mining. The most promising and easily-implementable opportunities are in forestry.

**Anew has identified three high potential pilot project opportunities on State forest lands which could be pursued in parallel, or independently.**

If the Department chooses to pursue the projects one at a time, Anew recommends beginning with Haines/SE Alaska due to the high volume of credits and revenue potential. A summary of the crediting and revenue opportunities for the three identified projects is shown in Table 6. Anew recommends pursuing all three projects simultaneously to take advantage of the record level of forest offset demand currently being seen in the voluntary market.

*Table 6: Summary of Pilot Project Opportunities*

| Pilot Project | 10 year Crediting Potential | 10 year Revenue Potential |
|---|---|---|
| Haines/SE Alaska | ~1,334,000 tCO2e | ~$33 million |
| Tanana Valley (Fairbanks) | ~830,000 tCO2e | ~$24 million |
| Mat-Su | ~870,000 tCO2e | ~$25 million |

No immediate project opportunities have been identified in the other categories. There are no meaningful opportunities related to marine or soil carbon sequestration in the State, and opportunities around LNG, fleet vehicles, and mine methane capture require further investigation. Anew recommends waiting until the pending carbon capture and storage in deep saline aquifer protocols are published by ACR and Verra and then further evaluating CCS project opportunities in the State. Ahead of these publications, the Department should evaluate which partnerships are needed with oil and gas and/or electricity producers who have the ability to capture large volumes of $CO_2$ and assess what volume of $CO_2$ can be sequestered underground. Additionally, the Department should evaluate and codify how the State will deal with long-term liability as CCS projects are more viable in states where the government accepts long-term liability of reversal once the project is shut-in.

Once a specific facility, partner, project activity is selected, Anew can be engaged to complete an in-depth feasibility study to align the exact parameters of the project with the methodology and registry standard. Detailed feasibility studies can only be completed once a specific emission reduction activity is identified as facility-specific detailed are needed to determine viability for credit generation with a reasonable level of assurance. The feasibility study would also identify whether the cost of implementing a project would exceed the revenue generated by the credits. Only in circumstances where the credit revenue exceeds project costs is a project recommended.