APPENDIX A

Summary of Without Project Conditions and Impacts to Diomede

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Summary of Without Project Conditions and Impacts to Diomede

I: Introduction

This section summarizes the major without-project conditions that have created, and continue to cause, negative impacts to the community and residents of Diomede. Access to the offshore marine environment is probably the most critical requirement for continued existence of the community. Due to the extremely remote nature of Diomede, almost all of the food they consume has to be locally produced. There has been no regularly scheduled freight service to Diomede for more than a decade, making Diomede uniquely remote, even among rural marine communities in Northwest Alaska.

During the open-water portion of the year, the only access to Diomede is via the small boat fleet and weekly helicopter service that has frequent and lengthy disruptions in service. Even when the helicopter service is operating, freight to the community is limited to approximately 400 pounds per week. Evergreen Helicopters Inc. holds a federal mail contract to provide mail service to Diomede, and they provide very limited passenger service on the one day a week for part of the year when flying mail from Nome to Diomede.

Diomede is located in an extremely difficult location to provide wave protection. Currently, boats are launched and hauled out in one or the other of the small rocky 'fingers' directly to the south of the helipad (see the beach areas in Figure 1). The photo shows the effects of wave surges sweeping in and out of the rocky launch area, making it hazardous a large proportion of the time. The local fleet, described below, is hauled in and out by hand, utilizing plywood and lumber under the hulls to prevent damage from the sharp rocks. The plywood and other hull protection measures are shown in Figure 3.

Figure 1: Diomede Beach Areas North and South of the Helipad

In the following summary, the economic impact of the without project conditions are estimated and provided where possible. In the cases where this is not possible, a qualitative evaluation of the impacts to the community is provided.

II: The Potential Alternative Projects for Diomede

The U.S. Army Corps of Engineers has developed a series of four different alternatives for Diomede to provide greater access for the local residents to be able to launch and retrieve their boats safely during periods of adverse wind and wave activity[1]. All four options will provide wave protection, but they differ in their effect because of their location. Alternative N1 is on the north side of the helipad. It would primarily provide wave protection when the wind and waves are coming from the south. It would provide little protection when the wind and waves are coming from the north. The other three alternatives (S1, S2 and S2) are located on the south side of the helipad. These alternatives would provide wave protection when the wind and waves are coming from the north, but would provide little protection when the wind and waves are coming from the south. Figure 1 clearly shows the wave and ocean surges at the shoreline in front of the community. North is to the left side of the photo in Figure 1, and south is to the right side of the photo.

Residents of Diomede estimate that access to the ocean, utilizing the skiff fleet described below, avoid going out when the waves are greater than two feet[2] . When waves are two feet of greater, the rocks, surges and currents at the beach make conditions too dangerous to launch.

To better evaluate how the respective Alternatives will serve to protect boat launches and retrievals, the Corps of Engineers developed a wave model to estimate, by month, the proportion of the time that waves come from the north and south (see Table 1 below).

The top legend in Table 1 shows the proportion of the time (out of 100 percent of the time) that waves of different heights come from the north and south. For example, in the month of June, we can see that the wave model predicts that waves will be no waves for 7.1 percent of the time. So we could conclude that during the month of June, the water would be calm (no waves) 7.1 percent of the time. During this proportion of the month, residents would have no problem getting their boats in or out to participate in subsistence hunting, fishing or gathering.

The next column in Table 1 shows the proportion of the time that there are waves projected to be up to 1.7 feet. According to Diomede residents, they are generally able to launch and retrieve their boats in these wind condition, so subsistence activities should be possible during these projected wave heights even in the current (without-project) situation.

For the month of June, we can see from Table 1 that 14.4 percent of the time, waves 1.7 feet or less come from the north. And 37.6 percent of the time, waves 1.7 feet or less come from the south. The next column to the right in Table 1 shows the proportion of the time that waves are forecast to range from 1.7 feet to 3.3 feet. This column is highlighted in yellow, since this is the interval that the various

[1] U.S. Army Corps of Engineers, Appendix A, Hydraulic Design, Draft report, April 2012.
[2] Francis Ozenna, Diomede IRA Council, personal communication, October 2011.

alternatives would be successful in expanding boat use at Diomede. For the month of June, for example, there are waves from the north 11.5 percent of the time, and from the south 12 percent of the time.

The final column on the right side of Table 1 shows the proportion of time that waves are forecast to range between 3.3 feet and 6.6 feet. In these wave conditions, the ocean is considered to be too rough for the Diomede fleet to be out on the water, so the respective alternatives will have little benefit in these conditions. However, there is a possibility that boats caught out in unexpected wave conditions might be able to make a safe landing with the wave protection that they could not ordinarily be able to make.

The yellow highlighted column shows the respective proportions of the time, for the months of June, July, August, September and October that the respective alternatives would be effective in providing wave protection from the north and from the south. Perhaps the easiest way to discern the different effects of the north versus south projects is to divide the 5 month period into two components. We can see from Table 1 that the amount of protection in the highlighted column for the month of August is almost identical (waves between 1.7 feet and 3.3 feet 14.3 percent of the month from the north and 14.0 percent of the month from the south). However, if we group the remaining four months into an early period (June and July) and a later period (September and October), we see a marked difference in the protection provided by the north and south alternatives. For the early period (June and July), the highlighted protection period shows a total of 6.8 days of protection from waves from the north

Table 1:
Wave Heights by Month and Direction at Diomede, Alaska
numbers in cells represent the proportion of the time (in percent) that waves come from the specified direction

		no waves	up to 1.7 feet	1.7 to 3.3 feet	3.3-6.6 feet
June	north	7.1	14.4	11.5	7.5
	south		37.6	12	3.4
July	north	1.1	12.6	10.8	7.6
	south		34	17.3	6.9
August	north	0.8	9.5	14.3	14.8
	south		15.6	14	11.4
September	north	0.1	8.2	17	25.3
	south		4.6	8.4	4.8
October	north	0	4.5	15.5	26.6
	south		2.9	5.4	5.8

Source: reprinted from U.S. Army Corps of Engineers, Appendix A, Hydraulic Design for Diomede, March 2012.

(protected by Alternatives S1-S3) and 9.0 days of protection from waves from the south (protected by Alternative N1). So if Diomede residents wished to get the most protection possible during the early (June and July) period, they would select Alternative N1.

For the later period (September and October), the highlighted protection period shows a total of 9.9 days of days of protection from north waves (Alternatives S1-S3) and only 4.1 days of protection from south waves (Alternative N1). So if Diomede residents wished to get the most protection possible during the late (September and October) period, they would clearly select Alternatives S1, S2 or S3.

The design engineers cannot provide the conclusion as to which Alternative is best, since is dependent upon the needs and preferences of Diomede residents. All else being equal, the above comparison might be a reason to consider Alternatives S-1, S-2 and S-3, since they provide more wave protection when the waves come from the north. However, Diomede residents have other considerations that may affect their preference, such as erosion protection, community beach use patterns, the potential to enhance freight offloading, as well as others.

To better understand the difficulties of launching and hauling out skiffs at Diomede, we can also review two data series on subsistence use and wave patterns off Diomede. The first series, shown in Figure 2 shows the number of subsistence activities by month. The trips by target species are shown in Table 4 at the end of this section.

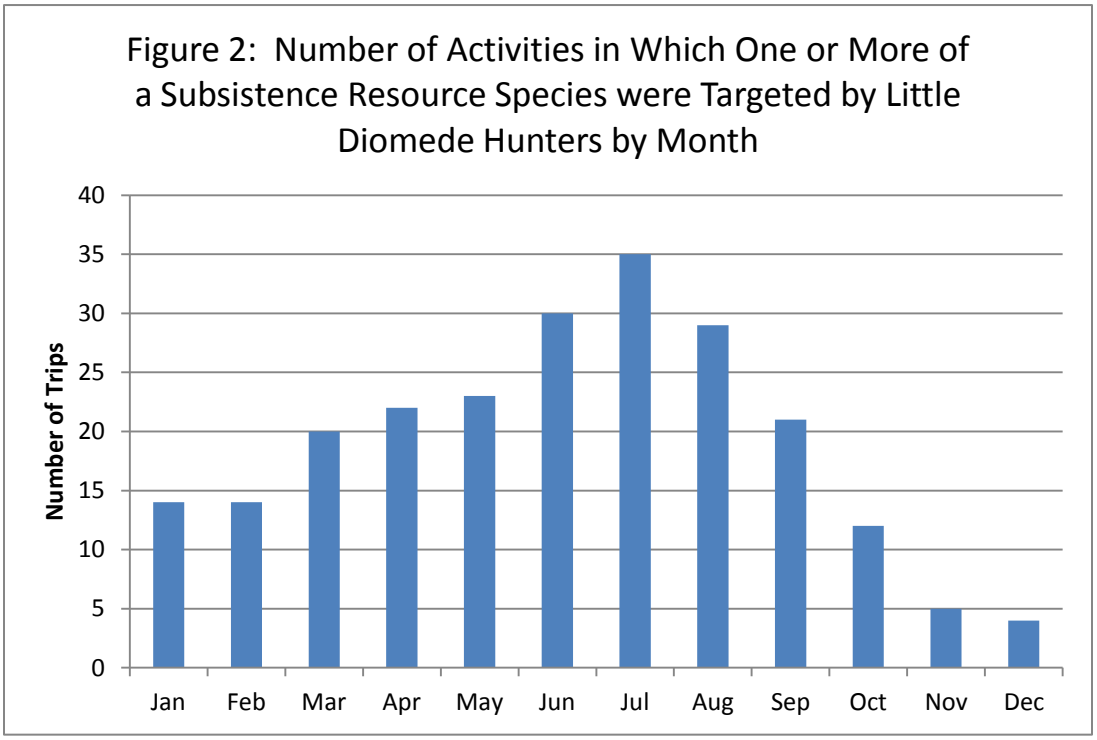
It is clear from Figure 2 that the peak months for subsistence activities occur in May, June July and August, with the lowest level of activity during November and December. This busy period is generally concurrent with the ice-free period of the year, where participants are able to utilize their boats for hunting, fishing and gathering activities. This is the portion of the year where the respective project alternatives will provide enhanced marine access and provide the most benefits to the residents of Diomede.

Additional detail of subsistence activity is shown in Table 4 at the end of this section. This expanded version of the data presented in Table 2 shows subsistence activity by month and by target species.

III: Problem/Issue #1: Insufficient Food for the Community and Residents of Diomede

Because of its remote location and difficult conditions, Diomede has had no scheduled freight deliveries for more than a decade. Occasional chartered freight deliveries come into the community for special situations, such as delivering materials for the community boardwalk. However, Diomede residents produce a very large proportion of their food both by necessity as well as cultural preference. Diomede residents' high level of dependence on subsistence produced foods for their very survival makes the community unique, even compared with other villages in the region.

Residents of the community have suggested that subsistence production of foods could be increased by as much as 50 percent over current harvest levels, if a project is completed which would allow the local boat fleet better access during periods of higher wave conditions[3].



Source: data from Tetra Tech, Inc. et. al. Economic Value of Subsistence Activity, Little Diomede, Alaska, December 2011.

The U.S. Army Corps of Engineers completed a survey of Diomede residents in 2007 to gather information on the needs of the community. The following quotes are from the responses of Diomede residents to a question asking about the impact "a protected harbor" in Diomede would have on extending their subsistence harvests or extending the family's subsistence activities[4]. The phrase "protected harbor" is slightly different from the current proposed alternatives (which provide wave protection). However, we believe the effect is the same, since the skiff fleet would not have remained on the water in either situation. The comments received included the following:

"Subsistence harder by year due to warming. Walrus moving in March. Used to be May."
"20 percent more subsistence overall. Helpful in October and November when surf is harsh."
"Yes, a protected small harbor facility would increase our subsistence harvest by lots."
"Would extend the range of hunting."

[3] Francis Ozenna, Diomede IRA Council, personal communication, December 2011.

[4] U.S. Corps of Engineers, Alaska Region. Household Interviews: Diomede, conducted during the week of March 19 through March 23, 2007.

"Yes, a protected small harbor facility would increase our subsistence harvest by 50 percent."
"Would make 5 more trips (per year)."
"Yes, would be able to purchase skiff – 10 to 12 trips per year."
"Yes, a few more times a year. Protection from large swells when launching."
"*The harbor would help – boats wouldn't have to be stored on land, lager boats."*
"Yes, 24 more hunting trips, currently 8 trips. 25 to 50 percent improvement"

The following points provide some perspectives on greater marine access resulting in increased food production and resolving the shortage of food for the residents of Diomede.

- Diomede residents prefer to harvest walrus that migrate past Diomede. In the spring (May and June), females and sub-adults migrate northward through the Bering Strait. Depending on the weather and ice conditions, the period of successful hunting may be relatively short. In the fall (October and November), the reverse population migration occurs as the walrus head south to join up with the males working their way north from Bristol Bay. Again, the weather conditions dictate the potential for launching boats and safely returning in difficult wave environment at the Diomede beach. Restricted ability for the Diomede hunters to launch and return mean either lost opportunities and/or longer hunting trips that increase costs and risks.

  Table 2 shows the walrus harvests by Diomede hunters for the period from 1989 to 2011. There is a very clear decline in the numbers harvested, particularly in recent years. We do not know the reasons for this sharp decline, but since walrus is a preferred species for food production, this trend represents restricted food opportunities for residents of Diomede. It is likely that changing weather patterns have resulted in changed ice conditions during the periods that the walrus migrate past Diomede Island. If that is the case, then expanding the 'operating window' for hunters to be able to get out – per the discussion of Table 1, could mean a substantial increased opportunity for walrus harvests, particularly in the early spring and late fall – the time periods when migrating walrus are likely to be travelling through the area.

  We are suggesting that the known decline in harvests of walrus by Diomede is symptomatic of the ocean access problems that could be partially addressed by one of the wave protection alternatives. Data for harvests of seals and other important subsistence species have not been collected in recent years, so trends in harvests of other species are not available.

  For purposed of comparison, Table 2 shows that the 2011 harvest of walrus by Diomede hunters was 8. For the same year, the harvest by Gambell hunters was 439; the harvest by Savoonga hunters was 444; and the harvest by King Island hunters, where there are no permanent residents, was 12 walrus.

- Even if Diomede residents are able to harvest sufficient amount to keep from going hungry, they may not be able to harvest their nutritionally and culturally preferred foods due to inadequate hunting opportunities. Again, this issue may be exacerbated by the restricted ability of the skiff

fleet to hunt during critical times and would be at least partially resolved by the wave protection offered through Alternatives N1 or S1-S3.

Table 2: Walrus Harvests at Diomede: 1989 to 2011	
year	Total walrus reported as harvested
1989	1
1990	236
1991	532
1992	99
1993	91
1994	378
1995	197
1996	90
1997	152
1998	163
1999	131
2000	159
2001	57
2002	99
2003	64
2004	60
2005	15
2006	21
2007	51
2008	30
2009	46
2010	31
2011	8
Data source: U.S. Fish and Wildlife, Marine Mammals Management, Marking, Tagging, and Reporting, Program at http://alaska.fws.gov/fisheries/mmm/mtrp/mtrpmain.htm	

- We know that long term food storage is difficult on Diomede. Households use 'ice pits' dug under their homes to preserve foods for long term use, since freezer use is not practical. The freshness and quality of subsistence foods consumed would be increased if addressing the ocean access for Diomede hunters were enhanced throughout the season, but particularly during the early spring and late fall when walrus are migrating through the area.
- Aside from subsistence foods harvested directly for consumption by Diomede residents, it is likely that increased ocean access would enable production of food that could be traded to residents of nearby communities for food or other items not available at Diomede.

Without Project Economic Cost of Inadequate Food Production

Providing protection for boat launching in Diomede will allow for increased food production, and any of the alternatives selected will have a beneficial effect. However, placing a value on the current 'shortfall' in subsistence production is difficult. Since subsistence foods are not bought and

sold they do not have a market price. To help address this lack of essential data, the U.S. Army Corps of Engineers sponsored a recently completed study to evaluate the economic value of subsistence production[5]. A short summary of this research project is appended to this report.

The study team completing this project utilized a production cost model to calculate a value for subsistence production in Diomede and Wales, Alaska. The data for the calculations came from a survey of residents in the two communities completed in March 2011.

In Diomede, 23 of the 30 occupied households were surveyed. There are two components to the valuation methodology. The first component of the value estimated includes all the expenditures made by a household (during the calendar year) in their subsistence activities. The second component estimated a value for all of the hours a household uses in a calendar on subsistence activities, including trips, food processing, equipment preparation and maintenance, etc.

The results of the subsistence valuation study are shown in Table 3. The two components of subsistence production in Diomede provide an approximation of the economic value of $651,000 for calendar year 2010. Each year will be different, but this valuation can be a representative point estimate for the value of subsistence production in Diomede.

Table 3: Summary of Subsistence Valuation from Production Costs in Diomede, Alaska

Component 1: Production Cost	Estimated Cost	# of Households
sum of subsistence costs	$69,500	25
estimation for unsurveyed households	$36,200	13
total 2010 subsistence costs	$106,000	38
per household subsistence costs	$2,780	38
Component 2: Value of Subsistence Hours		
sum of subsistence hours	15,630	25
estimation for unsurveyed households	8,218	13
total 2010 subsistence hours	23,758	38
per household subsistence hours	625	38
calculated value of subsistence hours per household	14,300	
total value of subsistence hours in 2010	$545,000	
Combined value of subsistence costs and value of subsistence hours in 2010	$651,000	

Source: data from Tetra Tech, Inc. et. al. Economic Value of Subsistence Activity, Little Diomede, Alaska, December 2011.

[5] Tetra Tech, Inc. et. al. Economic Value of Subsistence Activity, Little Diomede, Alaska, December 2011.

Getting back to the issue of the current cost/impact of the reduced subsistence opportunity in Diomede, we can use the valuation above to help us make an estimation of the economic cost of reduced food opportunities in the without-project situation. We have estimates for the amount of increased food production in Diomede, were a wave protection were developed, showing that subsistence production could increase from 20 percent to 50 percent over current levels.

Taking the 2010 subsistence valuation estimate for Diomede of $651,000, an increase of 20 percent represents an annual without-project cost of $130,000.

Taking the 2010 subsistence valuation estimate for Diomede of $651,000, an increase of 50 percent represents an annual without-project cost of $326,000.

The figures above are based on point estimates of the economic value of Diomede's subsistence production in 2010, but they provide the best available information with which to assess the without-project costs created by the lack of marine access in Diomede.

IV: Issue 2: Increased Costs of Boat Operation at Diomede

The small boat fleet in Diomede is comprised of aluminum outboard skiffs of various makes. Specific boat characteristics are listed below:

- 20 foot Star Trek Aluminum boat with an Evinrude 150 horsepower outboard
- 20 foot fiberglass boat (made in Shishmaref) with a 90 horsepower outboard
- 18 foot Ocean Pro aluminum boat with a Yamaha 70 horsepower outboard
- 16 foot Crestline aluminum boat with a Tohatsu 40 horsepower outboard
- 20 foot Bering Sea aluminum boat with a Tohatsu 40 horsepower motor

There are several smaller aluminum boats in the community shown in Figure 3, and there are also two traditional skin boats. The skin boats are shown in the photo of the project summary at the end of this report.

The existing fleet of boats operated by residents of Diomede are subject to damage from being landed and hauled our across the rocky beach, and launched in the 'fingers' shown in Figure S-1. This damage could be minimized with effective wave protection in place. An associated issue with the use of boats is the lack of a boat ramp, which makes it necessary to launch and retrieve the boats by hand, a very labor intensive and potentially dangerous solution. Additionally, there is limited storage area on the beach for the boats (see Figures S-3 to S-6). With the completion of one of the proposed alternatives, it should be possible to utilize mechanical launching and haul outs for the Diomede fleet, making ocean access quicker and safer than the current methods.

Figure 3: skiffs on the beach at Diomede

Figure 4: skiffs on the beach at Diomede

Figure 5: skiffs on the beach at Diomede

Figure 6: skiffs on the beach at Diomede

With the lack of freight shipment, it is also very difficult to get new boats to the community. In recent years, there have been two new boats brought to Diomede. One boat was purchased in Shishmaref and taken to Wales, then driven across to Diomede. Another boat was delivered by one of the occasional freight deliveries from Alaska Marine Specialties of Alaska, West.

According to residents, the purchase costs for the Diomede skiff fleet were: $2,500, $4,000, $7,000, $9,000, $12, 000, and $20,000[6]. Due to the lack of freight service to Diomede, the current replacement value for these boats is likely considerably higher than the figures shown above.

As noted above, the current fleet of boats is relatively small, varying from 16 feet to 20 feet in length. If a boat ramp and mechanical launching equipment were available, larger, and safer, boats could be utilized.

As a final issue related to the use of the Diomede boats, we have already discussed on pages three and four the periods of time that boats can neither be launched nor landed due to wave conditions. Since the hunters are seeking migratory species, the frequency of periods where boat use is not possible can increase the use of fuel, and increase running time, during those periods when weather conditions are favorable. Thus, the increased windows of opportunity to access the ocean that would be provided by the proposed alternatives should be very effective in providing increased hunting opportunities when the target species are in close proximity to Diomede.

In 2010, the cost of boat fuel in Diomede was $2,985. This amount could be reduced substantially if a wave protection project allowed hunting to occur during periods when the migratory species was in close proximity to Diomede Island.

Alternatives N1 and S3 have an additional benefit to the community, due to upland storage areas that would be created. Either Alternative N1 or Alternative S3 would provide 0.3 acres of upland storage area and a launching ramp that would allow the use of mechanical launches for the fleet. With the extremely limited beach area at Diomede, this additional benefit would be very important to the community, and could be used for upland storage for containers, processing of marine mammals harvested, or many other uses.

V: Issue 3: Emergency Medical Evacuation Costs and Issues

There is no landing or moorage currently available in Diomede for a vessel of sufficient size to provide emergency medical evacuations to Nome.

All of the wave protection alternatives would allow landings of a 50 to 55 foot emergency vessel that could be moored in Nome and make trips to Diomede as needed during the open-water portions of the year. This option could provide both reduced costs for emergency evacuations, and possibly make evacuations possible during weather that would prevent helicopter landings.

[6] Tetra Tech, Inc. et. al. Economic Value of Subsistence Activity, Little Diomede, Alaska, December 2011.

It should be noted that the emergency vessel is a concept only, and no operational cost data for a Diomede emergency vessel are currently available. The wave protection is a necessary condition to allow consideration of this option for the community, but it is not sufficient to state that this option would be feasible at this point.

Data are not readily available on the number of emergency medical evacuations that occur in Diomede or other rural communities. From Diomede, emergency medical evacuation flights are conducted using whatever equipment is available at the time. If they are operating, emergency helicopter trips are chartered from Evergreen Helicopters, Inc. If they are not flying, or are not available, then a Blackhawk helicopter from the National Guard is utilized.

Currently, medical evacuation costs are paid by the Norton Sound Health Corporation. The Norton Sound Health Corporation provides medical care for Diomede residents, was well as 14 other villages in the Norton Sound area. When Diomede residents require emergency medical treatment, staff from the Norton Sound Health Corporation fly out to transport the patient back to Nome or Anchorage, depending on their required care.

Since October 2008, emergency medical evacuations from Diomede have been necessary seven times[7]. The costs not only include the emergency charter to Diomede from Nome, but also the cost of transportation to Anchorage.

The uncertainty associated with transportation out of Diomede greatly increases the cost of medical treatment. Diomede patients knowing they are likely to need medical treatment (for example pregnant women) have to leave Diomede well in advance of their treatment dates, just to make sure that they can get out when necessary. In most cases, the Norton Sound Health Corporation also pays the cost for interim housing in Anchorage. The federal government pays much higher costs as a result, and the patient is greatly inconvenienced by the necessity of early travel. While the family member is away from the community seeking medical treatment, the rest of the family remaining in Diomede is also disrupted from their normal family life.

We do not have an estimate for the annual costs for medical evacuations of Diomede residents, or the increased medical costs that are required due to the uncertain nature of transportation into and out of Diomede. However, if the wave protection project resulted in operation of an emergency rescue boat to help with medical transportation into and out of Diomede, the benefits could include reduced health care costs to the Federal Government, and also increased safety for Diomede residents. Faster treatment times and improved healthcare could also result, if patients could leave the village in a more timely manner than under current transportation restrictions when they need medical assistance.

[7] Josh Hearns, Norton Sound Health Corporation, personal communication, November 2011.

VI: Issue 4: Freight Costs and Related Issues

There is a lack of regular barge service to Diomede that creates a hardship to the community as well as extraordinary expenses to its residents for the freight they are able to have shipped. There have been no regular barge deliveries to Diomede in over a decade.

Northland Services used to provide freight service to Diomede but no longer does so. The company withdrew from service for two reasons: (a) light freight shipments, and (2) damage to their barges.

When they provided service to Diomede, Northland used 150 foot x 50 foot landing craft barges. These barges require about five feet of draft when fully loaded. The barges can hold up to 350 tons of freight in containers. Northland's typical pattern was to bring loaded containers up from Seattle in one of their 390 foot barges, then transfer containers to one of the landing craft barges. When they deliver, shore equipment picks up the containers from the landing craft and sets them on the beach.

The main problem experienced by Northland in landing at Diomede was pounding on large rocks on the bottom as their barges approached the beach in the strong wave surges. They use the same vessels to deliver to Savoonga and Gamble, but the approach in front of those communities does not have the same large rocks as Diomede. During the period they delivered freight to Diomede, Northland experienced damage their barges from pounding on the rocks. The damage is discovered when the barges are drydocked and substantial repairs are required as they have to cut out and replace the damaged portion of the hull.

In the late 1970's or early 1980's, a private shipping company from Nome lost an entire tug and barge at Diomede when they sunk while attempting a landing at the south beach. The barge was called the Muktuk, and it was owned by Dale Whitney of Nome[8].

With no regular commercial freight service to Diomede for more than a decade, the only option for freight is via special charters. Currently, these special freight charters to Diomede are split between two companies: Seattle Action Service and Alaska Marine Specialties. Seattle Action Service has made five to six trips in recent years. The company uses an 80 foot landing craft that is based on Nome (see Alaska Marine Specialties of Alaska below). In the past, the company made one delivery with a 110 foot barge that had a capacity of 400 tons and required the same draft (4 to 5 feet). The maximum freight load for the vessel is 85 tons. It requires a draft of 4 to 5 feet, which is not a problem in Diomede. When the front of the barge is in 5 feet of water, the stern is in 90 feet of water.

The biggest obstacle for deliveries to Diomede for Seattle Action Services is the swell, causing the barge to drop down on the rock ledges adjacent to the beach.

In addition to making their own deliveries, Seattle Action Service also acts as a brokering agent for the other company currently making freight deliveries, Alaska Marine Specialties of Alaska, West.

[8] Randy Oles, State of Alaska, Alaska Department of Transportation, Nome, Alaska, personal communication, March 2012.

Alaska Marine Specialties of Alaska, West operates the barge that makes most deliveries to Diomede. The company provides barge service from Nome to Diomede, and has made at least two to three freight trips per year in recent years with their 90 foot landing craft**.** The vessel requires approximately five feet of draft, but water depth is not a constraint at Diomede. The maximum freight capacity for the barge is 90 tons (legal maximum), but the barge can actually carry 110 tons.

The wave protection alternatives being considered for Diomede will not provide a landing site for fright barges, however, they would address another important need for both the community and the barge companies. The 0.3 acres of upland storage area that would be created by the wave protection alternatives would provide sufficient space to use a forklift of loader to quickly offload small containers (20 feet by 8 feet).

The staging area and upland storage area would allow freight companies the ability to pick a favorable weather window and use their equipment to load a barge and head for Diomede with the intention of a quick turnaround to take advantage of the favorable conditions.

So while the lack of freight service will not be fully resolved with development of a wave protection project at Diomede, the increase speed of offloading will help to ensure that freight providers will continue to provide services to the community, and it may result in a decrease in freight costs over time.

VII: Issue 5: Erosion Protection

None of the alternatives being considered for Diomede were designed with erosion protection in mind. However, one of the potential benefits would be to protect the houses close to the beach (for the south side alternatives) or for the school (for the north side alternative).

There are currently no data available to quantify the magnitude of erosion along the south beach. However, residents along the lower elevations of the south beach indicated erosion of the beach below their house during violent storms from the southwest was of concern to them[9].

The have some information that indicates that erosion has been a problem requiring costly repairs. The fuel header and fuel lines used to run along the south beach to the community storage tanks. After repeated instances of being uncovered by storm action, the entire system was replaced by the Denali Commission and the State of Alaska in 2004 and 2004. The project included new fuel headers, lines and storage tanks. The Denali Commission funded $2,574,917 of the project costs and the State of Alaska provided an additional $539,760[10].

In early 2001, the community spent a total of $55,000 on beach restoration along the south beach, including gabion wires, heavy equipment use and manpower costs[11].

[9] Jim Richardson, personal communication with several Diomede residents, October 2010.
[10] Denali Commission, Project Database System, Diomede Bulk Fuel Facility, Project #340138, accessed March 2012.
[11] Francis Ozenna, Tribal Coordinator, Native Village of Diomede, personal communication, March 2012.

The community also uses their road grader for needed beach maintenance as needed. Data are not available to ascribe proportional costs to south beach repair since the equipment is primarily utilized for construction and maintenance of the ice runway.

The existing road grader cost $128,933 in 2001. The freight between Seattle and Nome added an additional $18,840. It took about two years and an additional $17,899 in freight to get the road grader from Nome to Diomede[12].

The useful lifetime of a road grader in Diomede is approximately eight years. A replacement road grader has been purchased for Diomede, and it cost over $300,000. It is currently being stored in Dutch Harbor, since transportation logistics to get it delivered to Diomede have not been successfully developed.

Erosion protection should be considered as a non-quantified but important additional benefit of development of the wave protection project in Diomede.

VIII: Issue 6: Economic Development Opportunities

Under the existing (without-project) conditions in Diomede, economic opportunities are severely limited. If a wave protection project were developed, it could act as an enabling factor to provide for enhanced economic opportunities in the future.

In the fall of 2009, the Institute of the North sponsored an International Arctic Fisheries Symposium in Anchorage[13] with the theme of 'Managing Resources for a Changing Arctic'. Speakers at the conference presented results of research suggesting that fish populations of the Bering Sea would not migrate northward and populate the Arctic Ocean. It appears, based on the presenter's research and opinions that major shifts in concentrations of Bering Sea fisheries resources will not occur.

However, there were many presentations suggesting that ocean transportation would be opening up in the Arctic over the next several decades, as the Arctic ice continues to recede. In addition, the known development interests and activities associated with offshore oil exploration in Alaskan arctic waters will mean increased transit of vessels in the region.

With polar ice retreating throughout the Arctic, there are clear strategic reasons for the United States to have in an increased presence in northern oceans. It is not clear at this point how that increased presence may present economic development opportunities to Diomede residents. However, since Diomede is the only community in the crucial Bering Strait waters, any marine infrastructure project that provides enhanced landing opportunities may enable future economic activities in the community.

With the addition of uplands storage, Diomede may be able to develop small-scale services to help support some of this activity. Northward movement in global freight traffic will create new vessel traffic

[12] Randy Oles, State of Alaska, Alaska Department of Transportation, Nome, Alaska, personal communication, March 2012.
[13] International Artic Fisheries Symposium, October 19-21, Hotel Captain Cook, Anchorage, Alaska.

associated with the U.S. Coast Guard, fisheries research vessels and oil exploration and service support vessels.

With future oil exploration and production likely in the Chukchi Sea, there may be opportunities for Diomede to store and maintain oil spill response equipment and materials. With wave protection in place, and some new upland storage capability (Alternative N1 and Alternative S3), Diomede may well be positioned to take advantage of some of these developing opportunities.

IX: Issue 7: Non-Use, or Passive-Use Values

Diomede is extremely remote, even by northwest Alaska standards. As one of the few remaining Native Alaskan communities remaining almost totally dependent upon subsistence production for food, Diomede is unique. It has existed through history with practices and activities very similar to those utilized today. To the rest of the United States, the very existence of Diomede is so extremely rare that has 'existence' value, even to people who would never travel to the community.

Passive valuation of non-market resources is most commonly used for wilderness areas or fish and wildlife resources rather than entire communities, but the situation and methods are the same. Recent examples for passive use valuation include the following:

Loomis, John. Passive Use Values of Wild Salmon and Free Flowing Rivers. In Lower Snake River Juvenile Salmon Migration Feasibility Study, U.S. Army Corps of Engineers, Walla Walla District, August 2001.

Carson, Richard T. et. al. A Contingent Valuation Study of Lost Passive Use Values Resulting from the Exxon Valdez Oil Spill, A report to the Attorney General of the State of Alaska, November 10, 1992.

Passive uses are viewed in two categories: existence values (the benefits people receive from knowing that a particular resource exists), and bequest values (the value of satisfaction from preserving a natural environment for future generations).

Both of these are appropriate considerations for considering the existence value of Diomede.

Examples of the use of passive use valuation by various federal agencies, such as the National Marine Fisheries Service or U.S. Fish and Wildlife are available. However, as important are the recommendations and requirements for economic analyses prescribed in OMB's Circular A-4:

Executive Office of the President of the United States, Office of Management and Budget. OMB Circular A-4, Regulatory Analysis, September 17, 2003.

This memorandum provides guidance to all Federal agencies for development of regulatory analysis required under a number of federal guidelines. Passive use is one of the methods covered in this report.

Table 4: Subsistence Activities by Species and by Month for Diomede in 2010

Subsistence Harvest Patterns at Diomede Island by Month During 2010												
target species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Marine Mammals	1	2	2	1	4	2	1	1	1	1	1	0
Seals	4	3	3	3	4	6	3	2	2	4	3	2
Bearded seal	1	1	1	4	7	7	3	2	2	1	1	0
Beluga	1	1	1	2	1	1	0	0	0	0	1	1
Bowhead	0	0	0	3	2	1	1	1	1	0	0	0
Polar bear	3	3	3	2	0	0	0	0	0	0	0	1
Walrus	2	1	1	5	8	8	3	3	3	2	3	1
Ducks	0	0	0	0	0	1	1	1	1	0	0	0
Brant	0	0	0	0	1	1	1	1	0	0	0	0
Murre	0	0	0	0	0	2	2	1	1	0	0	0
Sandhill crane	0	0	0	0	1	1	1	1	1	1	0	0
Fish	2	2	3	3	3	0	1	1	0	0	0	0
Salmon	0	0	0	0	0	1	1	0	0	0	0	0
Tomcod	0	0	1	1	0	0	0	0	0	0	0	0
Sculpin	0	0	1	2	0	0	0	0	0	1	0	0
Smelt	0	0	1	1	0	0	0	0	0	0	0	0
Crab	3	3	8	9	6	0	0	0	0	0	0	0
Berries	0	0	0	0	0	0	0	7	4	1	0	0
Eggs	0	0	0	0	0	6	9	2	1	1	0	0
Murre eggs	0	0	0	0	0	1	2	0	0	0	0	0
Plants	0	0	0	0	0	3	7	4	1	0	0	0
Wild potato	0	0	0	0	0	1	1	2	3	1	0	0
Puffin	0	0	0	0	0	0	1	1	0	0	0	0
Auklets	0	0	0	0	4	7	7	7	5	0	0	0
Cormorants	1	0	0	0	0	1	1	2	3	4	1	1
Seabirds	0	0	0	0	0	0	0	1	1	1	0	0
Hawk	0	0	0	0	0	0	0	0	1	1	0	0
Seaweed	0	0	0	0	0	0	0	0	1	0	0	0
All Species	14	14	20	22	23	30	35	29	21	12	5	4

Source: Tetra Tech, Inc. et. al. Economic Value of Subsistence Activity, Little Diomede, Alaska, December 2011.

APPENDIX 1

Economic Value of Subsistence Activity

Little Diomede, Alaska

ResourceEcon
Stephen R. Braund & Associates
Dr. Steve J. Langdon
Tetra Tech, Inc.

December 2011

A study team working for the U.S. Corps of Engineers recently completed a study to provide an estimate of the economic value of subsistence production, using Diomede as one of the two communities studied.

During the initial phases of this study, the study team conducted a series of meetings to discuss their combined anthropological/economic perspectives on subsistence valuation, and to determine the best approach for achieving the study goals. It was decided that the following approach would be taken in the study:

1. Conduct a literature search and review of existing available subsistence documents;
2. Identify the elements and components of subsistence based on the literature review;
3. Develop a definition of subsistence that includes all elements and components of subsistence;
4. Create a matrix to review the various methods for valuing the elements and components of subsistence;
5. Identify the components of subsistence that can be valued based on available data (or with data that can be collected);
6. Develop a methodology to collect data and estimate the cost of subsistence production that could be applied to other regions with appropriate modifications.

The proposed definition for subsistence derived from this current study is as follows:

> *Subsistence refers to a way of life in which wild renewable resources are obtained, processed, and distributed for household and communal consumption according to prescribed social and cultural systems and values. The harvest, distribution, and consumption of subsistence resources are governed by technology, infrastructure, cognitive mindsets, and traditional knowledge. These resources may be used as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible plants and byproducts of fish and wildlife resources; for barter, or sharing for personal or family consumption; for customary trade; and for celebrations and ceremonies.*

Subsistence activities are primarily organized through kin relations, special roles, and communal values within and among specific communities. These communal values emphasize reciprocity between individual community members and the community as a whole through sharing and with respect for the environment and relations with non-human species. Subsistence activities are reproduced across generations through both formal and informal training of descendants in the concepts, behaviors, values, and skills necessary to successfully sustain the community and the resources upon which they depend.

The Subsistence way of life satisfies to various degrees and in various contexts, the economic, social, cultural, and nutritional needs of subsistence-based communities.

The study team selected a production cost as the best method for estimating a value of subsistence in Diomede. They developed a protocol, did pre-tests, made revisions, and administered the survey in Diomede in March 2011, reaching a total of 25 households, out of a total of 30 occupied households at the time of the survey. However, there are 38 households on Diomede according to the 2010 census, so that figure was used in the study calculations.

The survey data was analyzed to come up with estimated of the two production cost components of subsistence for Diomede. The first component calculated the cost per household for subsistence activities in 2010. As shown in the table below, this estimated total came out to $106,000 for all the households in the community. The second component estimated a 'shadow' cost for the value of the time that Diomede residents spent on subsistence activities during 2010. This estimated total cost for all households came out to $545,000. Combining these two parts results in the total production cost estimate for the value of subsistence in Diomede of $651,000 per year based on activities and costs during 2010. This is the figure that the Corps of Engineers will utilize in their ongoing work to try to develop a wave protection project in the community.

The study team recognized that even with the new methodology, they were still missing some of the components of subsistence that contributed to economic value. However, this was an improvement over past methods.

Summary of Subsistence Valuation from Production Costs in Diomede, Alaska

Component 1: Production Cost	Estimated Cost	# of Households
sum of subsistence costs	$69,500	25 surveyed
estimation for unsurveyed households	$36,200	13 unsurveyed
total 2010 subsistence costs	$106,000	38 total households
per household subsistence costs	$2,780	38 total households
Component 2: Value of Subsistence Hours		
sum of subsistence hours	15,630	25 surveyed
estimation for unsurveyed households	8,218	13 unsurveyed
total 2010 subsistence hours	23,758	38 total households
per household subsistence hours	625	38 total households
calculated value of subsistence hours per household	14,300	
total value of subsistence hours in 2010	$545,000	
Combined estimate for value of subsistence costs and value of subsistence hours in 2010 using production cost model:	$651,000	annual estimate

Source: data from Tetra Tech, Inc. et. al. Economic Value of Subsistence Activity, Little Diomede, Alaska, December 2011.

The overriding conclusion from this study is that a production cost model is one method of characterizing the economic value of subsistence but does not fully account for the social, cultural, and nutritional value of subsistence. The advantages of the production costs methodology are that it is theoretically defensible, practically applicable, and can be updated and replicated. Recognizing that the social, cultural, and nutritional elements of subsistence are important in understanding the overall value of subsistence to a community, this study presents an improved approach to valuing subsistence that the Corps can use for future projects.

For further information, or a copy of the report, please contact Lorraine Cordova, U.S. Army Corps of Engineers at Lorraine.A.Cordova@usace.army.mil or phone 907-753-2500.

APPENDIX 2

EXISTING CONDITIONS IN DIOMEDE

PHYSICAL CHARACTERISTICS

Diomede is one of four insular or insular-like Inupiat Eskimo communities, comprised of Gambell and Savoonga on St Lawrence Island, Wales (on the mainland), and Diomede on Little Diomede Island. A fifth community in the region, King Island, was abandoned about 40 years ago, due to a combination of a number of factors including residents leaving to fight in WWII and not returning, disease, emigration for jobs and closure of the school. Diomede is the most remote of these communities, based on its location, travel time, travel cost, and difficulty/uncertainty associated with travel to and from the community, and the difficult attributes imposed by the physical features of Little Diomede Island.

Little Diomede Island rises abruptly from the sea at a 40 degree angle to a height of nearly 1,600 feet, and is characterized by steep slopes littered with substantial amounts of rock and boulders. The shoreline consists of large rock and boulders with no semblance of a beach. Located in the middle of the Bering Strait (see Figure 1), the island is a full day's travel by boat to Wales, the nearest community with air transportation service. The Bering Strait is frequently rough and windy, making travel to and from the island by 18- to 20-foot open aluminum skiffs a hazardous undertaking, and several lives have been lost in these crossings[14]. Waves are typically 2 feet and greater in height, and winds are seldom less than 20 to 30 mph. Sustained winds of 60 mph are common. There is neither wave protection for the rocky beach nor landing facility or structure. A helipad has been constructed; however, there is no year-round access by fixed wing aircraft.

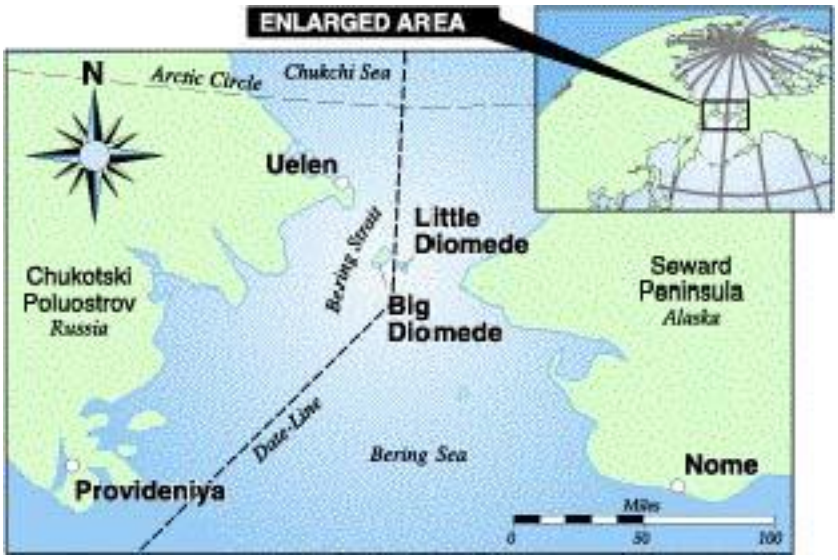


Figure 1: Location of Diomede *(source http://www.cristytrembly.com/travel/diomede.html)*

Little Diomede is ice-free only from June through November. The Bering Strait is generally frozen between mid-December and mid-June. The Bering Strait usually freezes over entirely between Big and

[14] Existing boat sizes are restricted by the lack of moorage, thus requiring that boats be removed and stored upland.

Little Diomede Islands while the waters elsewhere around the islands become covered with floe ice. Summer temperatures average 40 to 50 degrees. Winter temperatures average from -10 to 6 degrees. Annual precipitation is 10 inches, and annual snowfall is 30 inches. During summer months, cloudy skies and fog prevail.

ACCESS CONDITIONS

As a result of hazardous landing conditions at Little Diomede, local shipping companies have discontinued regular dry goods delivery service. Small dry goods shipments are received through the weekly helicopter service or, during the freeze-up, by plane. However, larger items must wait for a sufficiently large accumulation to justify the expense of barge delivery. Typically the delivery interval is two or more years. A fuel barge delivers fuel oil once a year. Air transportation is provided weekly by a small helicopter which can carry four passengers or 1,300 pounds of small freight. Bad weather and/or mechanical problems frequently disrupt service and several weeks can pass between flights. During February – April a runway is constructed on the frozen ocean. This runway typically is available for only three to four weeks, and dry goods and supplies are delivered during this time.

COMMUNITY SETTING

Due to the steep slopes of the island, and the lack of a coastal shelf, the community is constructed on the slope within an elevation range of 20 to 40 feet above the ocean. There has been an extreme housing shortage at Little Diomede in recent decades, in part due to the lack of a reasonably safe barge landing, and in part due to the lack of buildable sites. The very high cost of getting a barge to supply the materials to the village, added to the higher cost of construction on the island, has considerably hindered housing development.

Wind and wave conditions result in storm induced damage and erosion to structures, infrastructure, and equipment. The school is being undermined by erosion, while private and public property and equipment are damaged by waves, spray, and storm driven debris. Some residents have expressed interest in relocating the village, due to the rocky slopes and harsh storms, lack of useable land for housing construction, and inability to construct a water/sewer system, landfill or airport.

HUMAN CONDITIONS

Population

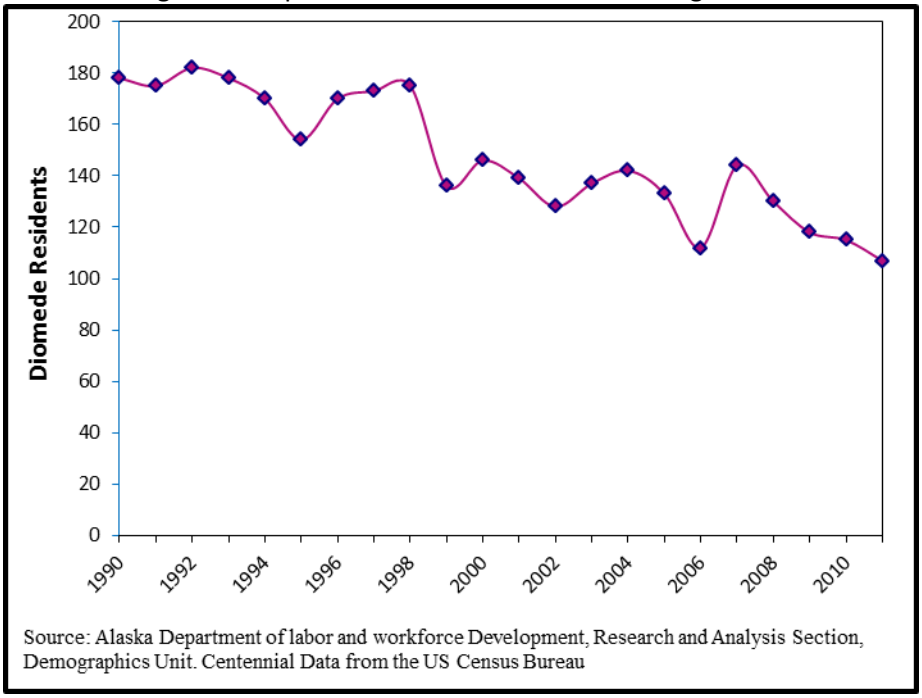
Diomede has had a very long history as a community with a relatively stable population. A 1983 study of the Bering Straits communities economy and population structure (Elena, 1983[15]) tracks back to 1779, with 164 Diomede residents estimated at that time. The annual population figures for Diomede from that time to the present vary somewhat, probably due to the time of the year that the census was taken and different methods, but the population has been remarkably consistent. The 1880 population was listed as 40, but was taken during the summer, when seasonal travel took residents to the mainland for fishing and hunting activities. Over most of the period reported (1779 to 1980), the population varied between 70 and 164. The 1980 population was 146.

Figure 2 shows a graph of recent population estimates for Diomede. The estimated number of residents at Diomede has gradually declined slightly over the period from 1990 to 2011, from 178 to the estimated 2011 population of 107. The reasons for the population decline are not known, but may be

[15] Linda J. Ellanna. Bering Strait Insular Eskimo: A Diachronic Study of Economy and Population Structure, Technical Paper No. 77, Subsistence Division, Alaska Department of Fish & Game, May 1983.

associated with temporary or permanent emigration by residents seeking employment outside the community.

Figure 2: Population of Diomede – 1990 through 2011



Source: Alaska Department of labor and workforce Development, Research and Analysis Section, Demographics Unit. Centennial Data from the US Census Bureau

Culture

Historically, and culturally, the location of Diomede was selected for its favored location in hunting walrus, whales and other marine mammals. It does not have many of the characteristics that probably makes life easier in other communities in the region, such as flat land, access to a reliable water supply, vegetation and other desirable features. In their Local Economic Development Plan, the residents describe their village location as follows: "*The Island, which is located only 2.5 miles from Big Diomede Island, formerly the U.S.S.R., is a mass of boulders and is approximately seven miles in area. There is a small rocky beach immediately west of the village and from there the land rises steeply on all sides to 1,250 feet. The top is broken tableland with no trees or shrubs and scant vegetation"* (Native Village of Diomede, Vision Statement, Diomede LEDP, 1999). What Diomede does have is access to the rich and varied marine mammals of the northern Bering Sea right at their doorstep. The cliffs nearby are also home to a large population of seabirds that are also utilized as food. These resources have been the economic mainstay of the community through subsistence production.

There is little data to provide a detailed and comprehensive profile of subsistence production by Diomede residents. While whaling has been important to the community, other marine mammals, particularly walrus, as well as seals and polar bear comprise the bulk of the harvests. Other subsistence production depends on king crab, seabirds and general marine organisms which are harvested from the beach also comprise the preferred foods for Diomede residents. In addition to food, seal and walrus hides are used to make individual clothing items, such as parkas, hats, mukluks, and furs and skins for

trade. Greens are taken from growth in between the talus slopes and boulder fields. Specific family hunting blinds are designated on the island. The cemetery is also located within the steep hill sides.

Facilities and Services

A state-owned heliport allows for weekly mail delivery. There is no permanent airstrip due to the steep slopes and rocky terrain. Water from a mountain spring and runoff during the summer months is treated and stored in a 434,000 steel tank. Families haul water from this source. Desalinization of sea water is occasionally used, if necessary. Water treatment and tank maintenance is provided by the City. The tank is filled for winter use, but the water supply typically runs out around March. The washeteria is then closed and residents are required to melt snow and ice for drinking water. The city has requested funds for a 600,000-gallon steel tank and to improve the water catchment system. The school has requested funding for a 500,000-gallon water storage tank to alleviate demands on the city water supply, and as a community back-up.

There is no community sewer system on Diomede. All households use privies and honeybuckets. The washeteria/clinic is served by a septic system and seepage pit. Due to the soil condition, lack of ground cover and steep terrain, United States Public Health Service (PHS) has found limited waste disposal methods. Refuse is disposed on the pack ice in winter; combustibles are burned. The city has requested funding to implement refuse collection and purchase an incinerator.

Electricity is provided by the city using a 505 watt capacity diesel. The end user pays $0.60 per kWh which is reduced by $0.4588 per kWh by the Power Cost Equalization subsidy (from the State of Alaska) for consumption up to 500 kWh monthly.

Local and long distance telephone service is provided by Mukluk Telephone Company and TelAlaska. The city operates local cable service. There is one television station, and two AM radio stations.

Housing is mainly BIA and HUD prefabricated houses.

Economy

Little Diomede villagers depend almost entirely upon a subsistence production for their livelihood. One of the main exports from the community is art, related to their subsistence activities. The Diomede people are excellent ivory carvers and are able to sell their carvings for much needed cash income. There are a limited number of jobs within the community, with government funded jobs limited to work with the city and school. The school has 18 employees, the City of Diomede has 27 employees, the Native Village of Diomede has 11 employees and the Inalik Native Corporation has 3 employees. Of these positions in the community, 15 to 20 percent are temporary or are on an as-needed basis. Within the region, seasonal employment is available in mining, construction and commercial fishing positions, but these require time away from the community.

Commerce and exchange is very difficult due to transportation constraints and costs. Villagers may travel to Wales by boat for supplies when weather allows. Mail is delivered once per week via helicopter.

There are no public accommodations currently available in Diomede. Visitors can make arrangements to stay at the school, and meals are available through the school cafeteria. A limited selection of food is available from the Diomede store. Marine gas and fuel oil for heating is available.

Government and Corporations

The City was incorporated in 1970 as a second class city, and is part of the unorganized borough area.

There are several regional corporations that help to provide services to residents of Diomede and other communities in the Bering Straits area. The Bering Straits Native Corporation (BSNC) is the ANCSA regional corporation that includes Diomede as well as other communities in the Bering Straits area. BSNC organized their non-profit corporation, Kawerak, in 1973 to provide services to communities throughout the Bering Straits region. Kawerak has four divisions to address the needs of communities: Children and Family Services; Community Services; Education, Employment & Training; and Natural Resources.

The Norton Sound Economic Development Corporation (NSEDC) is one of the six Community Development Quota groups. The Community Development Quota Program began in December of 1992 with the goal of promoting fisheries related economic development in western Alaska. The program is a federal fisheries program that involves eligible communities who have formed six regional organizations, referred to as CDQ groups. There are 65 communities within a fifty-mile radius of the Bering Sea coastline, including Diomede.

Education

Student education is provided by a K through 12th grade school operated by the Bering Strait School District. The school currently has 3 teachers and 33 students.

Income and Poverty Levels

The figures below are estimates based on a on the 2010 census sample[16]. They represent a cross sectional look at one point in time, and the current situation could differ significantly.

Diomede is located in the Nome Census Area.
Per Capita Income: $11,932
Median Household Income: $46,250
Median Family Income: $35,000
Persons in Poverty: 73
Percent Below Poverty: 57.9%

In a 2007 household survey completed by the Corps of Engineers, the family income distribution for 2007 was as follows: 2 households with incomes less than $10,000; 6 households with incomes between $10,000 and $14,999: 4 households with incomes between $15,000 and $24,999; 6 households with incomes between $25,000 and $34,999; 4 households with incomes between $35,000 and $49,999; and 1 household with income between $50,000 and $74,999.

Employment (2010)

Total Potential Work Force (Age 16+): 63

Total Employment: 56
Residents Employed: 56

[16] Alaska Department of Labor, Research and Analysis data from the 2010 Census.

Female workers: 21
Male workers: 35
Workers age 45 and over: 17
Workers age 50 and over: 12Civilian Employment: 45
Private Sector employment: 11
Local Government employment 45
Peak Quarterly Employment (2010): 49
Workers Employed All 4 Quarters (2010): 33
Unemployment Insurance Claimants: 13

Health

Diomede is classified as an isolated village, it is found in emergency medical service (EMS) Region 5A in the Norton Sound Region. Little Diomede has a health clinic which is staffed by a health aide and volunteers. Emergency Services have coastal and helicopter access, however, emergency response times vary from hours to days due to the limited availability of commercial helicopters. Nome has an Alaska National Guard base that has several helicopters which can be made available in emergency situations.

FUTURE ISSUES FOR DIOMEDE

Future Issues That May Affect Existing Conditions On Diomede

Chukchi Sea offshore oil development – The Minerals Management Service has been moving to complete a number of lease sales in recent years. These lease sales, if carried through, would have opened areas in the Chukchi Sea and the Beaufort Sea to offshore oil development. Lease sale 193 including areas in the Chukchi sea offshore from Cape Lisburne to Barrow, was completed in 2008, however exploration has been delayed by legal challenges.

Additional lease sales in the Chukchi area, lease sales 212 and 221 were scheduled for 2010 and 2012, respectively. Beaufort lease sales 209 and 217, including areas offshore from Barrow to Kaktovik, were scheduled for 2009 and 2011, respectively. However, on April 2, 2010, the Bureau of Ocean Energy Management, Regulation and Enforcement removed Beaufort lease sales 209 and 217 and Chukchi lease sales 212 and 221 from the 2005-2012 lease sale program. It is not clear when these lease sales will be re-scheduled, but it will be dependent upon resolution of the ongoing legal challenges to Chukchi lease sale 193.

The offshore lease sales, when and if they occur, are far to the northeast of Diomede, so there may not be direct effects to the community from oil exploration and/or development activities. However, offshore oil development would mean an influx of ship traffic directly through waters adjacent to Diomede. There could be opportunities to provide some level of services to those ships, and in providing emergency response capability in case of spills. These opportunities could not be pursued under the existing conditions, due to the lack of a dock and/or harbor in Diomede.

Northwest Passage – For many years, the Institute of the North, and others, have investigated the potential for freight passage across the top of Alaska and Canada to link the Pacific and Atlantic through arctic waters. In the opinions of some researchers, the reduction in arctic ice in recent years has increased the potential for this concept. At the 2007 Alaska Regional Ports and Harbors Conference (January 10th and 11th, 2007) Ben Ellis, Managing Director for the Institute of the North spoke to the

likely potential and timing of the Northwest Passage, given the benefit of recent research they have sponsored. The conclusion he presented was that even with global warming, freight shipments through the Northwest Passage are not likely within the next 40 to 50 year time period. The Northern Sea route, across the top of Russia, is not as constrained by narrow passages between islands as the Northwest Passage, and could become feasible at an earlier date. If shipping via either route becomes more prevalent, freighter traffic through waters near Diomede could increase substantially.

Commercial fisheries development (king crab, salmon) – The community of Diomede has been working with the Norton Sound Economic Development to investigate potential for commercial fishing from Diomede. A 2007 article in National Fisherman [17] discusses the potential for commercial exploitation of stocks of blue king crab near Little Diomede Island. However, the article concludes that given the small stock size and the existing importance of the subsistence harvests of blue king crab, this species is not a good candidate for development of a commercial fishery. With few other abundant fisheries stocks nearby, the article suggests that other avenues for economic development, other than commercial fishing, will be necessary for Diomede, based on current levels of abundance of fisheries resources.

[17] Creating Economic Development in Remote Communities, Simon Kinneen, Norton Sound Fisheries Research and Development, *National Fisherman*, August 2007.