Rock Quarry Potential
Preliminary Investigation
State of Alaska

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Prepared by:

U.S. Army Corps
of Engineers
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ROCK QUARRY POTENTIAL, A PRELIMINARY INVESTIGATION
STATE OF ALASKA

Contents

ALASKA REGIONAL PORTS ROCK QUARRY PRELIMINARY INVESTIGATION

A. Introduction

The Alaska District Corps of Engineers (USACE) and the State of Alaska Department of Transportation and Public Facilities (ADOT&PF) conducted this rock quarry investigation in an attempt to better understand the challenges of providing material for water infrastructure projects in Alaska. The analysis took a multi-pronged approach by interviewing existing quarry operators, reviewing historic rock prices, conducting site visits, and reviewing the environmental/permitting aspects of developing a quarry.

The attempt in this evaluation is to identify issues that could be addressed to allow construction of future projects at reduced cost. No one entity can address the high cost of construction in the state but by better understanding the challenges, individual agencies can address pieces of the puzzle that pertain to their organization. The focus of this preliminary investigation is to investigate additional quarries beyond those normally used for past projects.

The following addresses each of the investigative pieces in turn and offers possible approaches for agencies and/or private companies to pursue.

B. Research Conducted

Quarry Operator Feedback

A list of rock quarries in the State of Alaska (State) was compiled in the spring of 2010. Selected rock quarry operators[1] were contacted for interviews in an attempt to research the level of satisfaction quarry operators have with Corps (USACE) processes, to identify any areas for potential improvement, and to research cost concerns with the quarry operators.

Quarry operators in general had positive comments regarding their experiences with USACE. However, they also provided multiple suggestions on how the process could be improved. Communication between quarry operators and USACE was a key concern, which included suggestions to provide advance notice of projects to quarry operators so they can better prepare for jobs. See “Appendix A. Quarry Operator Feedback” for additional information.

[1] In most cases the owner (the one receiving the royalty payments) and the operator (the one who is producing the rock) are two different entities. However, often the operator and contractor are one in the same. The contractor is the one who bids on the rock and works directly with the USACE or ADOT&PF. Unless a quarry is designated, it is up to the contractor to negotiate and provide rock. For this interview effort, USACE primarily contacted quarry operators.

Key suggestions from quarry operators are:

- Eliminate all-or-nothing clause in bid requests (allow contractors to bid on individual items)[2]
- Expand the list of potential bidders (some operators not on list that would like to be)
- Increase number of rock quarries (more competition will decrease rock prices and transportation costs)
- Streamline the permitting process for new quarries
- Coordinate better between design engineers and quarry operators (continuity of team members)
- Allow the quarry operators to meet or exceed bid specifications[3]
- Provide additional lead time for development of new quarry (or additional time to complete project construction if new quarry is warranted)
- Publish a forecast of potential projects

Cost Engineering

USACE Cost Engineering Branch investigated previously constructed projects throughout Alaska that used rock for breakwaters, erosion control, and other marine infrastructure. Trends have shown that the prices bid by construction contractors for in-place rock products (gravel, sand, rubble-mound & rip-rap) has increased substantially in 15 years. The investigation identified different variables that contribute to the escalation in bid prices seen recently in order to be able to better predict the price for future project planning. Historical USACE project data was gathered for projects awarded between 1994 and 2010. Similar data was gathered for Alaska Department of Transportation and Public Facilities project awards between 1985 and 2010.

There does not appear to be a direct correlation between the source price of rock and the actual cost to produce, transport, and place rock at particular projects. For example, some contractors will quote an identical price for all varieties/sizes of rock whether it's A-, B- or C-rock[4], then have a mobilization/demobilization bid that is substantially different from the other bidders and the government's estimate. Actual direct costs associated with rock

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[2] This comment came from a quarry operator who said they would be willing to produce rock for Corps projects but would be unwilling to transport and place the rock. The Corps/State typically hire a general contractor who negotiates and works with the quarry operator directly.

[3] This comment came from a quarry operator who said sometimes it is difficult for them to meet the size and weight restrictions in our bid specification. This is an engineering issue. Further discussion with Corps engineers reveals that when the size and weight specifications are different than in the bid documents, negotiations with the Corps engineers takes place to make sure the project can be constructed with rock different from that in the bid specifications while still delivering a sound and environmentally safe project.

[4] "A" rock is typically armor stone placed on the exterior of a breakwater or revetment; "B" rock is the transition rock between armor stone and the core layer ("B" rock is sometimes referred to as "filter" rock); "C" rock is the core material. On ADOT&PF projects, rock is identified by the mean weight, for example 1300 pound armor rock would be A1300; this allows the State to have multiple unique rock sizes and optimizes quarry development.

production and profit margins are shifted between bid elements to minimize risk, maximize reward, and for other business reasons known to the bidder.

There are no restrictions on which quarry a contractor uses, as long as the rock meets specifications. Therefore, it is up to the contractor to find/select an adequate rock source, negotiate prices and contract for materials, produce rock products as needed, transport and place the rock. Thus the line item prices for a project bid include all of the above direct costs plus indirect costs. It is not possible to analyze the unit bid costs or break out the contractors' costs for production, transport, and placement of rock. The unit bid prices are not directly indicative of source costs or cost escalation. See "Appendix B. Cost Engineering" for additional information.

Field Surface Reconnaissance Report

Corps (USACE) staff conducted site visits between February and September 2010 at the following ten locations: Bering Shai Quarry, Shakmanof Cove, Platinum Quarry, Perryville Quarry, Flat Island Quarry, Chugach Bay (2 sites), Diamond Point, Snake Lake Quarry, Ekuk Quarry, and Sawmill Cove.

Table 1. Summary of Potential Material Source Contact Information

Potential Rock Source	Owner	Point of Contact	Transportation Access	Rock Type	Comments
Bering Shai Quarry, Unalaska	Bering Shai Construction	Bill Shaishnikoff 907-581-1409	Onsite barge loading facility and Captains Bay Road	Diorite	Currently producing crushed aggregate products
Shakmanof Cove, Kodiak	Koniag Incorporated	Angayuk Construction, Keith Miles 907-360-7827	Undeveloped, potential onsite barge loading facility	Biotite Granite	Undeveloped, has potential to produce very large stone
Platinum Quarry, Platinum	Calista Corporation	Knik Construction, Parry Rekers 206-439-5560	8.3 miles on haul road to barge loading facility	Metamorphic	Currently producing crushed aggregate products
Perryville Quarry, Perryville	N.A.	N.A.	Truck haul road	Sandstone and Conglomerate	Not suitable for harbor and shore protection projects
Flat Island Quarry, Nanwalek	Chugach Alaska Corporation	Dave Phillips 907-261-0345	Unimproved logging roads	Granite	Potential for development of barge loading facilities along Cook Inlet
Chugach Bay	Chugach Alaska Corporation	Dave Phillips 907-261-0345	Undeveloped, potential onsite barge loading facility	Granodiorite	Currently no plans to develop as material source
Diamond Point, Iliamna Bay	Diamond Point, LLC	Mark Graber 907-222-3073 & 210-240-4795	Undeveloped, potential onsite barge loading facility	Granodiorite	Dredging a channel from Iliamna Bay would be required for barge access
Snake Lake Quarry, Dillingham	Choggiung Limited	Rich Tennyson 907-842-5218	About 14 miles from Dillingham via Snake Lake and Aleknagik Lake Road	Greywacke	Provided material for local roads and shore protection along Nushagak and Wood Rivers
Ekuk Quarry, Dillingham	Horizon Contractors and Amanka Construction	Gary and Bobbi Buchholz 907-842-5683 John and Ina Bouker 907-842-4660	About 15 miles from Dillingham via Aleknagik Lake Road	Greywacke	Currently producing crushed aggregate products for road and airport construction
Sawmill Cove, Sitka	N.A.	N.A.	Potential barge loading facility in Sawmill Cove	Metamorphic	Development access limited

A Vicinity Map of each location is shown in Figure 1.

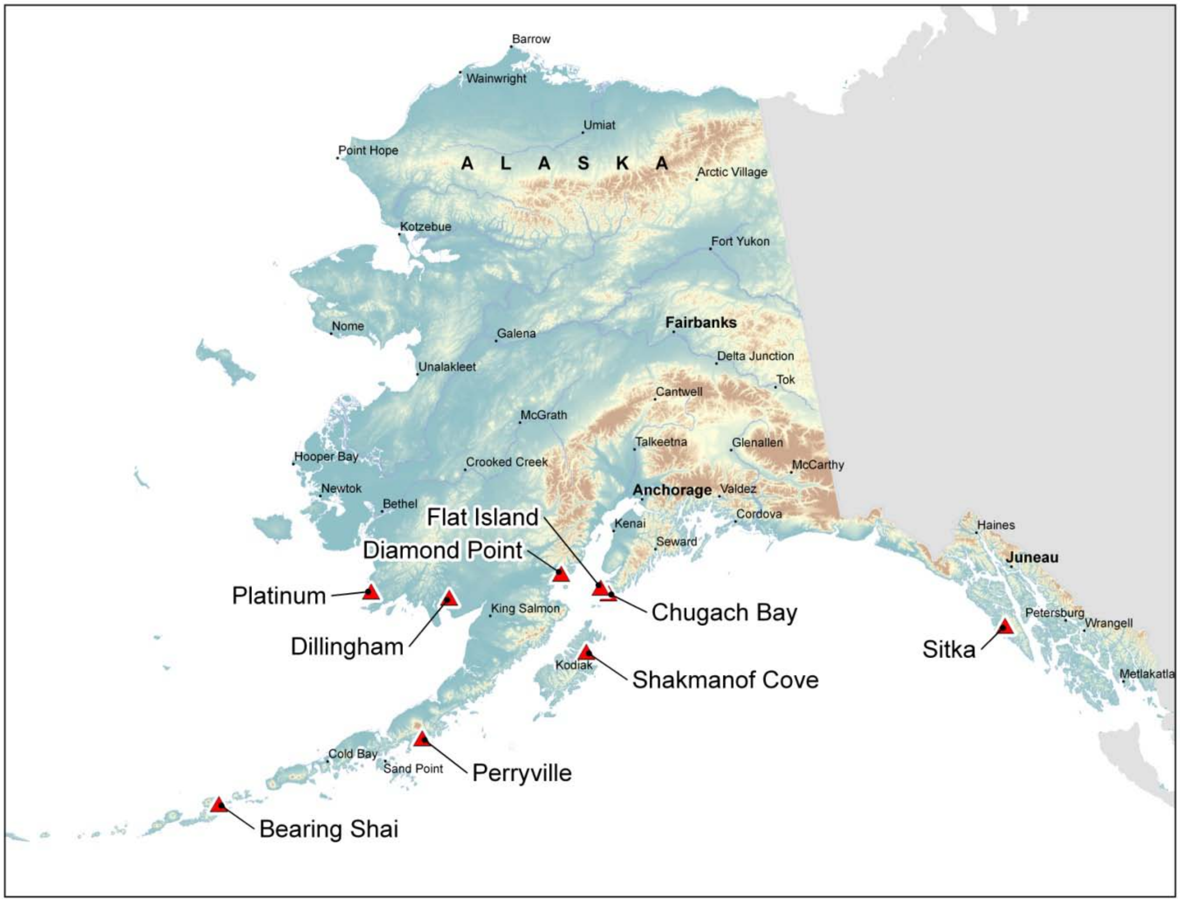

Figure 1. Site Visits of Potential Rock Quarries - 2010

The purpose of the site visits was to identify potential material sources of large stone for future harbor and shore protection projects.

Of the ten sites visited, all except the Perryville Quarry would be recommended for future consideration as a potential material source of large stone for the construction of harbor and shore protection projects. Sight inspection of rock outcroppings at Perryville suggests that this rock would not be suitable for large stone. Shakmanof Cove, Diamond Point, Flat Island

Quarry, and the Bering Shai Quarry have the best potential to meet USACE criteria for rock specification and likely have sufficient quantity for a viable operation. All four of these sources have large material reserves and the potential for development of onsite barge loading facilities. Additional consideration should include field exploration and laboratory testing.[5] See “Appendix C. Field Surface Reconnaissance Report, Potential Large Stone Material Sources” for additional information.

General Environmental Coordination

As part of the rock quarry investigation, questions arose concerning environmental requirements for establishing a new rock quarry. Many factors play into the requirements including whether the quarry is established as a federal project or a private enterprise. The Environmental Coordination discussion touches on the environmental considerations for a federal versus private enterprise.

Federal agencies are required to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those proposed actions. The basic policy of the National Environmental Policy Act (NEPA) requires the Federal Government to make environmentally informed decisions when implementing Federal actions and to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions.

Non-Federal Interest Projects (Private Sector Projects) accomplish environmental coordination and compliance through the permitting arena. When these projects occur in or near a “water of the United States”, the USACE Regulatory Program becomes the permitting agency. Project specific applications submitted for Regulatory Action can be considered to have three steps: pre-application consultation (for major projects), formal project review, and decision making.

For State of Alaska sponsored projects, the State would generally follow the private sector approach of applying for permits through the USACE Regulatory Program unless the State were developing the quarry for a Federal interest project which would then be held to a higher standard.

The application process to the USACE Regulatory Division guides the applicant through the statutory requirements of the National Environmental Protection Act (NEPA) in order to obtain the appropriate permits. The permitting process is unique to the particular project unless it is covered by a nationwide permit. See “Appendix D. General Environmental Coordination, Compliance, and Analysis” for additional information.

[5] Laboratory testing for Corps of Engineers projects must be completed by a certified lab. As a result of this investigation, the State’s lab obtained the necessary documentation to pursue certification for future rock testing of potential quarry sites.

C. Variables Impacting Rock Cost

Variables impacting construction with rock in the State of Alaska can be summarized in the following general categories of Access, Competition, Quality, Other Costs, Business Relationships, and Other Factors including:

Access

- Remoteness of the quarry (available skilled labor, transport & subsistence costs)
- Haul distance to a load out facility or project site (cost of trucks & tug/barges)
- Condition of the load out (improvements required for safety & usability)
- Barging costs and barge availability (shortage of equipment is prevalent)
- Lightering required (access to beach, barge landing, or shallow waters)
- Mobilization costs required for equipment to produce rock (contractor working nearby)

Competition

- Competition for the rock from other projects (priority given to other uses)
- Number of bidders for a project (seasonal work is booked early in calendar year)
- Volume of work being bid in the state at the time (other bidders' interest)
- Other available competitively priced sources (haul distance/cost from alternate source)

Quality

- Quarry capacity to produce rock (demand exceeds quantity or production rate)
- Size and quality of rock specified (how much of blasted rock used/wasted)
- Estimated yield of specified rock size (how much of blasted rock is useable)
- Condition of the quarry (overburden, rock in the way or remaining loaded holes)
- Risk of availability costs (source will not meet quantity and quality testing spec)
- Quarry owner's demands for use (site improvements, testing or production of materials for owner's uses, stockpiling and cleanup, landing/road maintenance)
- Yield depends on contractor's blasting methods and production sequence

Other Costs

- Fuel costs (extraordinary fuel price inflation and deflation occurred in past five years)
- Explosives costs (subcontracts, purchase, shipping, storage, and blasting costs)
- Risk of loss costs (haul, barging or placement loss, production variances)
- Recovery of development costs by quarry operator (quarry operated by the contractor versus independent/owner's quarry operator charging added overhead)
- Added work or rework costs (some project elements include more than supply and place rock costs, i.e. rough/finish grading, sand/filter layer, filter fabric, trenching, special placement method, keying/interlocking/orienting rocks)

- Royalty charged for the rock (fees to local and regional land owners)

Business Relationships

- Relationship between quarry operator and bidding contractor(s)
- Sponsor's relationship with the USACE (Cost Share Agreements should include agreed ceiling price for rock products where sponsor controls, or is related to owner of, quarry)

Other Factors

- Publishing the available funds for the project (bidder knows max funds available)
- Exclusive rights to a rock source by one contractor (prior contractual use)
- Placement tolerances (allowed variance in paid quantity vs. unpaid over-placed)
- Placement constraints (rock placed in-water, deep water, strong currents)
- Economic impacts (failures of other industries prompt increased fees for resource use)
- Availability of an Engineer of Record during design and construction
- Engineering design and specifications (lower the design criteria to accept higher risk and increased probability for potential failure)
- Claims (can significantly increase the cost of rock)

D. Path Forward

Following are potential actions for the USACE and the State to consider. There are risks associated with the following considerations which this report attempts to highlight. These considerations are offered as a starting point for all affected parties to engage in dialogue. The following are in no particular order.

Table 2. Considerations to Decrease High Cost of Rock for Federal Projects in Alaska

Action	Potential Drawback
Revise the design standards for projects.	This action would increase the probability of potential failure. Design standards currently assume a 50-year project life expectancy for USACE projects.
Streamline the permitting process.	The permitting process must follow regulations. Federal interest projects are held to a higher standard.
Break out bids so that multiple contractors can bid on pieces of the contract.	Breaking out pieces would increase the risk to the government of failure from any one contractor unable to meet obligations and add to the complexity of managing the construction.

Action (continued)	Potential Drawback
Federally owned quarry.	Federal government ownership of a quarry would put additional risk on the government and potentially increase cost to the project.
State-owned quarry.	This would require a memorandum of understanding between the State and Federal government and require payment of royalties to the Division of Natural Resources.
Designate quarry in the bid package.	This leaves the government open to lawsuits if the rock fails to meet specifications – quality and quantity issues.
Allow additional time to complete projects.	Current timeline of 18 months to complete project does not allow sufficient time for quarry development close to project. New quarries take on the order of 3 – 5 years to develop. Also opens government to potential lawsuits if the rock fails to meet specifications, or if there are quality and quantity issues.
Find a proven source at tidewater.	The ceiling for new rock quarry development is the price of concrete armor units (dolos) from Seattle. New quarry development would need to consider this as the competition.
Develop new partnership agreements with other agencies or perhaps the military.	Partnership agreements take time to develop and put in place. These would need to be developed prior to request for proposal.
Develop partnership agreements with Native Regional Corporations	Generally speaking, the Native Regional Corporations own the subsurface rights to the rock on their land. Supplying the rock to regional communities could be in-kind services as long as the rock meets the standards specified in the proposal.

E. Summary

The relationship between quarry location, competition, and project size can have a direct effect on project cost. There is no direct correlation between the source price of rock and the actual cost to produce, transport, and place rock specified for a particular project.

Appendix A:
Quarry Operator Feedback

APPENDIX A. QUARRY OPERATOR FEEDBACK

A. Background

Using a variety of data sources including 1) the contracting section of the USACE, 2) internet searches, and 3) State of Alaska business license database, a list of rock quarries in the State of Alaska was compiled during the spring of 2010.

Rock quarries were contacted by USACE for interviews in an attempt to research the level of satisfaction quarry operators have with USACE processes, to identify areas for potential improvement, and to research cost concerns with the quarry operators. Interviews were conducted via telephone with select quarry operators in the State of Alaska. These conversations provided quarry operators[6] with the opportunity to share their current business practices, discuss any concerns that they had with USACE processes, and provide suggestions for improvement.

For confidentiality purposes, comments are aggregated and no quarry names or locations are listed.

B. Summary of Discussions

Time-Line Concerns

While some quarries indicated that the USACE bidding process allows sufficient time for a response and that the timing/seasonality on the request for bids works well, there were other quarries that had less than favorable experiences.

Several quarries mentioned that the best thing USACE could do to be more successful in the bidding process is to publish a forecast of potential projects to make quarries aware of what projects could potentially be coming up. Currently, quarries have a 30-45 day window to respond to a Request for Proposal. A three- to five-year forecast of potential projects was requested, or in the alternative, a year to year outlook would provide some benefit. Several quarries indicated that they attempt to forecast their quarry work load out three years at a minimum, and that while they certainly understand that nothing is guaranteed when projecting workload out into the future, being informed of potential projects in advance would be very helpful to them.

[6] In most cases the owner (the one receiving the royalty payments) and the operator (the one who is producing the rock) are two different entities. However, often the operator and contractor are one in the same. The contractor is the one who bids on the rock and works directly with the USACE or ADOT&PF. Unless a quarry is designated, it is completely up to the contractor to negotiate and provide rock. For this interview effort, USACE primarily contacted quarry operators.

Additional lead time (while USACE is in the engineering phase of a project) would also enable an operator to get started on trying to set up additional quarries to meet our needs, if they desired to do so. The quarry permitting process is long and operators indicated that they would love to have the opportunity to get a jump on the competition and work on opening quarries to provide material sources for future projects (even without a guarantee of receiving the contract in the end).

Bid Restrictions

One major concern expressed by multiple quarry operators was that USACE bid requests specifically note that the bid is “all-or-nothing” (the bid request does not allow a quarry to bid on pieces of the project, a quarry must be able to supply the entire proposal or they do not qualify to bid on the request).[7] Quarry operators indicated that it is extremely rare that one quarry will have access to all the materials on the RFP. Therefore, most quarries are eliminated from the opportunity to bid on the project and competition among bidders is thereby decreased. It was suggested that breaking the bids into multiple pieces would open up opportunity and increase competition by allowing quarries to bid on supplying the materials that they have available. Quarries provided specific examples of bid requests that they desired to participate in, but for which they didn’t have access to all the materials requested in the bid. These quarries indicated that they would like to work with USACE more often, but USACE bid requests are just too restrictive.

A further price issue generated by restrictive requests for bids was noted by quarry operators. They indicated that USACE pays more for the products by using restrictive bid requests because quarries that are able to meet the full bid request are not necessarily near the project site. USACE therefore frequently has materials transported from a quarry that is farther away, thereby increasing transportation costs.

An additional type of bid restriction that was noted as a concern was related to product restrictions on the bid requests. For example, it was suggested that USACE should provide a bid request with a range of rock weights rather than a single targeted number. One example that was provided during discussions was that if a quarry tends to yield a heavier rock they are not able to bid on a project, even though the structural integrity of the project would not be adversely affected by the heavier rock.[8][9] If a range of product specifications was provided on the bid request it could increase competition and reduce costs.

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[7] Quarry operators would typically not be a general contractor for the project so this comment needs to be taken in that light. Multiple quarry operators can supply product for a particular construction project but requests for proposals would typically be issued with the intent of a complete project as opposed to pieces such as quarrying, transporting, and placing the rock as separable elements.

[8] Subsequent conversation with Corps engineers reveals that these situations can be negotiated provided the integrity of the project is not affected by the rock weights being different from the bid specifications. Things such as geometry and filter layer may not allow heavier weight rock for a particular project.

[9] Value engineering option is highly recommended on each project as the Corps is open to looking at rock sizes or reconfiguration when it is in the best interest of the Federal government and the project sponsor.

Competition

During the telephone interviews, it was noted that the quarries are generally familiar with what products can be supplied by their competition. When a quarry receives a Request for Proposal, they are able to determine who their competition is – and if it appears that they are the only quarry that can fulfill all requirements on that bid request, then their price is increased because they know there will be a lack of competition. One quarry disclosed that in this case they increase their bid price by upwards of 30 percent.

Several quarries cited that rock price is high because of the limited number of sites – supply and demand play a critical role in the price of rock in Alaska. A limited number of quarries leads to decreased competition and increased transportation costs. The cost for employee training, regulations and permitting, and other requirements was also indicated to be increasing, along with the cost of fuel. Quarries are responsible for paying royalty costs when they obtain rock on Alaska Native lands, and the royalty cost is determined by the Native Corporation (a cost that it outside of the control of the quarry operators). It was suggested that one way USACE could help to reduce rock costs would be for the agency to work with Native Corporations to reduce or lock-in royalty costs.

Concerns with Communication

Quarry operator's major complaint with how USACE does business is that by the time the quarry gets involved, the design engineer is out of the picture.[10] The only people the quarry has contact with are the Contracting Officer, the COR, and a field inspector. According to the quarry operators, the field inspectors range from extremely talented to completely inexperienced. They find that handling issues without the design engineer (who is most familiar with the project and what rock is needed) causes many problems and can dramatically increase the cost. Quarry operators believe that increased communication between the design engineers and the contractors could provide tangible benefits to the process.

Another comment that was frequently repeated by quarry operators was that they did not believe that their quarry was on our list of potential bidders and had not been receiving requests for bids.[11] Every quarry operator that mentioned this concern indicated that they would love to be included in the USACE list of potential bidders and that they would be very interested in doing business with USACE.

It was also suggested that communication with USACE is inconsistent. It was hypothesized by one operator that communication with USACE is so inconsistent that it seems as if their quarry is on the contact list for one person in contracting, but not on the list

[10] This perception may not be true of all construction projects.

[11] This comment gets back to the capability of the quarry operator to meet all the requirements of a general contractor for the project.

for the rest of the department. Maintaining regular communication with the quarry operators was a key concern.

Opportunities

One quarry indicated that they thought the best way for us to try and reduce the cost of our projects is for USACE to go out and investigate rock sources and provide that information to quarry operators, providing them with the opportunity and information to expand into areas where rock is available. Having USACE conduct preliminary investigations would make it more appealing for the quarry operators to expand into new locations. It was also noted that the permitting process for opening/expanding quarries is very lengthy and that having that processes shortened or expedited would help speed up the permitting process for quarries.

Miscellaneous Comments

Those quarries that had supplied materials for USACE projects in the past generally had very positive feedback for the USACE processes. It was noted by multiple quarries that they had positive experiences with USACE in the past, and always look forward to working with us.

C. Conclusion

Quarry operators in general had positive comments regarding their experiences with USACE; however they also provided multiple suggestions on how the process could be improved. Improving communication between quarry operators and USACE was a key concern, which included suggestions of providing a forecast of future projects to quarry operators to enable them to better prepare for future jobs. Reducing restrictions during the bidding process was also a major concern cited by multiple quarry operators.

Appendix B:
Cost Engineering

APPENDIX B. COST ENGINEERING

A.   Background

Cost engineering has been tasked to support an investigation of previous USACE projects constructed throughout the State of Alaska that utilized rock for breakwaters, erosion control, and other marine infrastructure. Trends have shown that the prices bid by construction contractors for in-place rock products (gravel, sand, rubble-mound and rip-rap) has increased substantially in 15 years.

The purpose of this investigation is to identify different variables and circumstances that contribute to the escalation in bid prices seen recently in order to better predict the price for future project planning.

Historical data was gathered for the following projects awarded between 1994 and 2010;

- 2010 - Seward Breakwater Extension
- 2010 - Coastal Erosion Control Unalakleet
- 2010 - Phase 3 Kivalina Erosion Control   17+50 to 21+50
- 2010 - Akutan Navigation Improvements
- 2009 - Shishmaref 38+00 to 39+00
- 2009 - Phase 2 Kivalina Erosion Control 2009   21+50 to 33+50
- 2009 - St. Paul Harbor Improvements, Ph3
- 2008 - Shishmaref 32+00 to 38+00
- 2008 - Phase 1 Kivalina Erosion Control 2008 33+50 to 35+75
- 2008 - Unalaska Navigation Improvements
- 2008 - Douglas Harbor Navigation Improvements
- 2006 - False Pass Harbor Improvements
- 2006 - Shishmaref Emergency Shoreline Erosion Protection
- 2005 - St. Paul Harbor Improvements, Ph2
- 2005 - Sand Point Harbor Improvements
- 2004 - Seward Harbor Improvements
- 2003 - Nome Navigation Improvements
- 2003 - Wrangell Harbor Improvements
- 2002 - Chignik Small Boat Harbor
- 2001 - Ouzinkie Small Boat Harbor
- 1995 - King Cove Harbor Improvements
- 1995 - Kodiak Harbor, Ph 2
- 1994 - Sitka Channel Rock Breakwaters

All of the above projects were structured as a performance-based requirement where the contractor was to provide a specified rock size/range that met specified quality & quantity, installed per contract drawings and specifications.

There were no limitations as to what quarry a contractor could use in on any of the projects, as long as the rock met specifications; therefore, it was up to the contractor to find/select an adequate quarry source, negotiate prices & contract for materials, produce rock products as needed, transport and place the rock. Thus the project bid schedules line item prices include all of the above direct costs plus indirect costs, and it is not possible to analyze the bid unit costs and break out the contractors' separate costs for production, transport and placement of rock products. The bid unit prices are not directly indicative of source costs or cost escalation.

B. Elements of the Unit Cost

When producing a cost proposal prior to contract award, many factors contribute to the unit prices in the bid schedule. There is no direct correlation between the source price of rock and the actual cost to produce, transport and place rock specified for the project. For example, some contractors will quote an identical price for all varieties/sizes of rock whether it's A-, B- or C- rock, then have a mobilization/demobilization bid that is substantially different from the other bidders and the government's estimate. Actual direct costs associated with rock production and profit margins are shifted between bid elements to minimize risk, maximize reward, and for other business reasons known to the bidder.

Some common factors that contribute to the actual cost for providing and installing rock on these projects include (compiled by USACE Alaska District Cost Estimating Branch and Soils and Geology Section, and the ADOT&PF Coastal Engineering Section);

Access

- Remoteness of the quarry (available skilled labor, transport and subsistence costs)
- Haul distance to a load out facility or project site (cost of trucks and tug/barges)
- Condition of the load out (improvements required for safety and usability)
- Barging costs & Barge availability (shortage of equipment is prevalent)
- Lightering required (access to beach, barge landing, or shallow waters)
- Mob required for Equipment to produce rock (contractor working nearby)

Competition

- Competition for the rock from other projects (priority given to other uses)
- Number of bidders for a project (seasonal work is booked early in calendar year)
- Volume of work being bid in the state at the time (other bidders' interest)
- Other available competitively priced sources (haul distance/cost from alternate source)

Quality

- Quarry capacity to produce rock (demand exceeds quantity or production rate)
- Size and quality of rock specified (how much of blasted rock used/wasted)

- Estimated “yield” of specified rock size (how much of blasted rock is useable)
- Condition of the quarry (overburden, rock in the way or remaining loaded holes)
- Risk of Availability Costs (source will not meet quantity and quality testing spec)
- Quarry owner’s demands for use (site improvements, testing or production of materials for owner’s uses, stockpiling and cleanup, landing/road maintenance)

Other Costs

- Fuel costs (extraordinary fuel price inflation and deflation occurred in past five years)
- Explosives costs (subcontracts, purchase, shipping, storage, and blasting costs)
- Risk of Loss Costs (haul, barging or placement loss, production variances)
- Recovery of development costs by quarry operator (quarry operated by the contractor versus independent/owner’s quarry operator charging added overhead)
- Added work or Rework costs (some project elements include more than supply and place rock costs, i.e. rough/finish grading, sand/filter layer, filter fabric, trenching, special placement method, keying/interlocking/orienting rocks)
- Royalty charged for the rock (fees to local and regional land owners)

Business Relationships

- Relationship between quarry operator and bidding contractor(s)
- Sponsor’s relationship with the USACE (Cost Share Agreements should include agreed ceiling price for rock products where sponsor controls, or is related to owner of, quarry)

Other Factors

- Publishing the available funds for the project (bidder knows max funds available)
- Exclusive rights to a rock source by one contractor (prior contractual use)
- Placement tolerances (allowed variance in paid quantity versus unpaid over-placed)
- Placement constraints (rock placed in-water, deep water, strong currents)
- Economic impacts (failures of other industries prompt increased fees for resource use)

C. Cost Discussion

Cost estimates produced by the USACE for upcoming projects must be based on existing quarry operations and previously awarded bids for similar projects. Received bids are often inclusive of other development, transportation, and placement costs making wide ranges for the cost estimates. This occurrence results in inaccurate planning documents and cost “busts” when it is time for project development.

The ADOT&PF also relies on historic bids and existing quarries; the ADOT&PF may develop new source s for certain materials, but tend to rely on contractors for quarry rock. Historically, the state estimates for rock costs have been close to bid prices. The ADOT&PF

does more rock work (larger quantities) than the Corps annually, which may provide a better idea of overall rock and projects costs and contribute to lower rock costs. Additional, state projects tend to be completed quicker so that the estimate and the construction bids are closer.

The perception is that the cost of rock paid by the USACE is a lot higher than that paid for ADOT&PF projects, but in fact, the cost of rock is based on the intended function for the project so comparisons between USACE and ADOT&PF projects are difficult to make and can be misleading. Rock for State projects is more plentiful, easier to produce, and closer to readily available transportation modes. Rock for USACE projects tends to be in remote areas, specialized in terms of size and weight specifications, and often requires multiple handling to place at the project site.

D. Project Facts

The following tables identify the project, quarry source(s), distance from quarry to project, transport method and placement method.

Table B - 1. Seward Breakwater Extension, 2010

Quarry Source	4th of July Creek Quarry (owned by City of Seward)
Distance Quarry to Project	3 miles via road to loading dock & 3.5 miles via water
Transport	Trucked to loading dock, barged to project
Placement	• Unloaded from barge via crane or f/e loader, staged on breakwater, placed with hydraulic excavator from breakwater
Other Items	

Table B - 2. Unalakleet Coastal Erosion Control, 2010

Quarry Source	Kaministi Quarry – St. Paul Island (Native Corporation owned)
Distance Quarry to Project	2 miles via truck, 630 miles via sea one way
Transport Cycle	Haul via truck to loading dock in St. Paul, barge to Unalakleet on large barge, transport from large to small barge offshore, tow small barge to shore, land barge on beach, unload and place
Placement Method	Via Hydraulic Excavator on land (anticipated)
Other	1. Due to shallow shore line, rock has to be unloaded from deep draft barge onto shallow draft then unloaded on shore. 2. Nome quarry not used even though its closer to project. Nome quarry had already been retained by other projects and capacity couldn't support Unalakleet project.

Table B - 3. Phase 3 Kivalina Erosion Control, 2008 - 2010

Quarry Source	Cape Nome Quarry, Nome (Native Corporation Owned)
Distance Quarry to Project	330 miles one way via water
Transport Cycle	Loading dock at quarry, barge to Kivalina, beach the barge, unload via front end loader, stage on beach, load and truck to project site
Placement Method	• Hydraulic excavator on land
Other	1. 2008 construction required an additional truck from quarry to City of Nome as the loading dock at quarry was not functional. 2. 15 mile additional truck to Nome loading dock, where rock was loaded on barge for transport.

Table B - 4. Akutan Navigation Improvements, 2010

Quarry Source	Ugadaga Quarry – Unalaska aka Dutch Harbor
Distance Quarry to Project	4 mile truck to loading dock, 55 miles via water
Transport Cycle	Load in Unalaska, barge to Akutan.
Placement Method	• Various methods could be to place core from beach and precede seaward, B- and A- rock placed via excavator or crane on a barge.
Other	1. Project awarded in early 2010, contractor has not presented plans for placing. 2. Quarry location is known however.

Table B - 5. Shishmaref Emergency Shoreline Erosion Protection, 2006 and 2009

Quarry Source	Cape Nome Quarry
Distance Quarry to Project	230 miles via water, 2-3 mile truck to project site
Transport Cycle	Load at quarry, barge to Shishmaref, beach barge, unload via f/e loader & dump truck, stage on beach, load and haul to project
Placement Method	• Via hydraulic excavator from shore
Other	1. 2006 construction required an additional truck from quarry to City of Nome as the loading dock at quarry was not functional. 2. 15 mile additional truck to Nome loading dock, where rock was loaded on barge for transport.

Table B - 6. Phase 2 and 3 St. Paul Harbor Improvements, 2005 and 2009

Quarry Source	Kaministi Quarry – St. Paul
Distance Quarry to Project	5 miles by truck
Transport Cycle	Load at quarry, truck to project site
Placement Method	• Construct causeway berms into harbor, then place via trucks and hydraulic excavator. May use marine based placement in some places as well.
Other	

Table B - 7. Unalaska Navigation Improvements, 2008

Quarry Source	Ugadaga Quarry – Unalaska aka Dutch Harbor
Distance Quarry to Project	4 mile truck to project
Transport Cycle	Load at quarry, truck to project,
Placement Method	• Core and B- rock: dumped from barge, and by loading into skip box and placing with crane. B-rock shaped with hydraulic excavator. • A-rock: Placed from shore and from barge. Rock loaded on barge. Barge was then moved to excavator on a flexi-float and placed.
Other	

Table B - 8. Douglas Harbor Navigation Improvements, 2008

Quarry Source	Fish Creek Quarry
Distance Quarry to Project	12 miles one-way
Transport Cycle	Trucked
Placement Method	• The extension breakwater was by excavator from land • A split hull barge was used to place core and some B-rock for other b/w working low tides • Excavator was set on crest of b/w to set B- and A-rock
Other	1. Quarry owned by borough

Table B - 9. False Pass Harbor Improvements, 2006

Quarry Source	Ugadaga (Unalaska), Sand Point, and Texada in British Columbia, and Beaver lake Quarry, Mt. Vernin WA
Distance Quarry to Project	151 miles, 200 miles and 1800 miles one way via ocean
Transport Cycle	Truck from quarry, load on barge, tow to project site
Placement Method	• Marine based placement with hydraulic excavator from flexi-floats and barges
Other	1. A-rock issues were encountered with Ugadaga Quarry (size and gradation difficulties) 2. Contractor procured rock from other quarries as a means of meeting specifications. 3. One barge load from B.C. was transported. Only 1 load came from B.C. Contractor was based in Pacific Northwest

Table B - 10. Sand Point Harbor Improvements, 2005

Quarry Source	Sand Point Quarry
Distance Quarry to Project	100 yards
Transport Cycle	Trucked and end dumped.
Placement Method	• B- and A- rock shaped and placed via hydraulic excavator. All land based.
Other	1. Causeway was built on top of new breakwater 2. Quarry was located right next to project site

Table B - 11. Seward Harbor Improvements, 2004

Quarry Source	4th of July Creek Quarry
Distance Quarry to Project	5 Miles Via Nash Road and Seward Highway
Transport Cycle	Load in 20cy end dumps at quarry, truck to project site, dump along breakwater
Placement Method	• Dump trucks would dump core and B- material directly into water, working their way seaward. Hydraulic excavator would place and shape A- and B- rock working from the nose towards the shore. Dump trucks would feed this rock to excavator from shore.
Other	1. Prior to project contractor investigated at least two quarries. One needed some environmental permits coordinated and contractor was considering its use.

Table B - 12. Nome Navigation Improvements, 2003

Quarry Source	Cape Nome Quarry – Bering Straits Native Corp
Distance Quarry to Project	15 miles one way via gravel road
Transport Cycle	Sorted rock is loaded at the quarry via f/e loader onto flat bed trailers and 20 – 80 cubic yard dump trucks. A- and B- rock unloaded on beach with f/e loader then fed to placement equipment.
Placement Method	• A-rock placed with 150-ton crane and orange peel grapple, large hydraulic excavator with grapple. A- & B- placed with large excavator grapple, and bucket/thumb all from land. • Smaller B- and Core placed with hydraulic excavator but mostly via direct dump method from dump trucks.
Other	1. Contractor negotiated sole use of this quarry for the contract period with the owner/operator. They were able to operate quarry with in-house crews and labor. This surely helped mitigate some risk to the contractor in terms of a predictable supply of specified rock. One concession for this arrangement was the contractor was required to pay royalties up front to the owner. 2. Cape Nome has a reputation as a very good quarry in terms of rock quality, access and capable of producing a variety of different rock sizes.

Table B - 13. Wrangell Harbor Improvements, 2003

Quarry Source	Airport Quarry (located near Airport on State Land)
Distance Quarry to Project	
Transport Cycle	Core rock mined, sorted then moved via conveyor belt to a stockpile location, then with another conveyor belt it was transferred directly onto a split hull barge. This was then towed into place and directly dumped in place. B- and A-rock was loaded on dump trucks and staged for loading on split hull barge.
Placement Method	• Core was towed into place and directly dumped in place. • B- and A- rock was placed by direct dump where possible, but majority was fed to a hydraulic excavator.
Other	1. Quarry was developed by contractor. 2. FAA owned land and worked a deal with contractor to develop and take rock for a very low price as this was an area that needed to be lowered for airport safety reasons.

Table B - 14. Chignik Small Boat Harbor, 2003

Quarry Source	Indian Creek (located in Chignik)
Distance Quarry to Project	5 miles via gravel road.
Transport Cycle	Via truck from quarry
Placement Method	• Contractor built core by direct dumping with trucks from the shore, progressing offshore. • B- rock was placed via truck and hydraulic excavator from breakwater. • A-rock was delivered via truck to end of breakwater then placed with hyd excavator. • Large A-rock at the toe in deep areas was placed via crane and grapple off of a barge.
Other	1. Quarry was developed by contractor for this project. 2. A lot of waste was generated to obtain the required A- and B-rock. This material was used to build causeways for equipment to access harbor basin for dredging. 3. Rock is deteriorating more rapidly than is acceptable; therefore this quarry will not be approved for further use in USACE projects.

Table B - 15. Ouzinkie Small Boat Harbor, 2001

Quarry Source	Kodiak Island (not clear where or owner.)
Distance Quarry to Project	Unknown
Transport Cycle	Via barge and tug tow.
Placement Method	• Marine based. Used crane and hyd excavator on a barge to unload B- and A- rock from barge. • Skip box fead hyd excavator placed on breakwater to shape and final place rock.
Other	

Table B - 16. King Cove Harbor Improvements, 1998

Quarry Source	Sand Point Quarry
Distance Quarry to Project	100 miles via sea
Transport Cycle	Load on barges at quarry, tow to project site.
Placement Method	• Placed with crane on a barge, used f/e loaders to feed shore equipment, let barge go dry on some loads,
Other	

Table B - 17. Phase 2 Kodiak Harbor, 1995

Quarry Source	Seward and Brechens Construction (Kodiak based construction company that has a quarry source on the island somewhere)
Distance Quarry to Project	Seward to Kodiak: 220 miles by sea Brechens: Unknown
Transport Cycle	Seward: Load at quarry on trucks, unload at dock onto barge, tow to project. Brechens: Not known
Placement Method	• Placed off of a barge then with an excavator on the crest of the core rock as the tide allowed.
Other	1. Project photos not digital and most personnel that worked on project for the COE are not available so not much info on this project.

Table B - 18. Sitka Channel Rock Breakwaters, 1994

Quarry Source	Sitka Quarry
Distance Quarry to Project	3.3 miles via sea
Transport Cycle	Load at quarry directly into barges from quarry loading facility. Tow loaded barge to project for placement
Placement Method	• Direct dump from split hull scow for most of core and B-rock. • When draft was not achieved, material was loaded from scow with f/e loader onto a skip box (aka hopper), where it was lifted with crane into place and dumped. • B- and A-rock where above water level was placed with hyd excavator.
Other	1. Quarry was also accessible via road. Distance from town of Sitka to quarry is about 5 miles.

E. US Army Corps of Engineers, Historic Rock Cost Data

Project Title	Project Location	Advertised Date/IFB or RFP	Contract Award	# of Bidders	Rock Source of Successful Bidder	Rock Price (Base Bid Only)			Quarry Quote			Bid Qty of Each Rock (Base Bid Only)			Size of Rock		Award Amount	General Comments
						A	B	Core	A	B	Core	A (cy)	B (cy)	Core (cy)	A (lbs)	B (lbs)		
2006 Shishmaref Emergency Shoreline Erosion Protection	W911KB-05-C-0019	RFP	8/4/2005	1	Cape Nome Quarry	$282.00	$232.00	$157.00				1,433	708	2,173	1200-650	200-65	1,428,813	Rock from Cape Nome Quarry. Mined, and hauled via truck to Nome causeway dock by local Nome contractor. Loaded on subcontractor barges at the Nome causeway via excavator and front end loader. Barged to Nome via tug and barge. Unloaded in Shish by landing barge and stockpiling material on the beach. Material was then loaded and trucked to project site for placement via hydraulic excavator.
2008 Shishmaref 32+00 to 38+00	W911KB-08-C-0028		9/29/2008		Cape Nome, Dutch Harbor, Sand Point	$720.97	$710.34	$325.00				3,028	2,191	3,731	1200-650	200-65	9,583,520	
2009 Shishmaref 38+00 to 39+00	W911KB-08-C-0028		12/31/2008			$735.00	$730.00	$325.00				567	343	470	1200-650	200-65	965,025	
2010 Coastal Erosion Control Unalakleet	W911KB-09-C-0010		2/27/2009		St. Paul	$925.00	$800.00	$300.00				6,500	5,550	6,450	3500 - 2100 LBS	2100 -1 LB	6,902,514	

Project Title	Project Location	Advertised Date/IFB or RFP	Contract Award	# of Bidders	Rock Source of Successful Bidder	Rock Price (Base Bid Only)			Quarry Quote			Bid Qty of Each Rock (Base Bid Only)			Size of Rock		Award Amount	General Comments
						A	B	Core	A	B	Core	A (cy)	B (cy)	Core (cy)	A (lbs)	B (lbs)		
2010 Coastal Erosion Control Unalakleet	W911KB-09-C-0011		Not yet awarded			$325.00	$325.00	Between $75 and $90				11,750	8,100	9,450	3500 - 2100	2100 - 1,000	11,470,626	
Phase 1 2008 Kivalina Erosion Control 2008 33+50 to 35+75	W911KB-08-C-0010	4/11/2008	4/17/2008	1	Cape Nome Quarry	$288.00	$247.00	$145.00				3,600	1,500	1,200	2750 - 1500	200-25	3,971,000	Rock from Cape Nome Quarry. Mined, and hauled via truck to Nome causeway dock by local Nome contractor. Loaded on subcontractor barges at the Nome causeway via excavator and front end loader. Barged to Nome via tug and barge. Unloaded in Shish by landing barge and stockpiling material on the beach at Shish. Material was then loaded and trucked to project site for placement via hydraulic excavator. Kivalina has a shallower beach landing so lighter barges were loaded in Nome in order to land for unloading.
Phase 2 2009 Kivalina Erosion Control 2009 21+50 to 33+50	W911KB-08-C-0010		9/11/2008	1	Cape Nome Quarry	$380.00	$355.00	$247.00				8,738	3,859	3,370	2750 - 1500	200-25	8,360,590	Same as 2008
Phase 3 2010 Kivalina Erosion Control 2010 17+50 to 21+50	W911KB-08-C-0010		12/23/2009	1	Cape Nome Quarry	$346.00	$361.00	$223.00				3,300	1,450	1,350	2750 - 1500	200-25	3,193,170	Same as 2008 and 2009
Akutan Navigation Improvements	W911KB-10-C-0008	12/3/2009 - IFB	2/11/2010	7	Ugadega, Dutch Harbor	$275.00	$245.00	$175.00				17,600	9,500	37,900	1400 - 500	500 - 50	31,845,600	Expected that rock will be trucked to sea loading dock in Unalaska. Barge will be towed to Akutan where rock will be unloaded and stockpiled on beach. Placed with land based equipment.
Unalaska Navigation Improvements	W911KB-08-C-0017	6/13/2008 - IFB	7/25/2008	3	Ugadega, Dutch Harbor	$260.00	$211.00	$126.00	2000 Quarry Quote: Sand Point Dome Quarry: A=$75/cy; B=$70/cy; Core =$40/cy with $450,000 lump sum cost to barge to			6,144	7,974	18,954	4200-2500	2500-250	10,179,312	trucked to Little South America (LSA), loaded on barge (core and B) then dumped and skip box into place. Excavator shaped b-rock. A rock placed from land, and from barge

Project Title	Project Location	Advertised Date/IFB or RFP	Contract Award	# of Bidders	Rock Source of Successful Bidder	Rock Price (Base Bid Only)			Quarry Quote			Bid Qty of Each Rock (Base Bid Only)			Size of Rock		Award Amount	General Comments
						A	B	Core	A	B	Core	A (cy)	B (cy)	Core (cy)	A (lbs)	B (lbs)		
									Unalaska									feeding exc that is on flexifloat.
Seward Breakwater Extension	W911KB-08-D-0017-Task Order 6	10/6/2009	10/6/2009		4th of July Creek	$235.50	$178.60	$136.00				6,000	3,500	10,400	4200-2500	2500-250	4,229,600	This project was awarded to one of the contractors on the CW-IDIQ contract. It's not quite known how it will be accomplished.
St. Paul Harbor Improvements, Ph3**	W911KB-09-C-0021	4/23/2009	5/15/2009		St. Paul	$176.00	$176.00	$176.00				11,000	3,900	5,000	1000-50	200-1		Most likely St. Paul Quarry. Not known exactly how it will be done at this point.
St. Paul Harbor Improvements, Ph2	W911KB-03-C-0008		6/27/2003		St. Paul	$86.00	$107.00	N/A				7,200	2,400	N/A			27,677,702	St. Paul quarry. Trucked to project site ~5 miles one way in 777's. Working tides they built causeway fingers and placed mat'l off of causeways. The Government provided stockpiled A-rock as Govt Furnished Material
Douglas Harbor Navigation Improvements	W911KB-07-D-0016 - Task Order 2	4/16/2008	5/16/2008		Local - J.D. Borough Fish Creek Quarry	$63.00	$63.00	$63.00				4,900	2,400	13,000	1250-750	500-40	1,603,697	Contract was awarded to one of the 2 CWIDIQ contractors. The extension from old dock was built by excavator from land. Split hull barge for other b/w, working on low tides, set excavator on b/w then feed material from barge. Core w/ split hull, then skip box after no depth was available. Quarry to project site is ~15 miles.
False Pass - Harbor Improvements	W911KB-05-C-0016	4/1/2005	7/11/2005	4	Ugadaga, Sand Pt., Texada (B.C.), Anacordes (WA)	$114.70	$104.10	$87.30				35,294	32,680	94,118	3600 - 2200	2200 - 200	19,729,300	Trucked to LSA, loaded on barge then dumped and skip box into place. Excavator shaped b-rock. A rock placed from land, and from barge feeding exc that is on flexifloat. Rock from BC and WA and Sand Pt. primarily A-rock. Core B and some A from Ugadaga.
Sand Point Harbor Improvements	Sand Point, AK		3/17/2005	6	Sand Point	$63.00	$60.00	$50.00				28,400	20,600	70,800	3200 - 1900	1900-200	10,795,572	
Seward Harbor Improvements	DACW85-04-C-0004	9/19/2003	2/2/2004	5	4th of July Creek	$43.00	$43.00	$28.00				25,300	13,800	28,600	4200-2500	2500-250	8,844,822	Material trucked from via side dump from quarry. Truck dumped on b/w and excavator placed. All work done via land based equipment.

Project Title	Project Location	Advertised Date/IFB or RFP	Contract Award	# of Bidders	Rock Source of Successful Bidder	Rock Price (Base Bid Only)			Quarry Quote			Bid Qty of Each Rock (Base Bid Only)			Size of Rock		Award Amount	General Comments
						A	B	Core	A	B	Core	A (cy)	B (cy)	Core (cy)	A (lbs)	B (lbs)		
Nome Navigation Improvements****	Nome, AK	5/1/2003	9/30/2003	?	Cape Nome	$45.00	$45.00	$35.00				23,700	28,800	29,200	12500 - 7500	3600 - 1000	41,005,260	Produced rock at Cape Nome Quarry. Trucked ~14 miles to project site where it was stockpiled on beach. Core was dumped from shore and proceeded seaward where b-rock and a-rock was placed on side slopes to protect. Large A-rock placed via large excavator and some with orange peel grapple and crane.
Wrangell Harbor Improvements			7/11/2003	4	Airport Quarry	$29.00	$27.00	$16.50	2003 Quote: Petersburg Quarry cost at quarry (no delivery): A=$8.50/cy; B=$8.25/cy; core=$7.25/cy. Note, supplier stated that rock had not been tested per COE requirements.			57,700	66,000	148,000		2250 - 250	14,267,445	Developed raw quarry in conjunction with the FAA to help with airport clearance. FAA gave right away to contractor to make it easy for transport of material to project. Core was conveyored to stockpile location and conveyor feed directly to split haul barges. Barges were 1900 cy capacity loaded in 45 min) towed to project location (1 1/2 mi) direct dumped in 75-85 feet of water. trucks 988G loading B rock. D-9 pushing into griz. Trucks hauled to marine loading dock where it was placed via marine equipment.
Chignik, AK Small Boat Harbor -	DACW85-01-C-0011	6/13/2001	8/20/2001	6	Indian Creek /Chignik Quarry	$66.00	$52.00	$44.00	2003 Quote: FOB Valdez Dock:A=$19/cy; B=18/cy; Core=$13/cy			21,200	21,100	29,600	4000 - 2500	2500 - 200	8,687,430	Quarry was developed by contractor. Location of quarry was within 2 miles of project in Chignik. Truck mat'l from quarry. Core was placed starting at shore and proceeded into water. Placing material was via land based equipment with a very small portion in deep water that had to be placed with clamshell on barge.
									1998 Quote: FOB Seward: A=$26/cy; B=$22/cy; Core=$14/cy									
Ouzinkie Small Boat Harbor	DACW85-01-B-0004	6/1/2001	7/27/2001	2		$79.00	$79.00	$60.00	2001 Quarry Quote: Afognak Logging FOB North Dock Seward AK: A=$68/cy; B=$44/cy; Core=$19/cy			10,250	9,150	11,200			3,871,350	
									2001 Quote: West Const Loaded on barge at Sand Pt. A=$48/cy; B=$32/cy;									

Project Title	Project Location	Advertised Date/IFB or RFP	Contract Award	# of Bidders	Rock Source of Successful Bidder	Rock Price (Base Bid Only)			Quarry Quote			Bid Qty of Each Rock (Base Bid Only)			Size of Rock		Award Amount	General Comments
						A	B	Core	A	B	Core	A (cy)	B (cy)	Core (cy)	A (lbs)	B (lbs)		
									Core=$20/cy									
King Cove Harbor Improvements - DACW85-98-B-0015	DACW85-98-B-0015	10/7/1998		6	Sand Point	$45.00	$45.00	$45.00	1996 Quote (Brown Construction): Rock in-place from Sand Point to King Cove: A=$45/cy; B=$25/cy; core=$20/cy			28,500	17,500	30,000			6,180,500	
Kodiak Harbor Ph 2	DACW85-95-B-0014	3/7/1995 - IFB		7	Seward?	$31.00	$31.00	$12.00				44,600 Ton	53,900 Ton	110,000 Ton			6,087,500	
Sitka Channel Rock Breakwaters	DACW85-94-B-0003	1/4/1994 - IFB		8	Quarry at Sitka	$30.00	$25.00	$19.00				37,000	42,000	133,000			5,203,000	Loaded barge via heavy equipment directly onto barge. Towed to project site ~3.5 miles. Split hull scow direct dump until ran out of draft, then mat'l was loaded into skip box and placed via marine equipment.

F. State of Alaska DOT&PF, Historic Rock Cost Data

State of Alaska, DOT&PF, Project	Project Location	Advertised Date or Date Bid Tab Certified	Contract Award	Number of Bidders	Rock Source of Successful Bidder, if known	Rock Price (Base Bid Only $/cy)			Bid Qty of Each Rock (Base Bid Only)			Size of Rock (Average by Stone Count, W50)				Award Amount	General Comments
						Armor	Filter	Core	A (cy)	B (cy)	Core (cy)	Armor (lb)	Filter (lb)	Core (lb)	Cobbles		
2010 SITKA-ROCKY GUTIERREZ AIRPORT RUNWAY SAFETY AREA IMPROVEMENTS	Sitka, AK	8/27/2010	9/29/2010	5	Proposed - Granite Creek, Sitka, AK for core and Skeena River Quarry in B.C. for filter and armor	$100.00	$36.70	$38.95	60,000	54,500	237,500	13000	1300			$24,503,680	Core below -36' @ average $38.95/cy (range $44-$35) and above -36' with filter rock @ $22/cy.
								$22.00			3,410,000						
2009 Kotzebue Roads - Shore Avenue	Kotzebue, AK	4/30/2009		9	Unknown	$380.70	$370.83		1,348	496		?	?			$33,010,932	Bid price in tons; converted to English. 611 - consultant design
2004 SAND POINT AIRPORT RUNWAY EXTENSION	Sand Point, AK	6/30/2004		6	Sand Point Dome Quarry	$39.48	$26.79	$5.51	17,837	13,376	834,524	13000	1300			$8,273,830	Bid price in tons; converted to English. Bid price doesn't include Additive alternate ($3.2M).
						$35.25	$25.38		27,652	15,149		7000	700				
						$36.66	$24.68		7,610	2,858		2100	210				
						$7.76	**$15.51**		**10,489**	**6,844**							**NOTE: THIS MATERIAL RECOVERED AND REUSED**
2009 Chignik Lagoon Runway Repairs Rebid	Chignik Lagoon, AK	5/22/2009		5	Unknown	$200.00	$200.00		1,700	1,625		900	90			$5,074,439	

State of Alaska, DOT&PF, Project	Project Location	Advertised Date or Date Bid Tab Certified	Contract Award	Number of Bidders	Rock Source of Successful Bidder, if known	Rock Price (Base Bid Only $/cy)			Bid Qty of Each Rock (Base Bid Only)			Size of Rock (Average by Stone Count, W50)				Award Amount	General Comments
						Armor	Filter	Core	A (cy)	B (cy)	Core (cy)	Armor (lb)	Filter (lb)	Core (lb)	Cobbles		
2007 Chignik Access Airport Road	Chignik, AK	4/4/2007		>3	Indian Creek Quarry, Chignik, AK	$73.00	$50.00	$43.00	6,600	12,000	9,300	3600	360			$3,997,944	Armor 1800-5400 lb, Filter 600-30 lb, Underlayer 1.6"-6.2" (W50 3.1").
						$63.00			11,300		9,800	2300					Used "Shot Rock" for core material **
1993 Diomede Heliport	Diomede, AK	9/2/1993		2	Cape Nome	$105.75	$70.50	$72.50	584,955	21,553	55,781	12000	1000			$2,495,108	Composite slope. Bid price in tons; converted to English. Intended for high permeability. Core rock W50=3000.
						$105.75	$70.50		43,444	4,467		4000	300				Composite slope
						$105.75	$70.50		79,545	27,767		8000	800				Transition Stone between 6 and 2 ton armor; 1000 and 300 lb filter
						$70.50	$49.35	$50.75	13,367	4,233	8,426	4000	300				Composite slope. Bid price in tons; converted to English. Additive Alternate 2. Core rock W50=3000.
1985 *** St Paul Breakwater and Dock Facilities ***	St Paul Is, AK	4/30/1985		5	St Paul Is and Washington state	$63.45	$19.74	$14.50	34,043	48,227	140,000	40000	?			$31,095,850	Project bid by Calista Corporation -- failed -- department enlisted to assist with repairs.

State of Alaska, DOT&PF, Project	Project Location	Advertised Date or Date Bid Tab Certified	Contract Award	Number of Bidders	Rock Source of Successful Bidder, if known	Rock Price (Base Bid Only $/cy)			Bid Qty of Each Rock (Base Bid Only)			Size of Rock (Average by Stone Count, W50)				Award Amount	General Comments
						Armor	Filter	Core	A (cy)	B (cy)	Core (cy)	Armor (lb)	Filter (lb)	Core (lb)	Cobbles		
						$54.99	$19.74		99,291	14,184		28000	?				
						$38.07			7,801			20000					
						$31.02			9,929			14000					
						$23.97			51,773			4000					
1996 Seward Highway, MP 90.3-97, Phase III	Turnagain Arm	3/20/1996		7	Rock cuts adjacent to project	$3.41	$3.41		205,674	212,766		1200	200			$8,233,421	
1997 Seward Highway, MP 90.3 to 97.0, Phase IV	Turnagain Arm	4/21/1997		>3	Rock cuts adjacent to project	$7.05	$7.05		44,468	11,379		1200	200			$9,533,054	Project bid in tons
2002 Seward Highway MP 96 to MP 102 Rebid	Turnagain Arm	11/4/2002		>3	Rock cuts adjacent to project	$9.89			72,100			750				$19,177,340	RipRap classification - bid quantity in megagrams (i.e. metric tons)

State of Alaska, DOT&PF, Project	Project Location	Advertised Date or Date Bid Tab Certified	Contract Award	Number of Bidders	Rock Source of Successful Bidder, if known	Rock Price (Base Bid Only $/cy)			Bid Qty of Each Rock (Base Bid Only)			Size of Rock (Average by Stone Count, W50)				Award Amount	General Comments
						Armor	Filter	Core	A (cy)	B (cy)	Core (cy)	Armor (lb)	Filter (lb)	Core (lb)	Cobbles		
1986 Unalaska Airport Improvements	Unalaska, AK	8/13/1986		3	Unalaska Basalt Quarry behind town	$100.00	$22.00		8,420	6,100		?	?				First Unalaska Airport project -- used local stone with micro fractures which ultimately failed. Replaced using concrete armor units. (see project 2001)
						$22.00	$22.00		7,370	6,210.000		?	?				
1992 Unalaska Airport Shore Protection and Pavement Reconstruction	Unalaska, AK	6/24/1992		9	?	$90.24	$42.30		11,947	8,156		?	?			$2,631,518	Bid in tons; converted for spreadsheet.
						$90.24	$42.30		2,970	1,732		?	?				
2001 Unalaska Airport Safety Improvements	Unalaska, AK	9/14/2001		3	Unalaska - dome granodiorite Quarry - Ugadega	$35.34	$33.83		5,404	5,033		3300	1760				Bid in metric and converted to English for this spreadsheet
					Concrete armor units from Bellingham; local cobbles	**$375.94**		**$33.25**	**3,913**		**511**				**X**		**NOTE Concrete armor UNITS measured in square yards!!!!!! Cobbles are for dynamically stable beach**

State of Alaska, DOT&PF, Project	Project Location	Advertised Date or Date Bid Tab Certified	Contract Award	Number of Bidders	Rock Source of Successful Bidder, if known	Rock Price (Base Bid Only $/cy)			Bid Qty of Each Rock (Base Bid Only)			Size of Rock (Average by Stone Count, W50)				Award Amount	General Comments
						Armor	Filter	Core	A (cy)	B (cy)	Core (cy)	Armor (lb)	Filter (lb)	Core (lb)	Cobbles		
2009 Nome Storm E R Permanent Repairs 2004-2005 Stage II	Nome, AK	10/6/2009		6	Nome	$114.00			22,225			1000				$4,091,282	
2007 Nome Storm E R Permanent Repairs 2004-2005	Nome, AK	12/4/2007		>2	Nome	$98.70	$84.60		10,235	4,918		700				$4,091,282	bid in tons; RipRap Class II bid was $90/ton compared with $70/tomn for PA
2004 Dayville Road Reconstruction	Valdez, AK	6/15/2004		4	local quarry	$30.00	$28.00	$22.00	55,400	8,000	52,300	*	*	*		$29,643,056	Class IV, Class II and Class I RipRap (611): Design called for Armor Stone.
20?? Ferry Terminal Road	Valdez, AK																
1999 Whittier Ferry Access Road	Whittier, AK	8/11/1999		6	Smitty's Cove	$14.29			8,710			?				$3,819,005	original bid in metric
2009 Nome Storm ER Permanent Repairs 2004-2005 Stage II	Nome, AK	10/6/2010		6	Nome	$160.74			15,762			1000				$4,091,282	original bid in tons; maintenance project
200? Nome Storm ER Permanent Repairs 2004-2005 Stage I	Nome, AK				Nome							700					

State of Alaska, DOT&PF, Project	Project Location	Advertised Date or Date Bid Tab Certified	Contract Award	Number of Bidders	Rock Source of Successful Bidder, if known	Rock Price (Base Bid Only $/cy)			Bid Qty of Each Rock (Base Bid Only)			Size of Rock (Average by Stone Count, W50)				Award Amount	General Comments
						Armor	Filter	Core	A (cy)	B (cy)	Core (cy)	Armor (lb)	Filter (lb)	Core (lb)	Cobbles		
2009 Gustavus Causeway Replacement	Gustavus, AK	3/26/2009		5	Long Island near Hoonah	$100.00											Item Bid as LUMP SUM; estimate cost of $100/cy for material produced, sorted, hauled and complete-in-place. Short haul by barge across Icy Strait.
1999 Homer Spit Pathway	Homer, AK	2/3/1999		>3	Unknown	$59.85	$32.00	$8.08	3,458	2,075	15,280	800	80			$2,592,470	Bid in Megagrams/ core is Borrow, Type D
							$20.00	$8.70		1,319	51,654		20				Bid in Megagrams/ core is Borrow, Type A
2005 Nome Sea Storm (9/5) Permanent Repairs, Unalakleet Beach Road	Unalakleet, AK	3/26/2009		2	Local quarry	$130.00	$130.00		6,000	3,200		30	5			$2,266,750	6-12" armor and 3-6" filter; riprap spec 611; getotextile fabric; engineered dynamically stable beach

Source: Alaska Department of Transportation and Public Facilities, Coastal Engineering Section.
Notes: ** SHOT ROCK. Used in the construction of embankment - well graded; maximum size 16-inch diameter by weight, with no greater than 10 percent passing the 0.75-inch sieve by weight. Free draining rock material obtained from a quarry by means of blasting or ripping.
*** Project was bid by Calista Corporation -- repaired by department prior to Corps project. Not designed by DOT staff.

Appendix C:

Field Surface Reconnaissance Report, Potential Large Stone Material Sources

APPENDIX C. FIELD SURFACE RECONNAISSANCE REPORT, POTENTIAL LARGE STONE MATERIAL SOURCES

A. Executive Summary

This report documents the results of preliminary field surface reconnaissance site visits conducted by the USACE between February and September 2010 at the following ten locations: Bering Shai Quarry, Shakmanof Cove, Platinum Quarry, Perryville Quarry, Flat Island Quarry, Chugach Bay, Diamond Point, Snake Lake Quarry, Ekuk Quarry, and Sawmill Cove. A Vicinity Map of each location is shown in Figure C - 1 and a list of contact information for each potential material source is provided in Table C - 11 at the end of this report.

The purpose of the site visits was to identify potential material sources of large stone for future harbor and shore protection projects. This report includes individual summaries of the site visit findings based on field observations. It also includes a summary of laboratory rock quality test results from previous studies, an assessment of rock quality, site access for material transportation, and overall suitability of the potential material source for the production of large stone.[12]

Of the ten sites visited, all except the Perryville Quarry would be recommended for future consideration as a potential material source of large stone for the construction of harbor and shore protection projects. Additional consideration would likely include field exploration and laboratory testing.

[12] Previous testing is only valid for the materials sampled. The extent and quality of past sampled quarries may vary. The test results should be viewed as an indicator but not confirmation of the existing quality of large stone.

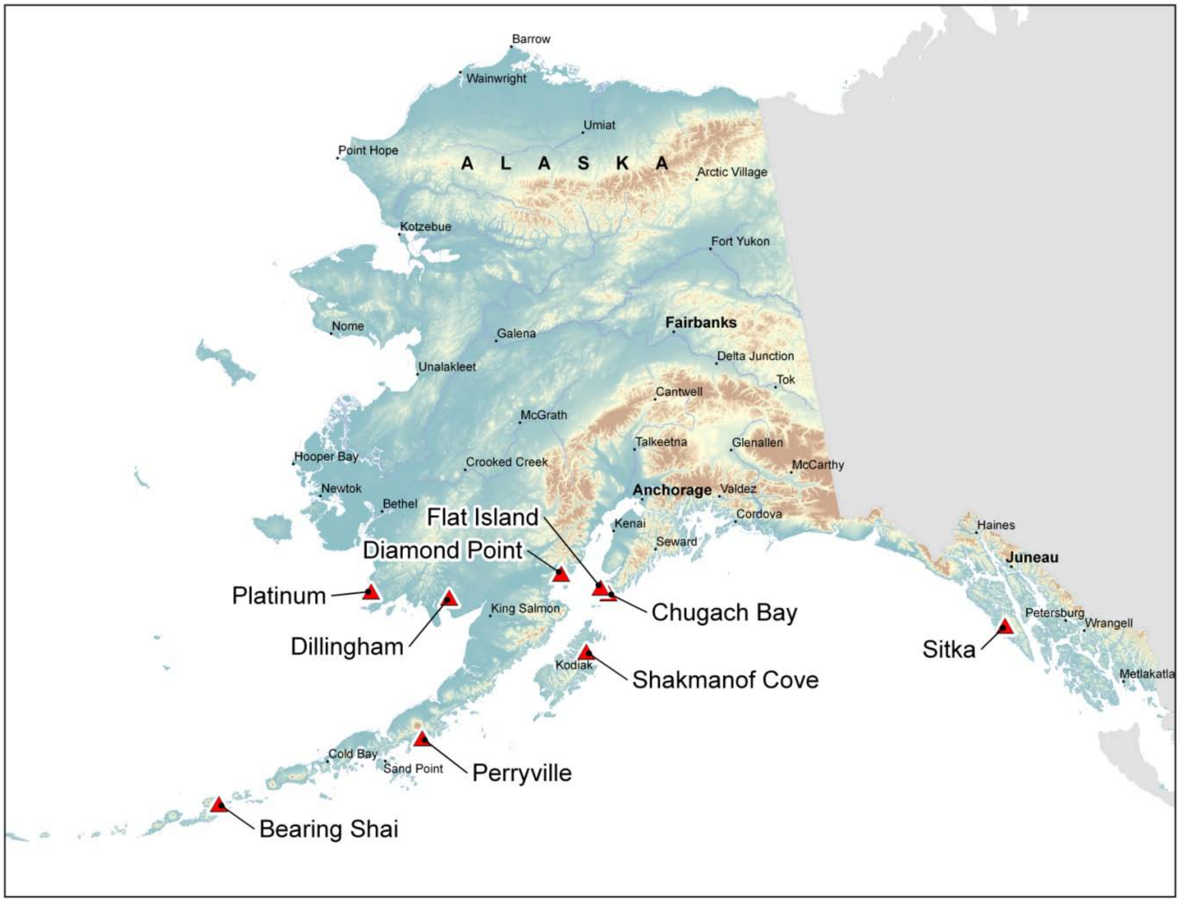

Figure C - 1. Vicinity Map

B. Introduction

Currently the USACE does not designate material sources for the production of large stone or aggregate to be used to construct harbor and shore protection projects. The contractor is responsible for selecting the material source, determining the suitability of the rock, and obtaining the necessary construction and environmental permits required to develop and mine the material source. Large stone for erosion control used on USACE projects is required to be composed of hard, strong, durable materials that will not slake or deteriorate upon exposure to the action of water, contain cracks, joints, faults, seams, laminations, or bands of minerals or deleterious materials which would result in breakage during or after placement, and be free of expansive or other materials which would cause accelerated deterioration by exposure to project conditions.

Typical Material Source Requirements

In general, all material sources used on USACE projects require a visual geologic examination of the quarry and laboratory rock quality testing to determine if the material is acceptable. After the rock proposed for use meets specified requirements, the rock is accepted at the construction site. Table C - 3 provides typical rock quality testing requirements and specifications for USACE harbor and shore protection projects. These requirements are general guidelines; however, exceptions have been made based on past performance of the rock in similar project conditions. If marginal quality rock is expected to be the only economical source for a project, over sizing the rock or increasing the constructed layer thickness of the rock may be used as an option. The use of marginal quality rock is excluded in certain critical areas.

Table C - 3. Typical Rock Quality Testing Requirements

Designation	**Test Method**	**Typical Specifications**
ASTM D 4992	Standard Practice for Evaluation of Rock to be Used for Erosion Control	Reference
ASTM C 127	Density, Relative Density (Specific Gravity), and Absorption	(BSSD) Not less than 2.65 Absorption: Not greater than 2.5 %
ASTM D 5312	Evaluation of Durability of Rock for Erosion Control Under Freezing and Thawing Conditions	Not greater than 10.0 % loss (100 Cycles)
ASTM D 5313	Evaluation of Durability of Rock for Erosion Control Under Wetting and Drying Conditions	Not greater than 10.0 % loss (80 Cycles)
ASTM C 295	Petrographic Examination of Aggregates for Concrete	No significant deleterious materials. See Note below
ASTM C 535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	Not greater than 20.0 % loss
CRD-C 148-69	Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol	No Breakage

The ASTM C 295 petrographic examination is used to identify micro fractures, seams, expansive minerals, or other defects which might cause accelerated deterioration from exposure to a harsh marine environment under freeze thaw conditions. The petrographic examination report is required to have provisions appropriate for the examination of large stone in section 11 and the procedures required by ASTM D 4992 Evaluation of Rock to be Used for Erosion Control, paragraph 10. The petrographer is required to include a narrative in the report discussing the suitability of the rock for use as armor stone in a marine environment and address any qualities of the rock that might cause accelerated deterioration.

The size and weight of large stone used for the construction of harbors and shore protection projects is a function of the anticipated wave forces, water velocities, and ice conditions at the project site. A typical rubble mound breakwater structure is normally comprised of a bedding or filter layer and core stone covered by one or more layers of larger armor stone. Typical gradation and weight requirements for these different layer types used on a past USACE project at Sand Point Harbor are provided in Table C - 4.

Table C - 4. Typical Gradation and Weight Requirements

Layer Type	Typical Specifications	
Primary Cover Layer "A Rock"	The average weight of each individual stone shall be 2,550 pounds or greater. No stone shall weigh more than 3,200 pounds or less than 1,900 pounds.	
Secondary Cover Layer "B Rock"	Specified Rock Weight (lb)	Percent Smaller by Weight
	1,900	100
	285	5 - 85
	200	0 - 5
Core Layer	Specified Rock Weight (lb)	Percent Smaller by Weight
	200	100
	15	0 - 85
	1	0 - 1
Bedding or Filter Layer	Well graded gravel in accordance with ASTM D 2847 with a maximum of 15 percent passing the No. 4 sieve.	

These are general ranges to be used as a reference and it should be noted that each individual project has specific design requirements that control the final size selection of the gradation and weight requirements. For example, past construction projects have required armor stone functioning as the primary cover layer to weigh 40,000 pounds.

C. Field Reconnaissance

The purpose of the following sections is to provide individual summaries of the ten site visits conducted between February and September 2010. Each section will present a summary of the rock quality and an evaluation of its potential as a large stone material source.

Bering Shai Quarry, Unalaska

The Bering Shai Quarry is located on Unalaska Island near the southeast side of Captains Bay. A Location and Vicinity Map of the quarry is enclosed as Figure C - 2. The quarry is accessed on land 3.5 miles down Captains Bay Road and consists of approximately 30 acres of undeveloped land that is owned and operated by Bering Shai Construction. The owner of

Bering Shai Construction, Bill Shaishnikoff, runs the daily operations of the quarry. The topography of the undeveloped area of the quarry is steep and the surface elevation rises rapidly from Captains Bay. Figure C - 3 provides a view of the quarry from the staging area.

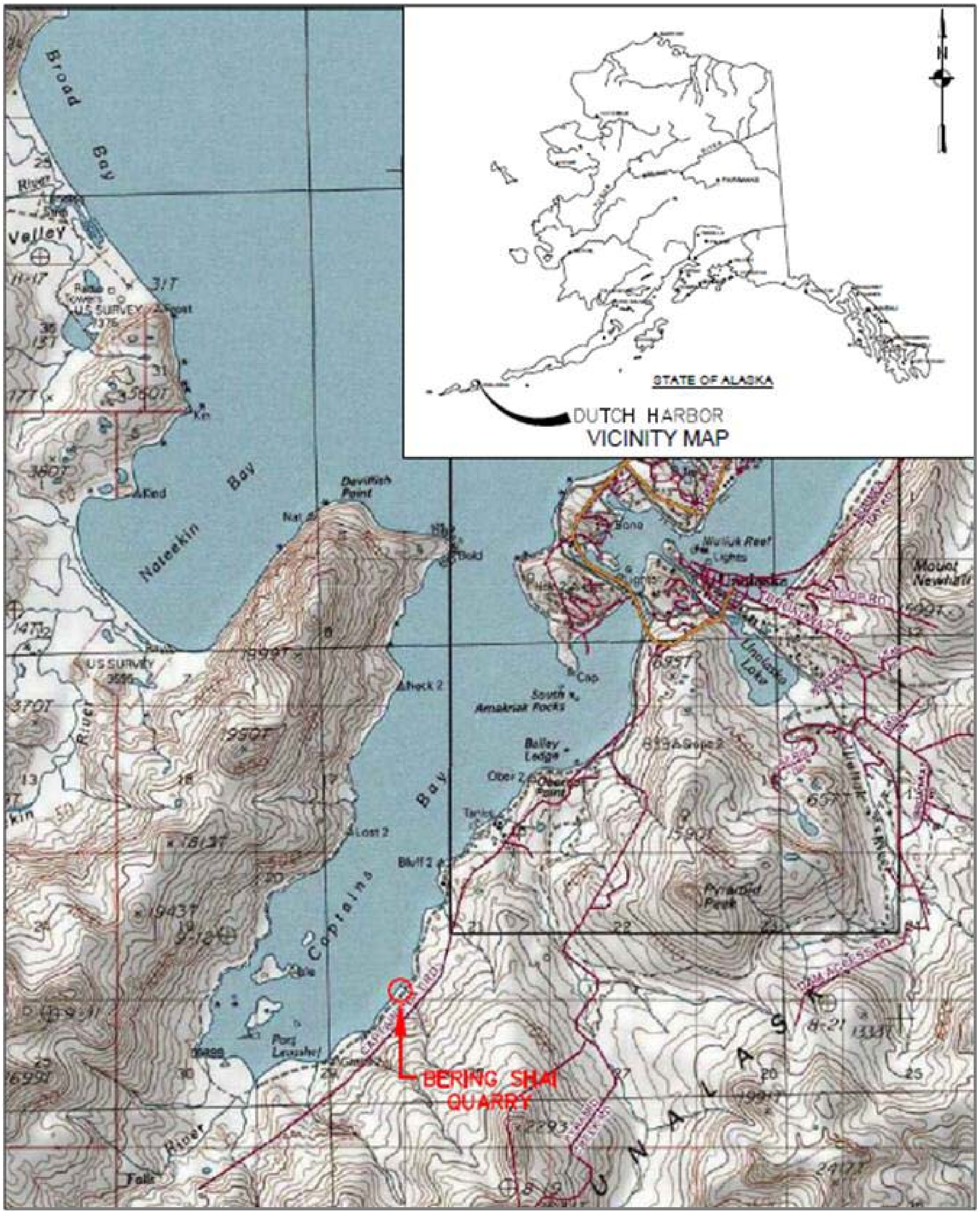

Figure C - 2. Location and Vicinity Map, Bering Shai Quarry, Unalaska

Figure C - 3. View of Bering Shai Quarry from Staging Area

The quarry is located at the edge of Captains Bay and the existing rock production face is within 100 yards of a barge loading ramp. Water depths ranging from 30 to 50 feet deep were reported just offshore in Captains Bay. Barges with ramps have been loaded with crushed aggregate in the past, however it appeared a small amount of dredging may be required near shore to allow deep draft barges within a practical distance of the existing barge loading ramp.

Overburden at the quarry consisted of surface organics and silt ranging in depths of four feet within the higher elevations and eight feet or thicker in the smaller drainage gullies. The overburden currently has no economic value and is considered waste material. The rock exposed in the production face of the quarry appears to be from an igneous source and most likely consists of diorite. Limited portions of unweathered rock exposure were visible within the existing production face. The quarry is in the initial stages of development with very little rock production faces exposed. It was reported that only six production shots ranging in volume from 5,000 to 10,000 cubic yards have been blasted. According to Mr. Shaishnikoff the quantity of material reserves was unknown. Overall, the exposed faces of rock were fractured, however, Mr. Shaishnikoff expressed that the rock joint spacing and overall quality has improved as the production face has advanced into the hillside. Figure C - 4 provides a view of the production face during our site visit.

Figure C - 4. Bering Shai Quarry Production Face

The joint and fracture spacing of the existing rock exposures ranged from approximately six inches to about three feet. A small stockpile of large stone consisting of two-foot to five-foot diameter boulders were seen in the quarry staging area. An example of these stones can be seen in Figure C - 5. Mr. Shaishnikoff reported that all of the production blasting was designed to produce a two inch minus product after crushing and screening. So the power factors and blast hole layout were not conducive to producing large stone. If drilling and blasting were conducted with the intention of producing larger stone for shore protection, a higher yield of larger rock could be expected. USACE estimates that the Bering Shai Quarry has the potential to produce larger stone for future harbor and shore protection projects if rock quality test results are acceptable.

Figure C - 5. Stockpile of Large Stone Consisting of Two-Foot to Five-Foot Diameter Boulders

Shakmanof Cove, Kodiak Island

The Shakmanof Cove potential material source is undeveloped and located on the north side of Kodiak Island near Kizhuyak Point between Anton Larsen Bay and Shakmanof Cove. A Location and Vicinity Map of the approximate area proposed for development is shown in Figure C - 6. The Ouzinkie Native Corporation and Koniag Incorporated have ownership of the land. Currently the site is only accessed by boat or helicopter. The topography of the area from the beach is steep for the first 200 feet of elevation and then becomes more gradual to an elevation of 1000 feet along a ridge. Surface vegetation in the area consists of large spruce trees and dense brush. Figure C - 7 provides a northward view from a high knob overlooking the proposed material source development area. Shakmanof Cove is the body of water on the right side of the photograph.

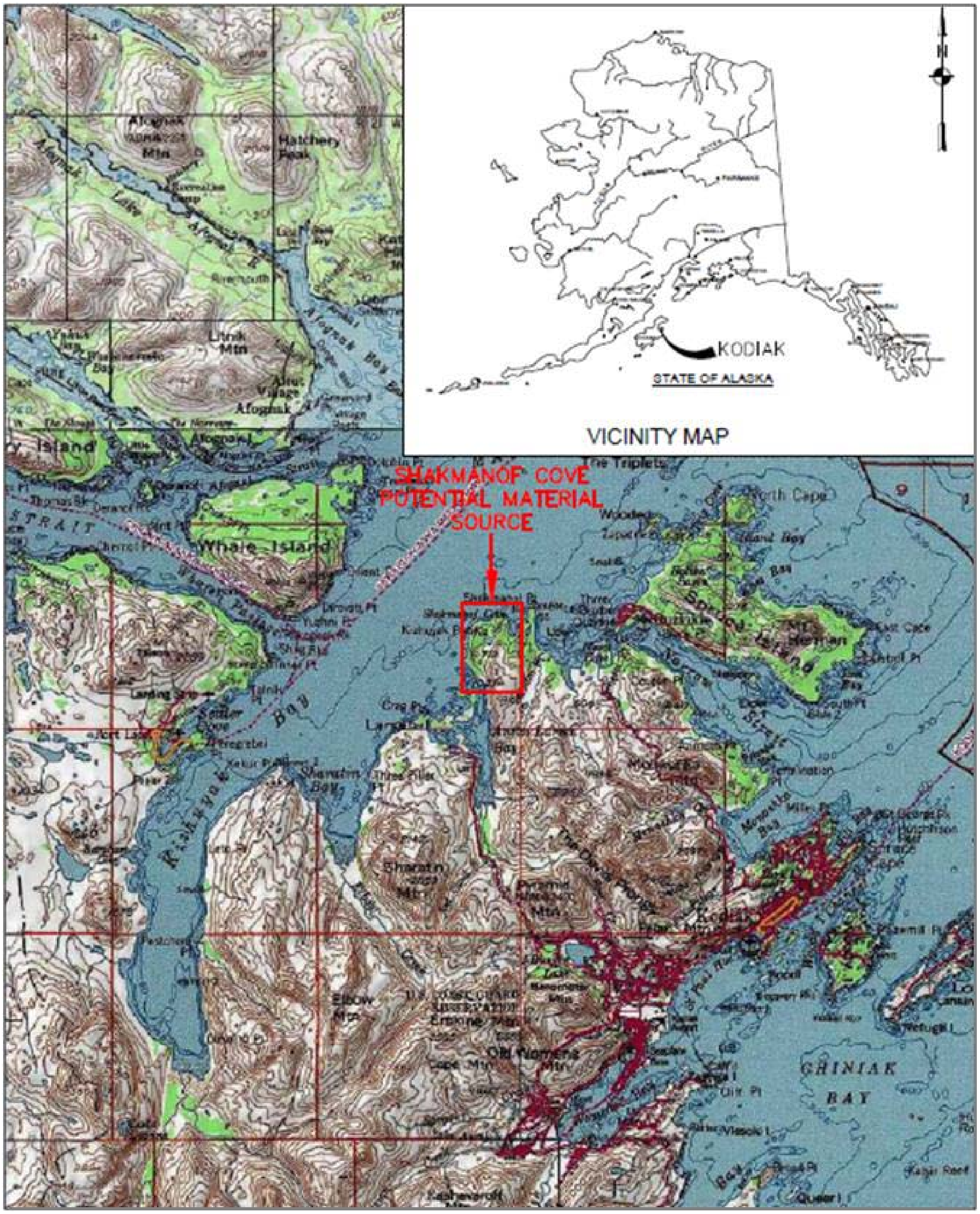

Figure C - 6. Location and Vicinity Map, Shakmanof Cove, Kodiak, Alaska

Figure C - 7. Northward View from a High Knob Overlooking the Proposed Material Source Development Area

A previous geological reconnaissance investigation was conducted at the Shakmanof Cove site by Hattenburg Dilley & Linnell. This investigation is presented in the following separate report: Hattenburg Dilley & Linnell: December 17 2008, “Geological Reconnaissance of Shakmanof Cove Site, Kodiak, Alaska”. During this reconnaissance investigation HDL visually examined rock outcrops and collected samples within an area described in the report as the Shakmanof Pluton. The extent of the Shakmanof Pluton was reported to cover an area of approximately three square miles. Field classifications of rock outcrops within the Shakmanof Pluton were described as very strong, blocky and competent granite. A summary of laboratory rock quality test results from this report are provided in Table C - 5. The HDL report concluded that rock from the Shakmanof Pluton should meet the requirements and be suitable for crushed aggregate products, riprap, and armor stone meeting the Alaska Department of Transportation specifications. The laboratory test results indicate all of the USACE rock quality testing requirements would be satisfied except for the specific gravity and LA Abrasion criteria.

From the samples tested, the rock’s specific gravity ranged from 2.56 to 3.04 and the ASTM C131 LA Abrasion test results ranged from 29 to 40 and the ASTM C 535 LA Abrasion test results ranged from 21 to 42. These initial test results would not necessarily exclude this material source from use on USACE projects; however, further laboratory testing and evaluation would be required.

Table C - 5. Summary of Shakmanof Cove Rock Quality Testing

Designation	Test Method	Range of Results
ASTM C 127	Density, Relative Density (Specific Gravity), and Absorption	(BSSD) 2.56 to 3.04 Absorption: 0.4 % to 1.54
ASTM D 5312	Evaluation of Durability of Rock for Erosion Control Under Freezing and Thawing Conditions	0.3% loss by weight (100 Cycles)
ASTM D 5313	Evaluation of Durability of Rock for Erosion Control Under Wetting and Drying Conditions	0.3 to 0.4% loss by weight (80 Cycles)
ASTM C 295	Petrographic Examination of Aggregates for Concrete	Biotite Granite
ASTM C 131	Resistance to Degradation of Small-Size Coarse Aggregate By Abrasion and Impact in the Los Angeles Machine	29% to 40% loss by weight
ASTM C 535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	21% to 42% loss by weight (1,000 revolutions)
CRD-C 148-69	Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol	0.09% loss by weight, no presence of swelling clays
ATM 313	Degradation of Aggregates	78 to 91
ASTM C 88	Soundness of Aggregate by Use of Sodium or Magnesium Sulfate	0.0 to 2.6 % loss by weight (5 cycles)
ATM 312	Nordic Abrasion	10.3 to 20

Overburden at the site generally consisted of moss and vegetation overlying a layer of silt and volcanic ash. The thickness of the surface organics and fine grained soils was reported to range from two feet or less in high areas to twenty feet or greater in small valleys and gullies. A limited number of outcrops were viewed during our site visit because most of the rock was covered with a layer of moss and vegetation. Figure C - 8 provides a view of the vegetation and exposed rock at the surface. In the rock outcrops that were visible, joint sets had spacing ranging from approximately six inches to eight feet or larger. Visual examination of the granite showed it to be greenish gray to brownish gray, very strong, and generally free of cracks and deleterious material.

Figure C - 8. Vegetation of Exposed Rock at the Surface

At the time of our site visit, Angayuk Construction Enterprises and Alaska Earth Sciences were conducting exploratory drilling to further define the quality of rock within the potential material source. A total of four test holes were drilled to depths ranging from approximately 350 to 400 feet below the ground surface. During this exploration, rock cores were extracted for classification and interpretation of rock quality and joint patterns. It was reported that very strong component granite with Rock Quality Designation (RQD) values ranging from 75 to 100 were encountered within the body of the potential material source.

Representatives from Angayuk Construction expressed their confidence in the material source being able to produce stones eight feet in diameter which could weigh approximately 40,000 pounds or greater. We agree with the assessment that the Shakmanof Cove material source has the potential to produce very large stone. USACE estimates that rock from Shakmanof Cove could produce an acceptable product for the construction of harbors and shore protection projects.

Currently, Angayuk Construction is planning to construct an access road from Shakmanof Cove to higher elevations. The construction of this road would provide rock for coastal infrastructure needed for site access such as barge loading facilities and material staging areas. Drilling and blasting for construction of the road would also supplement the subsurface exploration and better define the material source. Figure C - 9 provides a northward view of the shoreline on the west side of Shakmanof Cove.

Figure C - 9. Northward View of the Shoreline on the West Side of Shakmanof Cove

Platinum Quarry

The Platinum Quarry is located approximately 5.9 miles from the community of Platinum. The quarry is owned by the Calista Corporation and operated by Knik Construction under contract with Calista. The quarry currently produces three inch minus crushed aggregate products for the construction of roads and airfields. Access to the material source is by road and haul trucks are used to transport material from the quarry to Goodnews Bay for shipment. A Location and Vicinity Map of the Platinum Quarry is shown in Figure C - 10. At the end of the spit located just north of the community of Platinum, Knik Construction has barge loading facilities consisting of a belt conveyor, barge dock, and material staging areas. At this location, barges capable of carrying approximately 4,000 tons of aggregate are loaded for transport to various project sites throughout western Alaska.

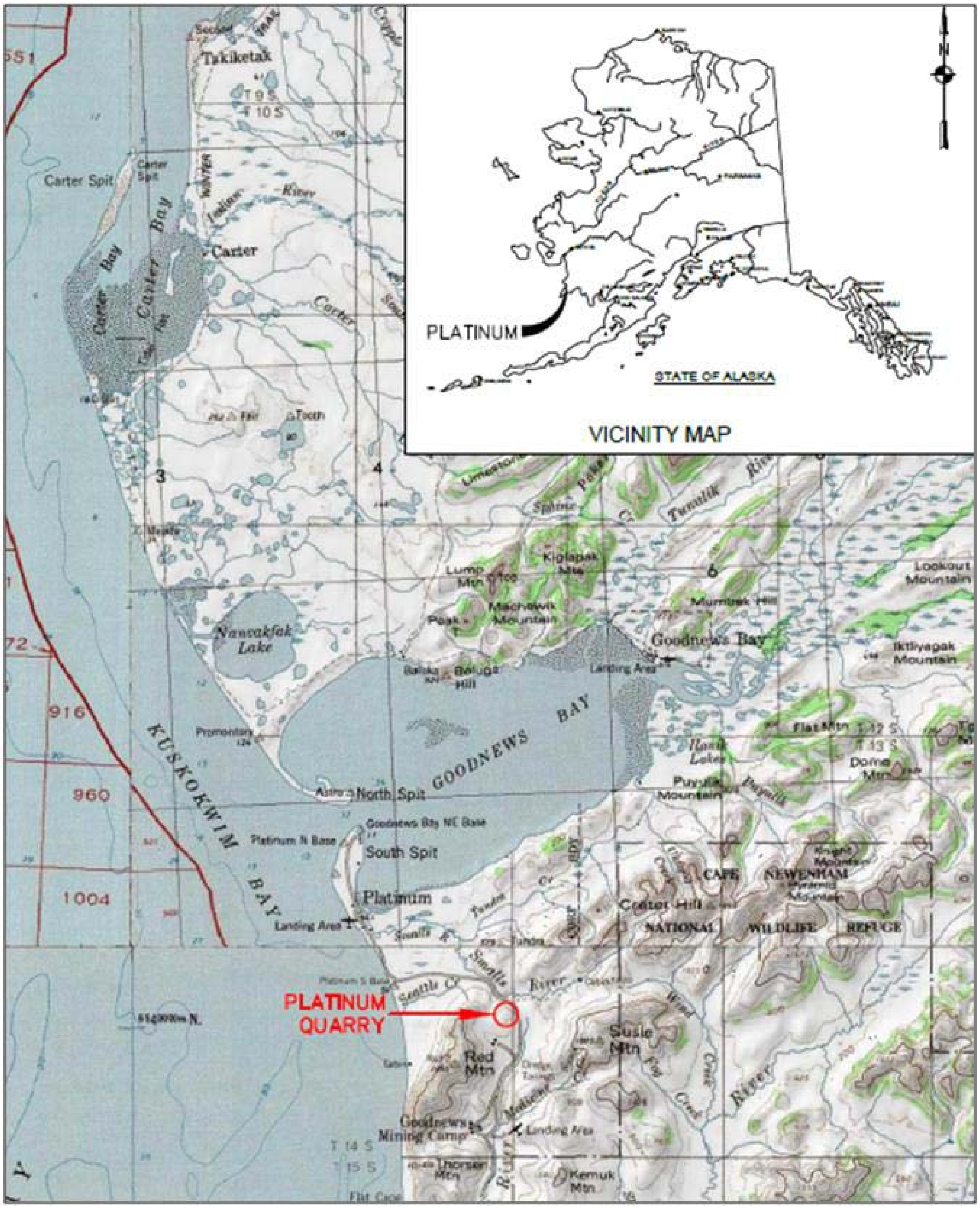

Figure C - 10. Location and Vicinity Map, Platinum Quarry

The topography of the area around the quarry contains moderately steep hills and mountains with surface vegetation consisting of tundra and low brush along creek bottoms. Figure C - 11 provides a southeastern view of the quarry. Overburden at the quarry consists of a thin layer of surface organics overlying silt, sand, and gravel ranging in depths of two to six feet.

Figure C - 11. Southeastern View of the Platinum Quarry

The metamorphic rock exposed in the production face of the quarry varies in quality with medium weak rock having a slightly weathered reddish brown color and strong to very strong rock having a greenish gray color. Cobble sized stones from the reddish brown colored areas could be fractured with a single firm blow of a geologic hammer. Overall the exposed faces of rock within the quarry were fractured. The discontinuity spacing ranged from less than six inches to about two feet. This can be attributed to the quarry normally producing aggregate products for roads and airfields. An example of the rock at the working face of the quarry can be seen in Figure C - 12.

Figure C - 12. Working Face of Platinum Quarry

In late 2004 Knik Construction submitted rock samples from the Platinum Quarry to the U.S. Army Engineer Research and Development Center (ERDC) for laboratory rock quality testing. The purpose of the testing was to determine the suitability of material from the Platinum Quarry for use as slope protection on future USACE projects. Results from the laboratory rock quality testing conducted by ERDC are provided in Table C - 6.

Conclusions from page six of the 2005 ERDC laboratory testing report stated "slope protection material from this quarry appears to be good sound stone and should be satisfactory for use as riprap, armor stone, derrick stones, etc., if fractures can be avoided; otherwise the stones may possibly separate around the fractures present in the rock, especially during cycles of freezing and thawing".

At the time of our site visit the quality of the rock did not appear to be uniform throughout the Platinum Quarry. Samples submitted by Knik Construction in 2004 most likely represent the good quality rock available in the quarry. If the Platinum Quarry was proposed as a material source on a USACE shore protection or harbor project, additional rock quality testing would be required to determine the suitability of the marginal quality rock having a slightly weathered reddish brown color. USACE estimates that this marginal quality rock would not meet the USACE typical rock quality testing requirements.

Table C - 6. Summary of Platinum Quarry Rock Quality Testing

Designation	Test Method	Results
ASTM C 127	Density, Relative Density (Specific Gravity), and Absorption	(BSSD) 2.72 Absorption: 0.3 %
ASTM D 5312	Evaluation of Durability of Rock for Erosion Control Under Freezing and Thawing Conditions	3.7% loss by weight (50 Cycles)
ASTM D 5313	Evaluation of Durability of Rock for Erosion Control Under Wetting and Drying Conditions	0.4% loss by weight (80 Cycles)
ASTM C 295	Petrographic Examination of Aggregates for Concrete	Albite
ASTM C 535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	21.9% loss by weight (1,000 revolutions)
CRD-C 148-69	Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol	0.2% loss by weight, no presence of swelling clays
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	0.8% loss by weight

Perryville Quarry

The community of Perryville is located on the Pacific Ocean side of the Alaska Peninsula approximately 160 air miles northeast of Cold Bay. During our site visit we viewed the Perryville Quarry and four rock outcrops. The Perryville Quarry is located southeast of the Perryville Airport and north of Three Star Point. The four rock outcrops are located at Three Star Point, northwest of the airstrip, east of the tsunami shelter, and east of Perryville, respectively. A Location and Vicinity Map of the Perryville Quarry along with general locations of the rock outcrops viewed during our site visit is shown in Figure C - 13.

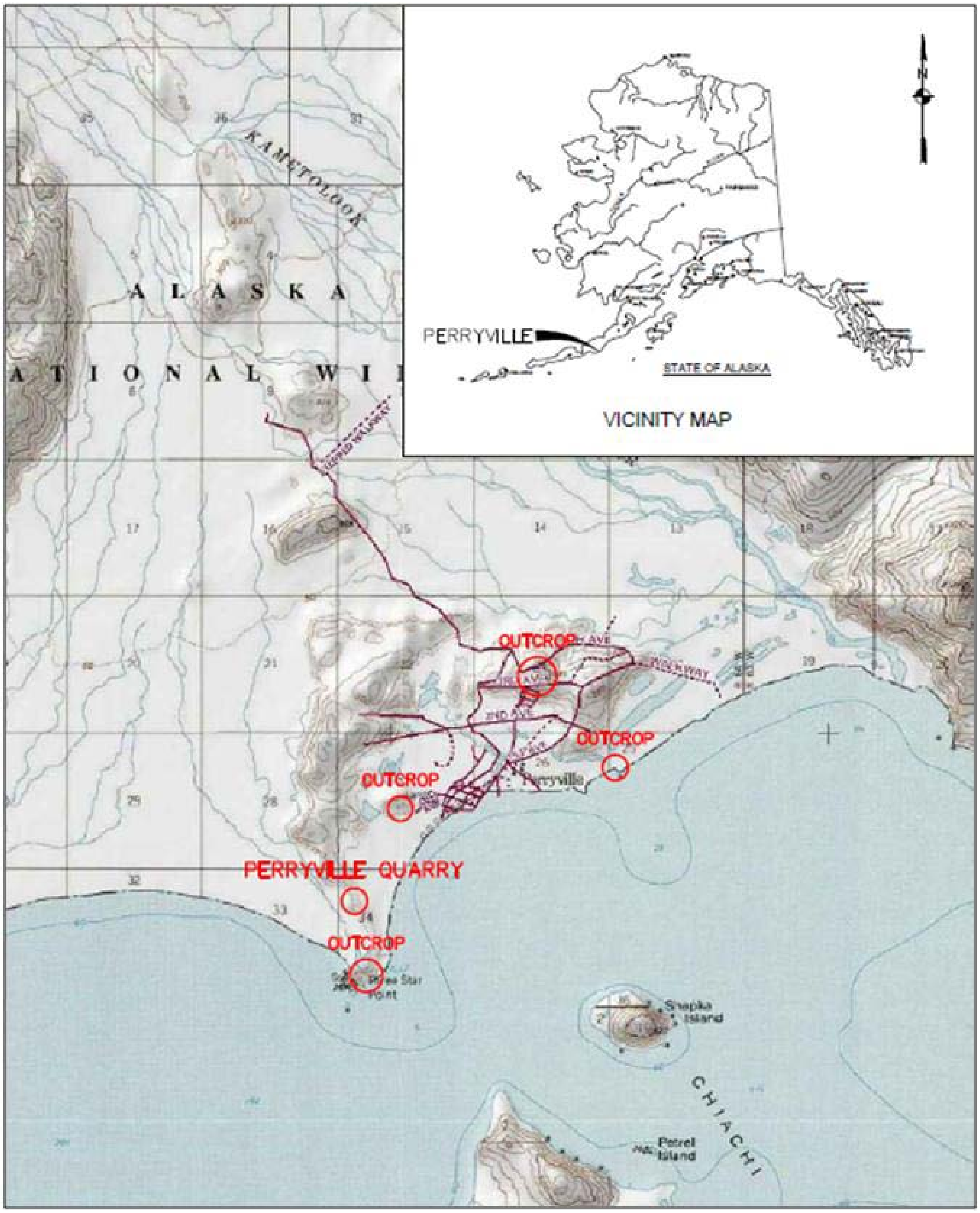

Figure C - 13. Location and Vicinity Map, Perryville Quarry and Rock Outcrops

The Perryville Quarry is composed of a sedimentary sandstone and conglomerate rock. Varying degrees of rock quality were seen throughout the production face of the quarry. Bands of lower quality, friable rock were intermixed with better quality, intact rock. The conglomerate contained well rounded gravel sized particles cemented within the sandstone. The exposed rock was well fractured and displayed a joint pattern with bedding planes. Large stones in excess of four feet in diameter were seen at the base of the quarry. Visible cracks and fissures were evident in all the large stones observed. These large stones were remnants of past quarry operations which provided material for construction of the Perryville Airport runway embankment. The quality of material from the Perryville Quarry did not meet the ADOT&PF's rock quality requirements for crushed aggregate surface course. Because of the poor material quality, crushed aggregate surface course material had to be imported by barge from another location. Figure C - 14 provides a view of the existing quarry production face.

Figure C - 14. View of Existing Perryville Quarry Production Face

The four rock outcrops appeared to be composed of the same sandstone and conglomerate rock as the existing quarry. The gravel particles observed in the conglomerate were generally two inch minus in size. The rock outcrop at Three Star Point exhibited distinctly different bands of rock. Larger boulder sized stones located at the base of this outcrop were highly fractured. Figure C - 15 provides a view of the sandstone and conglomerate at Three Star Point. The rock outcrop located northwest of the Perryville Runway appeared to be of the highest quality of the four outcrops visited. Large stones with diameters greater than four feet were observed along the base of this outcrop. However, bands of lower quality rock were also observed within the face. The rock outcrop located east of the Perryville tsunami shelter had an orange-to-red pigmentation. The rock outcrop located east of Perryville was highly fractured and bedding layers from its deposit were still evident. USACE estimates that the sandstone and conglomerate rock available at the Perryville Quarry and surrounding rock outcrops would not produce suitable quality or quantity large stone for the construction of harbor or shore protection projects.

Figure C - 15. Sandstone and Conglomerate at Three Star Point

Flat Island Quarry, Nanwalek (English Bay)

The Flat Island Quarry is located on the southwest side of the Kenai Peninsula approximately 2.4 miles southwest of Nanwalek, formerly known as English Bay, and 1.7 miles east of Flat Island. A Location and Vicinity Map of the approximate area of development is shown in Figure C - 16. It is our understanding that the English Bay Corporation owns the surface rights and the Chugach Alaska Corporation owns the subsurface rights in the vicinity of the Flat Island Quarry site.

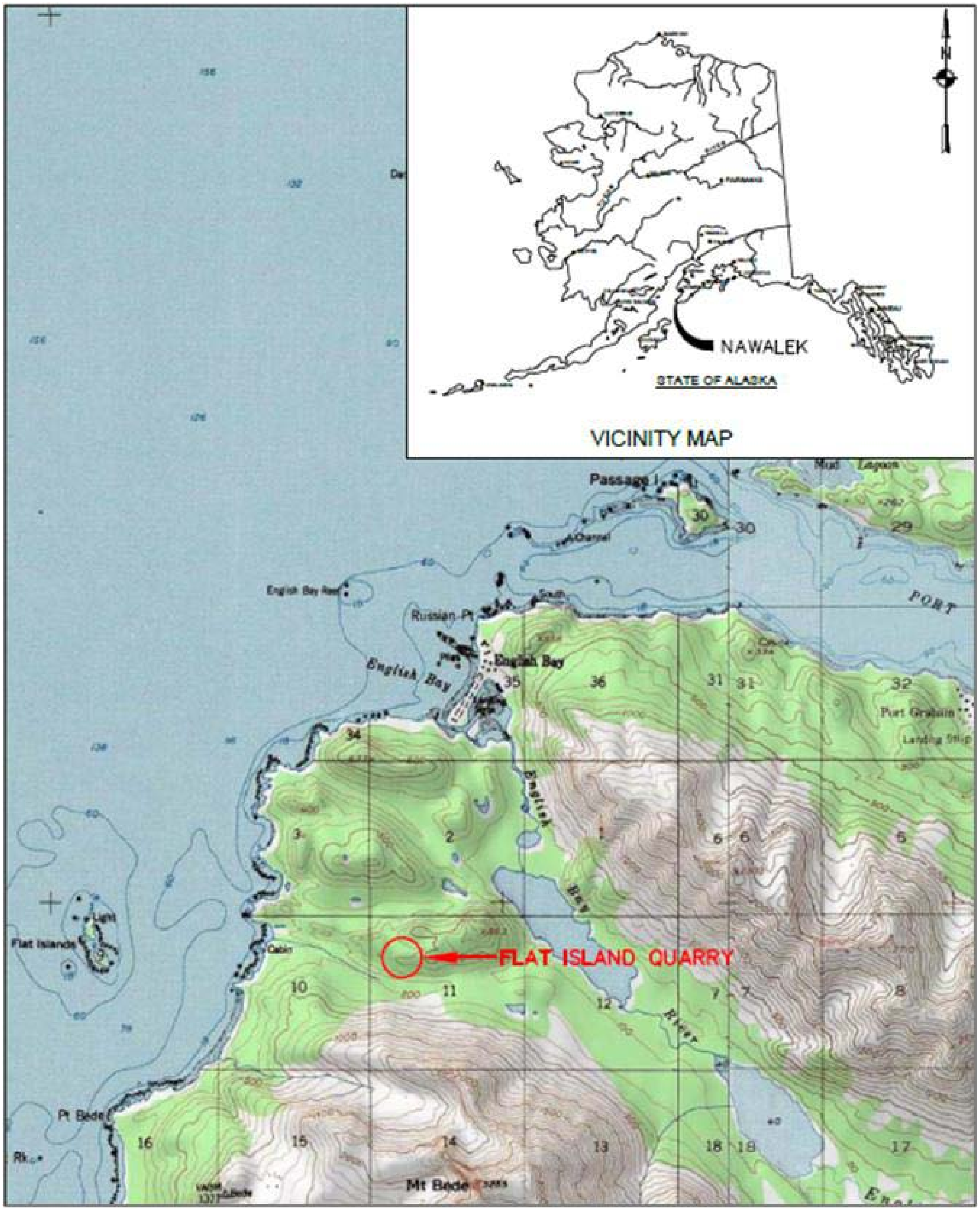

Figure C - 16. Location and Vicinity Map, Flat Island Quarry, Nanwalek

The Flat Island Quarry can be accessed from Nanwalek with off-road vehicles via a series of trails, stream and lake crossings, and overgrown logging roads. The quarry is not accessible from Nanwalek during periods when the water level in the lake along the English Bay River is high. Other access to the quarry is provided by unimproved logging roads from Dog Fish Bay, approximately eight miles south of the quarry. The quarry is located about 0.5 miles from a semi-protected shoreline along Cook Inlet and the potential for developing barge loading facilities would be feasible. The English Bay Corporation currently has plans to construct roads around the community of Nanwalek and they are intending to use the Flat Island Quarry as a material source. This construction project would provide improved road access from Nanwalek to the Flat Island Quarry.

The quarry was initially developed to provide a material source for the construction of logging roads. The topography of the undeveloped area of the quarry is steep. Surface vegetation in the area consists of large spruce trees and dense brush. Alders and dense brush have started to overgrow the staging area and rubble piles of rock left from past construction activity. Figure C - 17 provides a view of the overgrown staging area.

Figure C - 17. Rubble Pile of Rock and Overgrown Staging Area at the Flat Island Quarry

The rock exposed in the production face of the quarry appears to be from an igneous source and is most likely granite. Overall, the exposed faces of rock were fractured from blasting. The joint spacing of the existing rock exposures ranged from approximately one to about four feet. Small stockpiles of large stones weighing between 4,000 and 8,000 pounds were frequently encountered within the staging area and along the production faces of the quarry. Visual examination of the granite showed it to be strong and competent. An example of the granite can be seen in Figure C - 18.

Figure C - 18. Example of Granite Rock Seen in Staging Area at the Flat Island Quarry

Rock quality test results from the English Bay Corporation are provided in Table C - 7. The Flat Island Quarry has the potential to produce an acceptable product for the construction of harbors and shore protection projects if additional rock quality test results are acceptable.

Table C - 7. Summary of Flat Island Quarry Rock Quality Testing

Designation	Test Method	Results
ASTM C 127	Density, Relative Density (Specific Gravity), and Absorption	(BSSD) 2.762 Absorption: 0.6 %
NPD	NPD Freeze / Thaw	Not Reported
NPD	NPD Wet / Dry	0.05% loss by weight
ASTM C 535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	12% loss by weight
CRD-C 148-69	Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol	1.5% loss by weight
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	0.7% loss by weight
ATM T-13	Degradation of Aggregates	41

Chugach Bay

The Chugach Bay potential material source is undeveloped and located on the southern end of the Kenai Peninsula, south of Windy Bay and northwest of East Chugach Island. A Location and Vicinity Map of the approximate area with potential for development is shown in Figure C - 19. The land surface rights are owned by the Port Graham Corporation and the subsurface rights are controlled by the Chugach Alaska Corporation. Currently beach access is by boat or helicopter. It is reported that unmaintained logging roads from the main Windy Bay Road provide access to the northeast area of the site. The topography of the area from the beach is steep and surface vegetation consists of large spruce trees and dense brush.

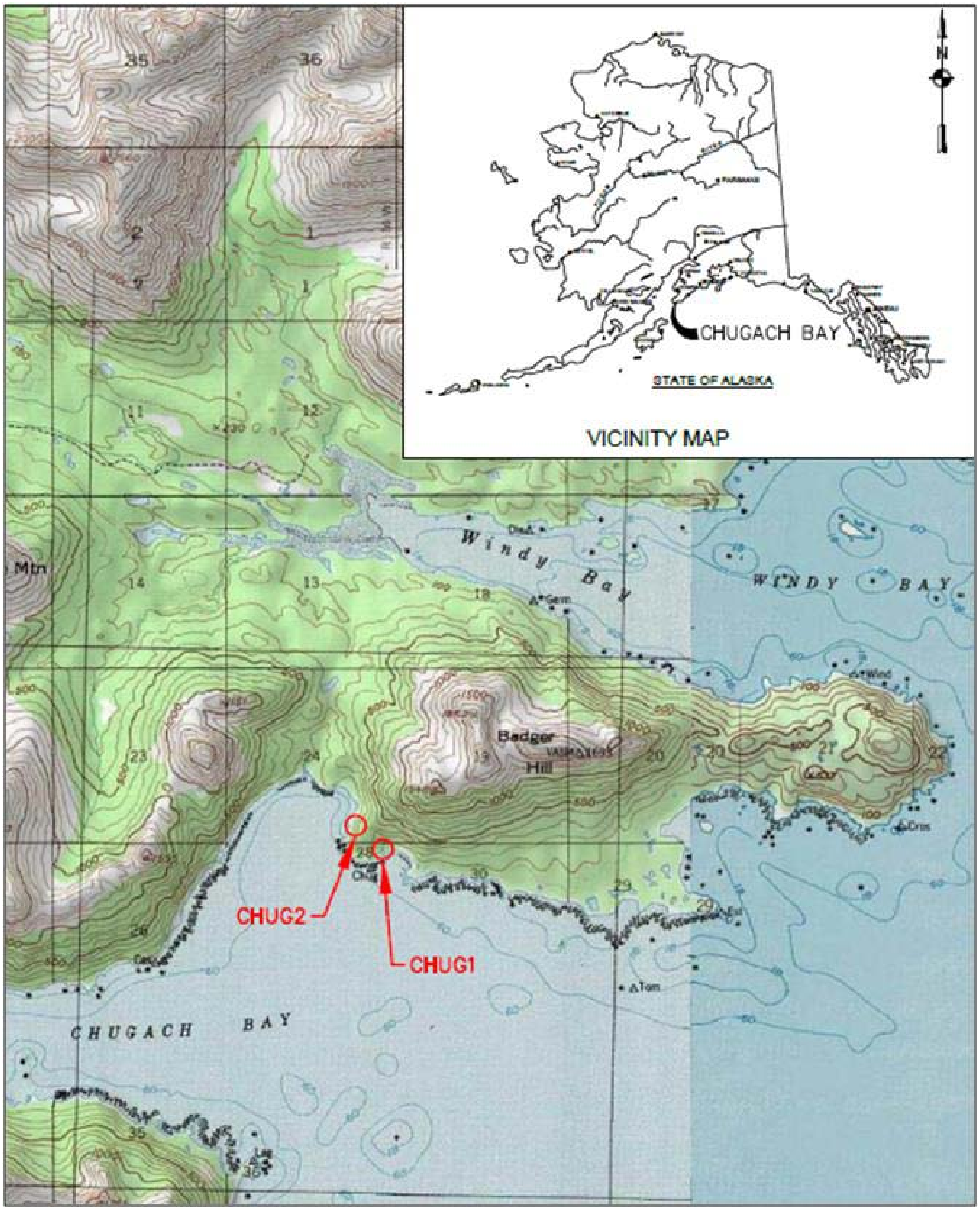

Figure C - 19. Location and Vicinity Map, Previous Reconnaissance, Chugach Bay

A previous geological reconnaissance investigation was conducted at the Chugach Bay site by the Chugach Alaska Corporation and Alaska Earth Sciences, Inc. This investigation is presented in the following separate report: Chugach Alaska Corporation, 2002, Port Graham Corporation Lands Preliminary Investigation for Quarry Rock in the Vicinity of Windy Bay. During this reconnaissance investigation rock outcrops in Chugach Bay were visually examined within an area described in the report as Chug1 and Chug2. This area, consisting of approximately 50 acres, has been mapped as Tertiary-aged granodiorite by the U.S. Geological Survey. The Chugach Alaska Corporation Report concluded that rock from the granodiorite geologic unit has potential to produce armor stone or riprap adjacent to Chugach Bay.

Figure C - 20 provides a view of the beach referenced as Chug1 in the Chugach Alaska Corporation Report. The light grey rock was mapped as granodiorite and the darker rock which bounds both sides of the intrusive rock was mapped as metasediments, primarily black carbonaceous argillites. Rock outcrops that were visible from the beach had joint set spacings and fractures ranging from approximately two inches to about four feet. Visual examination of the granodiorite showed it to be light gray and very strong. We do agree with the assessment that granodiorite rock exposed at the Chug1 beach has potential to produce large stone for the construction of harbors and shore protection projects. Boulders on the beach were generally subrounded to well rounded indicating they had been exposed to wave action for an extended period of time. Most boulders weighed between an estimated 2,000 to 16,000 pounds with a majority between an estimated weight of 4,000 and 6,000 pounds. Figure C - 21 provides a view of rock outcrops on the beach at Chug1.

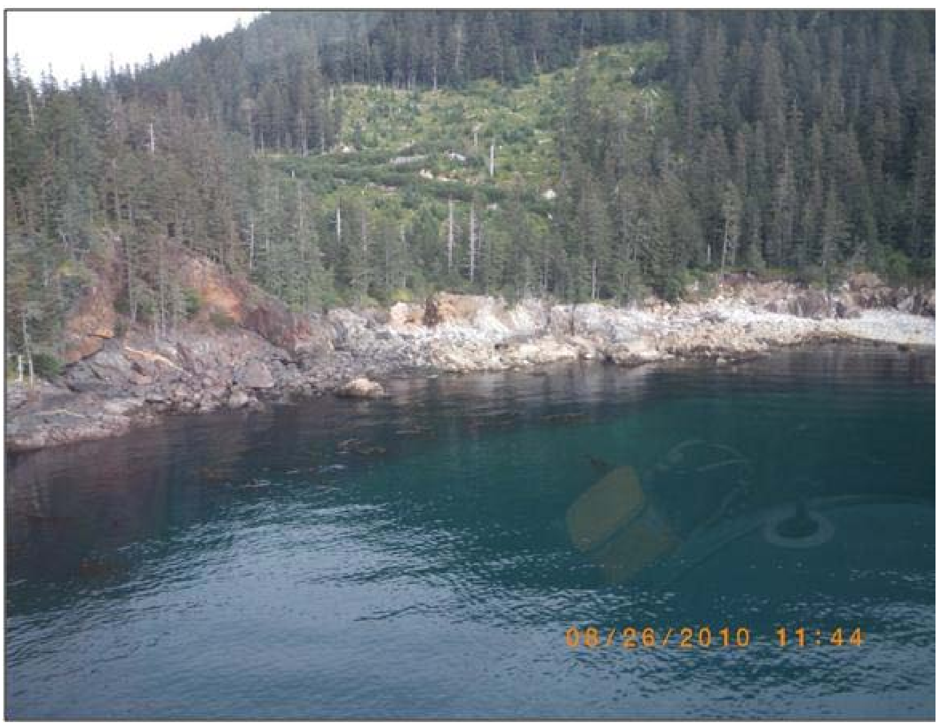

Figure C - 20. View of the Beach References as Chug1

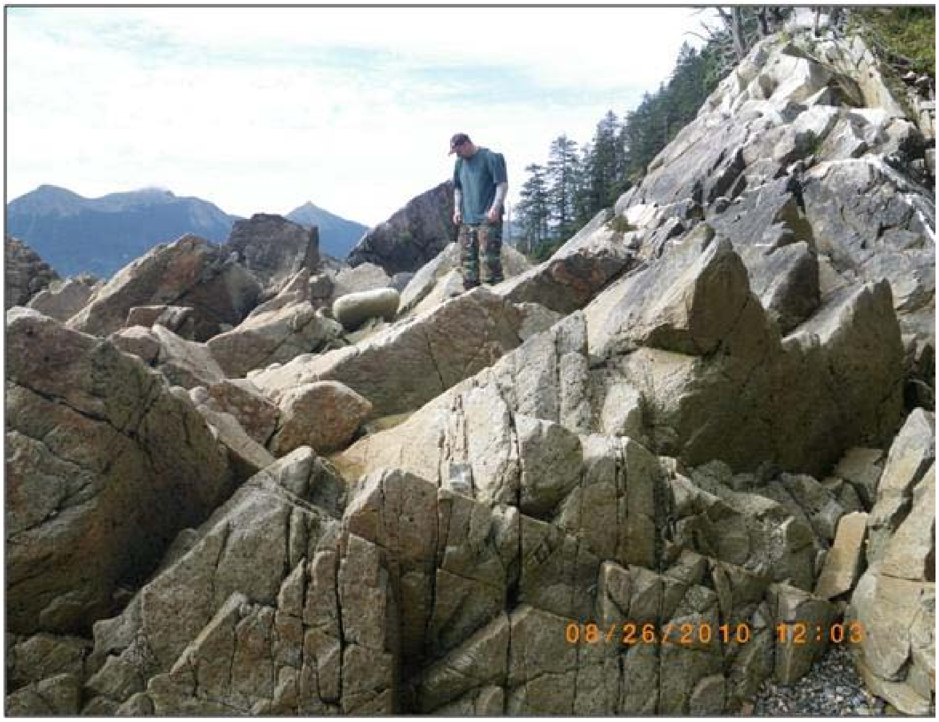

Figure C - 21. Rock Outcrop on Beach Referenced as Chug1

Currently Chugach Alaska Corporation has no plans to develop a material source in Chugach Bay. Additional characterization of the Chug1 and Chug2 sites including rock quality testing and detailed mapping of the granodiorite geologic unit would be required to evaluate the feasibility of any material source development in the area.

Diamond Point

The Diamond Point potential material source is undeveloped and located in Iliamna Bay, northeast of Cottonwood Bay. A Location and Vicinity Map of the approximate area proposed for development is shown in Figure C - 22. Diamond Point, LLC owns approximately 30 acres of undeveloped land containing an estimated 15 million cubic yards of material. Currently, the site is only accessed by boat, airplane, or helicopter. The topography of the area from the beach is steep with rock cliffs and surface vegetation at higher elevations consisting of alders and dense brush. It was noted during a fly-over of the area that numerous rock outcrops exist at higher elevations of the proposed material source and it is believed that excavation and removal of overburden would be minimal. Figure C - 23 provides a western view of Diamond Point with Cottonwood Bay in the background.

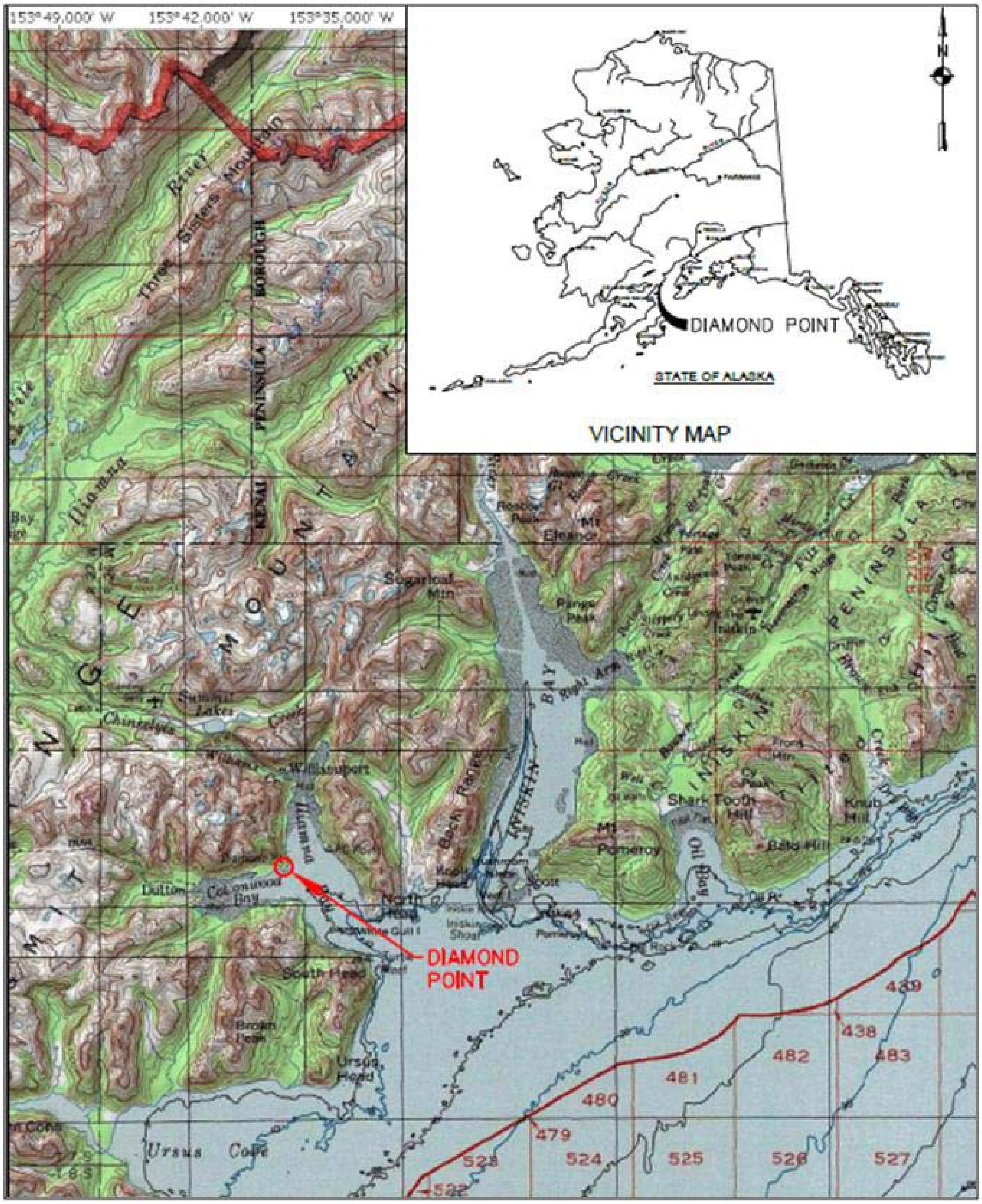

Figure C - 22. Location and Vicinity Map, Diamond Point

Figure C - 23. Western View of Diamond Point with Cottonwood Bay in the Background

Currently, Diamond Point LLC is actively pursuing permits for development of the proposed material source at Diamond Point. Coastal infrastructure proposed for development of site access includes constructing a 20-acre fill area for staging equipment, stockpiling aggregate, and barge loading facilities. Dredging a channel from Iliamna Bay to shore would also be required.

The rock exposed in the outcrops and cliffs at Diamond Point are from an igneous source and are most likely Granodiorite. Overall, the rock exposures were fractured with joint spacing and fracturing ranging from approximately two inches to six feet or larger. Visual examination of the granite showed it to be very strong and competent. Boulder sized rock seen on the beach weighed between an estimated 2,000 to 16,000 pounds. Limited rock quality test results from samples collected by others at Diamond Point are provided in Table C - 8. An example of rock cliffs at Diamond Point is presented in Figure C - 24.

Table C - 8. Summary of Diamond Point Rock Quality Testing

Designation	Test Method	Results
ASTM C 127	Density, Relative Density (Specific Gravity), and Absorption	(BSSD) 2.655 Absorption: 0.5 %
ASTM C 131	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	24% loss by weight
ATM T-13	Degradation of Aggregates	87

Additional characterization of the proposed Diamond Point material source, including rock quality testing and detailed geologic mapping, would be required to evaluate the feasibility of any material source development in the area. USACE estimates that rock from Diamond Point would most likely produce an acceptable product for the construction of harbors and shore protection projects if rock quality test results show the source to be acceptable.

Figure C - 24. Rock Cliffs Viewed from the Beach at Diamond Point

Snake Lake Quarry, Dillingham

The Snake Lake Quarry is located approximately 14 miles north of Dillingham. A Location and Vicinity Map of the quarry is shown in Figure C - 25. The quarry is owned by Choggiung Ltd and has provided material for construction of roads and shore protection along the Nushagak and Wood Rivers. Access to the material sources is by road and haul trucks are used to transport material from the quarry to Dillingham on the Snake Lake and Aleknagik Lake Road.

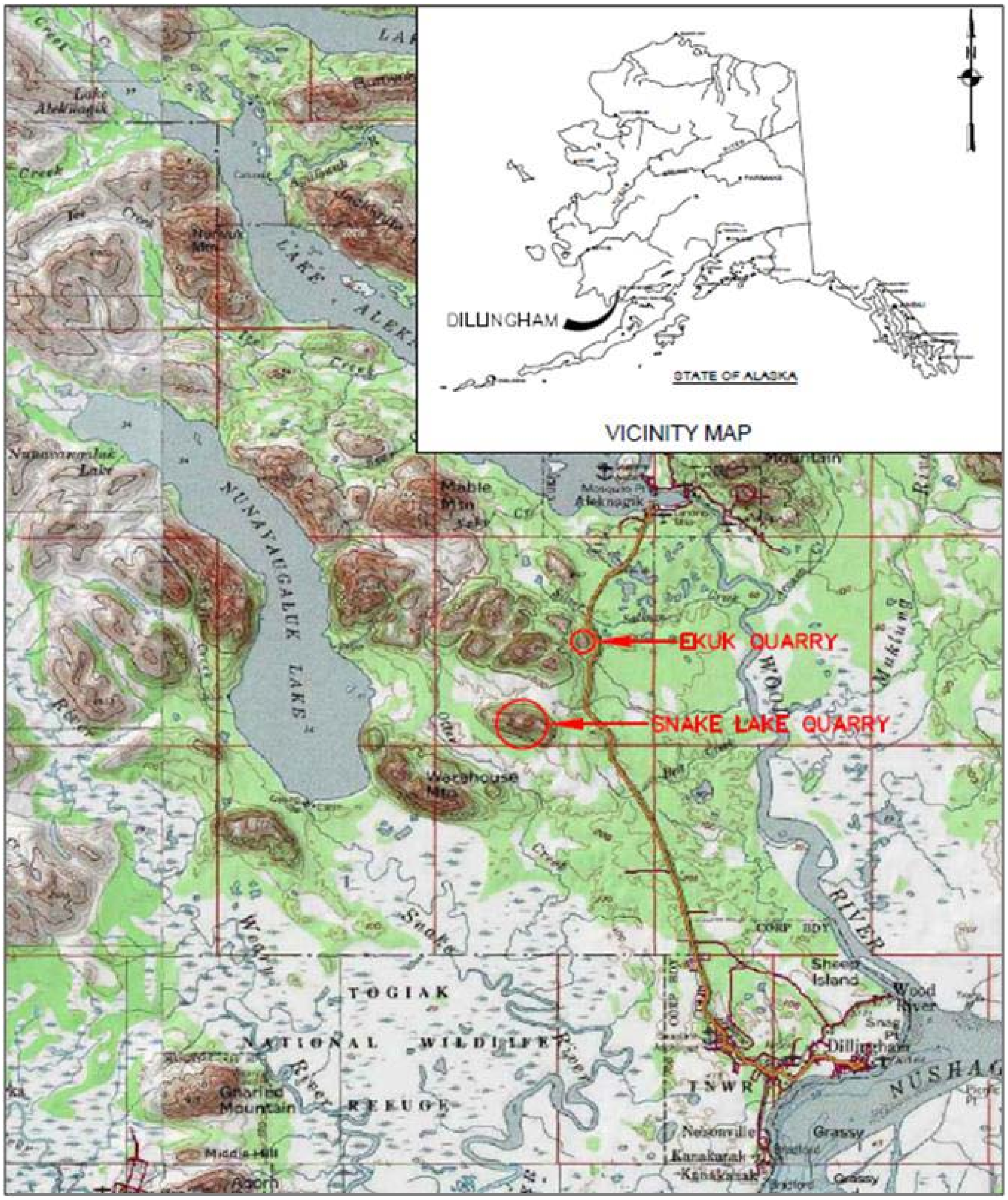

Figure C - 25. Location and Vicinity Map, Snake Lake Ekuk Rock Quarry, Dillingham

The topography of the area around the quarry contains moderately steep hills and mountains with surface vegetation at the higher elevations consisting of tundra, low brush, and alders. Figure C - 26 provides a view of the production face of the quarry. Overburden at the quarry consists of a layer of surface organics overlying fine grain soils ranging in depths from six inches to about two feet. The rock exposed in the production face of the quarry appears to be sedimentary and is most likely Greywacke. Overall, the exposed faces of rock were fractured from blasting. The joint and fracture spacing of the existing rock exposures ranged from approximately six inches to about two feet. The largest stone seen in the staging area and along the production faces of the quarry weighed between an estimated 125 to 600 pounds. Visual examination of the rock showed it to be strong and competent. An example of the rock is presented in Figure C - 27.

Figure C - 26. Snake Lake Quarry Production Face

Figure C - 27. Example of Rock in Staging Area of the Snake Lake Quarry

Limited rock quality test results from samples collected by others are provided in Table C - 9. USACE estimates that the Snake Lake Quarry has the potential to produce an acceptable product for the construction of harbors and shore protection projects.

Table C - 9. Summary of Snake Lake Quarry Rock Quality Testing

Designation	**Test Method**	**Results**
ASTM C 127	Density, Relative Density (Specific Gravity), and Absorption	(BSSD) 2.795 Absorption: 0.6 %
NPD	NPD Freeze / Thaw	0.06% loss by weight
NPD	NPD Wet / Dry	0.1% loss by weight
ASTM D 5240	Testing Rock Slabs to Evaluate Soundness of Riprap by Use of Sodium Sulfate or Magnesium Sulfate	0.3% loss by weight
ASTM C 535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	19% loss by weight
ASTM C 131	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	17% loss by weight
CRD-C 148-69	Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol	0.0% loss by weight

Ekuk Quarry, Dillingham

The Ekuk Quarry is located approximately 15 miles north of Dillingham. A Location and Vicinity Map of the quarry is shown in Figure C - 25. The quarry is owned by Horizon Contractors and Amanka Construction. Aggregate from the quarry has been used for the construction of local roads and the Dillingham Airport. Access to the material source is by road and haul trucks are used to transport material from the quarry to Dillingham on the Aleknagik Lake Road.

The topography of the area around the quarry contains moderately steep hills with surface vegetation consisting of thick brush, alders, and spruce trees. Figure C - 28 provides a view of the production face of the quarry. Overburden at the quarry consists of a layer of surface organics overlying silt, sand, and gravel ranging in depths from two to six feet or greater.

The rock exposed in the production face of the quarry appears to be from a sedimentary source and is most likely Greywacke. Overall, the exposed faces of rock were fractured from blasting. The joint and fracture spacing of the existing rock exposures ranged from approximately six inches to about four feet. Visual examination of the Greywacke showed it to be strong and competent and an example of the rock is presented in Figure C - 29.

Figure C - 28. View of Ekuk Quarry Production Face, Crusher, and Screens

USACE estimates that the Ekuk Quarry has the potential to produce an acceptable product for the construction of harbors and shore protection projects if rock quality test results show the source to be acceptable.

Figure C - 29. Example of Blasted Rock in Staging Area of the Ekuk Quarry

Sawmill Cove, Sitka

A potential material source exists along the Sitka Highway in Sawmill Cove about 4.5 miles east of the community of Sitka and just west of the old pulp mill. It has been reported that the Alaska Department of Transportation may soon develop the existing rock exposure adjacent to the Sitka Highway into a material source for local projects. A Location and Vicinity Map of the potential material source is shown in Figure C - 30 and Figure C - 31 provides a view of the existing rock ledge.

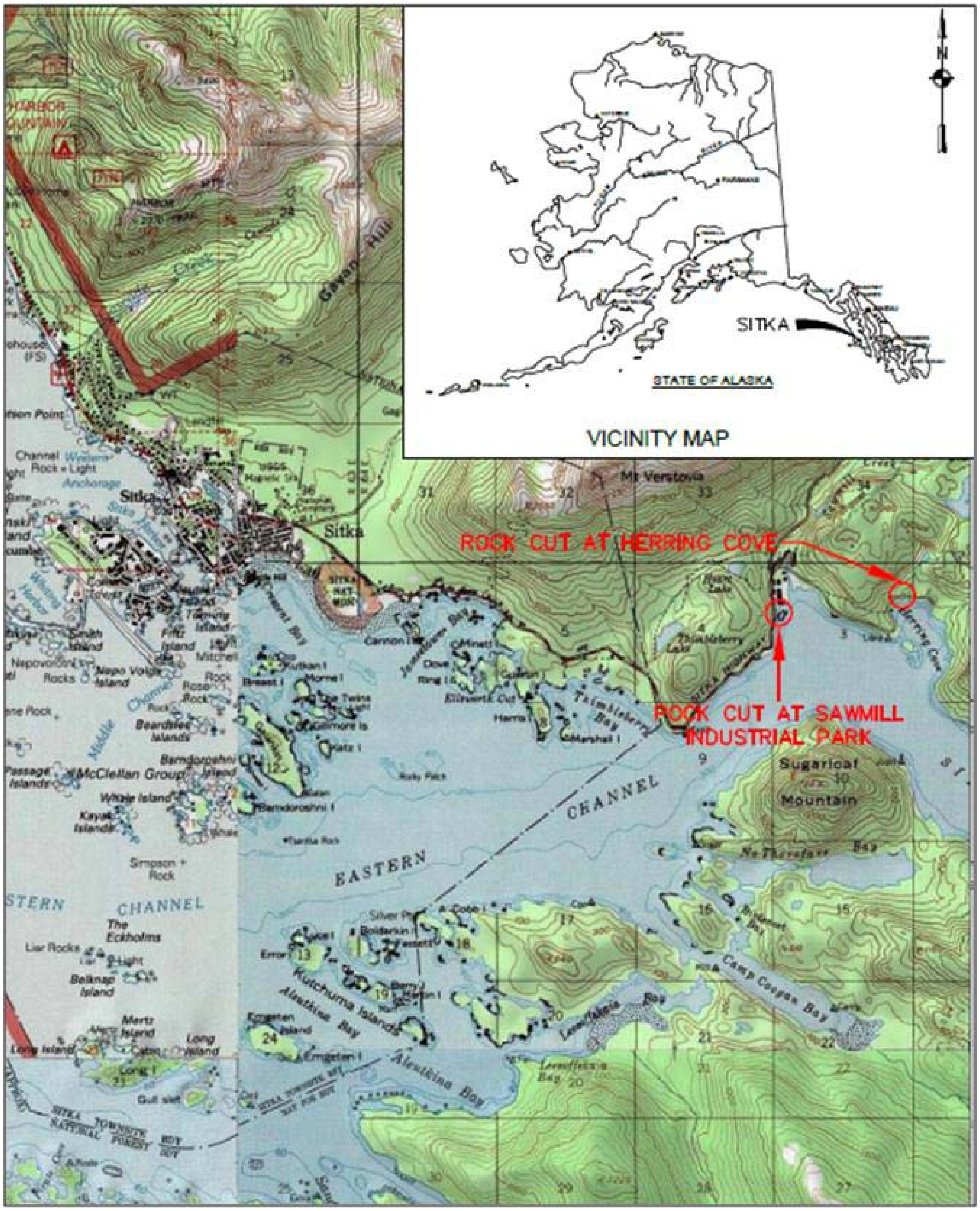

Figure C - 30. Location and Vicinity Map, Sitka

The topography of the area around the existing rock exposure is very steep with surface vegetation within and along the top of the exposure consisting of thick brush, alders, and spruce trees. Construction access to the area would be limited and pioneering an access road for drilling equipment poses many challenges. Staging equipment and stockpiling material would have to be done offsite until a large enough volume of rock was excavated to provide room for development. Access for transportation of material could be provided on the Sitka Highway or possibly by barge using dock facilities located in Sawmill Cove.

Figure C - 31. Existing Rock Ledge Adjacent to the Sitka Highway

Exposed rock in the existing face appears to be from a metamorphic source. Visual examination of the rock showed it to be strong and competent. Boulder sized rocks seen at the base of the exposure weighed between an estimated 1,000 to 8,000 pounds. Limited rock quality test results from samples collected from the surface are provided in Table C - 10. USACE estimates that a material source developed at the Sawmill Cove site has the potential to produce large stone for future harbor and shore protection projects.

Table C - 10. Summary of Sawmill Cove Rock Quality Testing

Designation	Test Method	Results
ASTM C 127	Density, Relative Density (Specific Gravity), and Absorption	(BSSD) 2.72 to 3.082 Absorption: 0.47 to 0.7 %
ASTM D 5312	Evaluation of Durability of Rock for Erosion Control Under Freezing and Thawing Conditions	Not Reported
ASTM D 5313	Evaluation of Durability of Rock for Erosion Control Under Wetting and Drying Conditions	0% loss by weight (80 Cycles)
ASTM C 535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	18% loss by weight (1,000 revolutions)
ASTM C 131	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. Grading B	15% loss by weight (500 revolutions)
CRD-C 148-69	Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol	0% loss by weight
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	0% loss by weight
ATM T-13	Degradation of Aggregates	23 to 25
ATM 312	Nordic Abrasion	17.5 to 18.5

D. Conclusion

The complexity and extent of investigations conducted to determine suitable material sources is usually governed by the size and design requirements of project features. These investigations generally occur in three stages which are reconnaissance, feasibility, and verification for use. Based on the preliminary field surface reconnaissance site visits of the previously mentioned material sources, all except the Perryville Quarry would be recommended for future consideration as a potential material source of large stone. Additional consideration would likely include field exploration and laboratory testing. The most promising potential material sources are Shakmanof Cove, Diamond Point, Flat Island Quarry, and the Bering Shai Quarry. All four of these sources have sufficient material reserves and the potential for development of onsite barge loading facilities.

Table C - 11. Summary of Potential Material Source Contact Information

Potential Material Source	Owner	Point of Contact	Transportation Access	Rock Type	Comments
Bering Shai Quarry, Unalaska	Bering Shai Construction	Bill Shaishnikoff 907-581-1409	Onsite barge loading facility and Captains Bay Road	Diorite	Currently producing crushed aggregate products
Shakmanof Cove, Kodiak	Koniag Incorporated	Angayuk Construction, Keith Miles 907-360-7827	Undeveloped, potential onsite barge loading facility	Biotite Granite	Undeveloped, has potential to produce very large stone
Platinum Quarry, Platinum	Calista Corporation	Knik Construction, Parry Rekers 206-439-5560	8.3 miles on haul road to barge loading facility	Metamorphic	Currently producing crushed aggregate products
Perryville Quarry, Perryville	N.A.	N.A.	Truck haul road	Sandstone and Conglomerate	Not suitable for harbor and shore protection projects
Flat Island Quarry, Nanwalek	Chugach Alaska Corporation	Dave Phillips 907-261-0345	Unimproved logging roads	Granite	Potential for development of barge loading facilities along Cook Inlet
Chugach Bay	Chugach Alaska Corporation	Dave Phillips 907-261-0345	Undeveloped, potential onsite barge loading facility	Granodiorite	Currently no plans to develop as material source
Diamond Point, Iliamna Bay	Diamond Point, LLC	Mark Graber 907-222-3073 & 210-240-4795	Undeveloped, potential onsite barge loading facility	Granodiorite	Dredging a channel from Iliamna Bay would be required for barge access
Snake Lake Quarry, Dillingham	Choggiung Limited	Rich Tennyson 907-842-5218	About 14 miles from Dillingham via Snake Lake and Aleknagik Lake Road	Greywacke	Provided material for local roads and shore protection along Nushagak and Wood Rivers
Ekuk Quarry, Dillingham	Horizon Contractors and Amanka Construction	Gary and Bobbi Buchholz 907-842-5683 John and Ina Bouker 907-842-4660	About 15 miles from Dillingham via Aleknagik Lake Road	Greywacke	Currently producing crushed aggregate products for road and airport construction
Sawmill Cove, Sitka	N.A.	N.A.	Potential barge loading facility in Sawmill Cove	Metamorphic	Development access limited

Appendix D:

General Environmental Coordination, Compliance, and Analysis

APPENDIX D. GENERAL ENVIRONMENTAL COORDINATION, COMPLIANCE, AND ANALYSIS

A. Introduction

As part of the rock quarry investigation, the question arose as to the requirements for establishing a new rock quarry. Many factors play into the requirements including whether the quarry is established as a federal project or a private enterprise. The following discussion touches on the environmental considerations for a federal versus private enterprise. This discussion summarizes some of the requirements but care should be taken as every quarry has its own unique conditions. The following is a general outline of coordination work that would be required while specifics would be developed as a result of a party expressing an interest in pursuing rock quarry development.

B. In Support of a "Federal Action"

Federal agencies are required to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those proposed actions.

Summary of Federal Requirements

The basic policy of the National Environmental Policy Act (NEPA) requires the Federal Government to make environmentally informed decisions when implementing Federal actions and to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions. Section 101 (b) of the Act states "it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy" to avoid environmental degradation, preserve historic, cultural, and natural resources, and "promote the widest range of beneficial uses of the environment without undesirable and unintentional consequences."

Federal facilities must include the NEPA process as a routine part of new project/construction development and when potentially environmentally significant issues are identified. This includes:

- early cooperative consultation among agencies, such as the State Historic Preservation Officer (SHPO), U.S. Fish and Wildlife Service, and Indian Tribes, is also part of project development
- identification of environmental effects and values in adequate detail so they can be compared to economic and technical analysis
- development and description of appropriate alternatives or to recommended actions in any proposal that involves unresolved conflicts concerning alternative uses of available resources; and

- use of appropriate Federal agency documents to evaluate and compare reasonable alternatives to recommend actions in any proposal.

NEPA requires a detailed statement on the environmental impact of the proposed action, by the reasonable official, for Federal actions significantly affecting the quality of the human environment. These detailed statements take the form of Environmental Assessments (EA) and Environmental Impact Statements (EIS) depending upon whether a project significantly affects the human environment.

An EA is required to be completed and submitted for review before any contract for action is entered into or action is begun unless the action normally requires an EIS or the action qualifies for a categorical exclusion. It is important to note that an EA will be prepared according to agency policies. Title 40 CFR 1501.3 states that agencies will adopt procedures to indicate when an EA is required to be done. See Agency NEPA Procedures for information on individual agency policies.

If due to the results of an EA, an EIS is not going to be prepared, a Finding of No Significant Impact (FONSI) must be prepared and made publicly available.

An EIS must be produced for any activity which normally required an EIS including:

- the adoption of new Agency programs or regulations that cover broad Federal actions
- technological developments with significant effect on the quality of the environment
- an EA indicates it is necessary.

All Environmental Impact Statements (EISs), together with comments and responses, prepared by federal agencies are filed with EPA. Each week, EPA publishes in the Federal Register a Notice of Availability for all the EISs filed the previous week. The EPA Notice of Availability is the official start of the public comment/wait periods required under the Council of Environmental Quality's regulations implementing the National Environmental Policy Act.

The following outline is programmatic in nature and denotes the types of information that would be needed to fulfill the requirements of NEPA for a Federal Interest Project. (This outline does not include all requirements that may apply to a specific project. However, this outline is meant to address major requirements. Site specific or project specific requirements and any additional requirements identified during site specific investigations would be identified later in the process.)

- Real Estate/Land Surface Owner Permission/Right of Entry
  - Legal Description
  - Site Survey/Mapping
    - Define quantities & location of competent rock
    - Define quantities & location of overburden
    - Define site boundaries, camp/working/staging/stockpile areas and roads

    - Identify overburden and waste stockpile areas

- NEPA/Federal Coordination, Analysis, Permits, and Authorizations
    - Clean Water Act - 404(b)(1) Jurisdictional Determination and analysis/Mitigation
    - Clean Air Act – Including development, crushing/operation, transportation
    - Endangered Species Act Coordination/Mitigation
        - USFWS Coordination
        - NMFS Coordination

- Coastal Zone Management Act/State of Alaska Coordination/Permits/Certifications/Determinations
    - DNR Land Use permits
    - DNR Material Extraction permit
    - Tidelands Lease (navigational servitude issue)
    - Section 106 NHPA/SHPO Determination/Concurrence
    - AK DF&G Habitat Permits
    - State 401 Water Quality Certification

- Tribal/Regional Corporation/Village Corporation Coordination
    - Tribal Consultation/G-to-G based on protected rights/resources
    - Coordination needed with Corporations based primarily on surface and subsurface ownership status

C. In Support of an "Individual Applicant"

Non-Federal Interest Projects (Private Sector Projects) accomplish environmental coordination and compliance through the permitting arena. When these projects occur in or near a "water of the United States", the USACE Regulatory Program becomes the permitting agency. Project specific applications submitted for Regulatory Action can be considered to have three steps: pre-application consultation (for major projects), formal project review, and decision making.

Pre-application consultation usually involves one or several meetings between an applicant, Corps district staff, interested resource agencies (Federal, state, or local), and sometimes the interested public. The basic purpose of such meetings is to provide for informal discussions about the pros and cons of a proposal before an applicant makes irreversible commitments of resources (funds, detailed designs, etc.) The process is designed to provide the applicant with an assessment of the viability of some of the more obvious alternatives available to accomplish the project purpose, to discuss measures for reducing the impacts of the project, and to inform the applicant of the factors USACE must consider in its decision making process.

Once a complete application is received, the formal review process begins. USACE districts operate under what is called a project manager system, where one individual is responsible for handling an application from receipt to final decision. The project manager prepares a public notice, evaluates the impacts of the project and all comments received, negotiates necessary modifications of the project if required, and drafts or oversees drafting of appropriate documentation to support a recommended permit decision. The permit decision document includes a discussion of the environmental impacts of the project, the findings of the public interest review process, and any special evaluation required by the type of activity such as compliance determinations with the Section 404(b)(1) Guidelines or the ocean dumping criteria.

USACE supports a strong, partnership with states in regulating water resource developments. This is achieved with joint permit processing procedures (e.g., joint public notices and hearings), programmatic general permits founded on effective state programs, transfer of the Section 404 program in non-navigable waters, joint Environmental Impact Statements (EISs), special area management planning, and regional conditioning of nationwide permits.

Summary of Private Enterprise Requirements

The application process to USACE Regulatory Division will guide the applicant through the statutory requirements of NEPA in order to obtain the appropriate permits. The permitting process is unique to the particular project unless it is covered by a nationwide permit.

For State of Alaska sponsored projects, the State would generally follow the private sector approach of applying for permits through the Corps' Regulatory Program unless the State were developing the quarry for a Federal interest project which would then be held to a higher standard.

D. Additional Information

For more information on the environmental process for your proposed project, please contact Michael Salyer at the Army Corps of Engineers at (907) 753-2690 or email him at michael.9.salyer@usace.army.mil.