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Identification of man-made hazards in Aneth Chapter, Navajo Nation, Utah

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IDENTIFICATION OF MAN-MADE HAZARDS IN ANETH CHAPTER, NAVAJO NATION, UTAH

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M.C.R.P., UNIVERSITY OF NEW MEXICO, 2010

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

Master of Community and Regional Planning

The University of New Mexico
Albuquerque, New Mexico

July 2010

DEDICATION

This professional project is dedicated to those who understand the importance of planning and how its discipline helps people and communities realize their potential so they can collectively work to build healthy environments.

ACKNOWLEDGMENTS

With sincere gratitude, I acknowledge my committee chair and committee members for their interest, continued encouragement and guidance as I worked through this project.

I am especially grateful to Dr. Ted Jojola, whose persistent reminders and suggestions influenced me to enter graduate school. He believed in me and he made me believe that there was a higher academic calling that I needed to fulfill in order to be better prepared to help others. My committee members, Dr. David Henkel, Jr., and Dr. Bill Fleming, whose subject matter expertise was very important as I began this project, planted some of the first seeds of growth when I began graduate school. Their immense knowledge in the background of information that was necessary for this project to manifest was truly instrumental. From each of my committee members, I reaped important rewards, from gaining invaluable knowledge and much appreciation of the work they did because they were passionate about it. I hope that one day I can be as accomplished and worthy in teaching people and communities that they are foremost important.

To my closest friends, whose encouragement and support helped me to appreciate being in graduate school, I thank you.

Finally, to my children, thank you for your love, understanding, constant encouragement and support as you selflessly took care of one another while I pursued fulfilling one of my important dreams. You are all my heroes.

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ABSTRACT OF THESIS

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ABSTRACT

Identification of man-made hazards is an initial step in planning recommendations for mitigation of man-made hazards. This project entailed a participatory process that engaged the local community in identifying man-made hazards specific to Aneth. The man-made hazards have challenged the community in managing potential damages, physical, environmental and economic losses due to pollution and contamination from man-made hazards.

The development of this professional project has revealed some pathways to environmental protection for the Aneth Chapter, which could be the first Navajo Nation Chapter to move towards the development a plan for mitigation of man-made hazards based upon the identification of the hazards. To realize the local potential, the analysis and recommendations through this project affords numerous points of reference for consideration, planning, and action.

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Statement of the Problem

As Aneth Chapter has developed over the past decades, man-made hazards have been introduced through development. Chapters on the Navajo Nation are local units of Diné government and Aneth Chapter is one of 110 Navajo Nation Chapters on the Navajo Nation. The Aneth Chapter has experienced increases in population, housing, public infrastructure, and technology. In spite of this, Aneth is remote. In comparison to the chapters to the south, it has an abundance of natural resources, especially oil and gas assets. Development of these, however, has subjected the Aneth community to challenges in managing potential damages, casualties, physical, and economic losses due to pollution and contamination from man-made hazards.

This professional project will identify man-made hazards in Aneth Chapter and outline recommendations for mitigating man-made hazards, based upon man-made hazards identified by Aneth Chapter officials, residents, and other stakeholders. Rather than solely relying upon emergency response action to address man-made hazards, a proactive mitigation plan for the Aneth Chapter will essentially prepare the community to address the question "what must we mitigate against?" The identification of man-made hazards will provide for guidance in managing the threats posed by man-made hazards before they occur.

With the identification of man-made hazards the Aneth Chapter, as a local government, can use the identification process to establish community goals for hazard mitigation planning. The goals are to minimize occurrences of man-made hazards or disasters, build relationships with facility owners and operators, foster citizen participation, share important information with the public, and invite other stakeholders to share responsibility.

This project will provide a framework upon which the Aneth Chapter can build and formulate a mitigation plan specific to its locale. The information provided through this professional project will present a framework of historical, regulatory, and potential environmental and human health impacts that exist at the Aneth Chapter.

The Aneth Chapter can be the first Navajo Nation Chapter to have such a plan which can then be used as a model for other Navajo Chapters to develop their own. Such plans can doubtless help to facilitate partnerships with other jurisdictions such as counties, states, and Chapters resulting in the improvement of planning opportunities. The key sections of this project will be:

(1) Hazard identification,

(2) Descriptive information of man-made hazards in Aneth

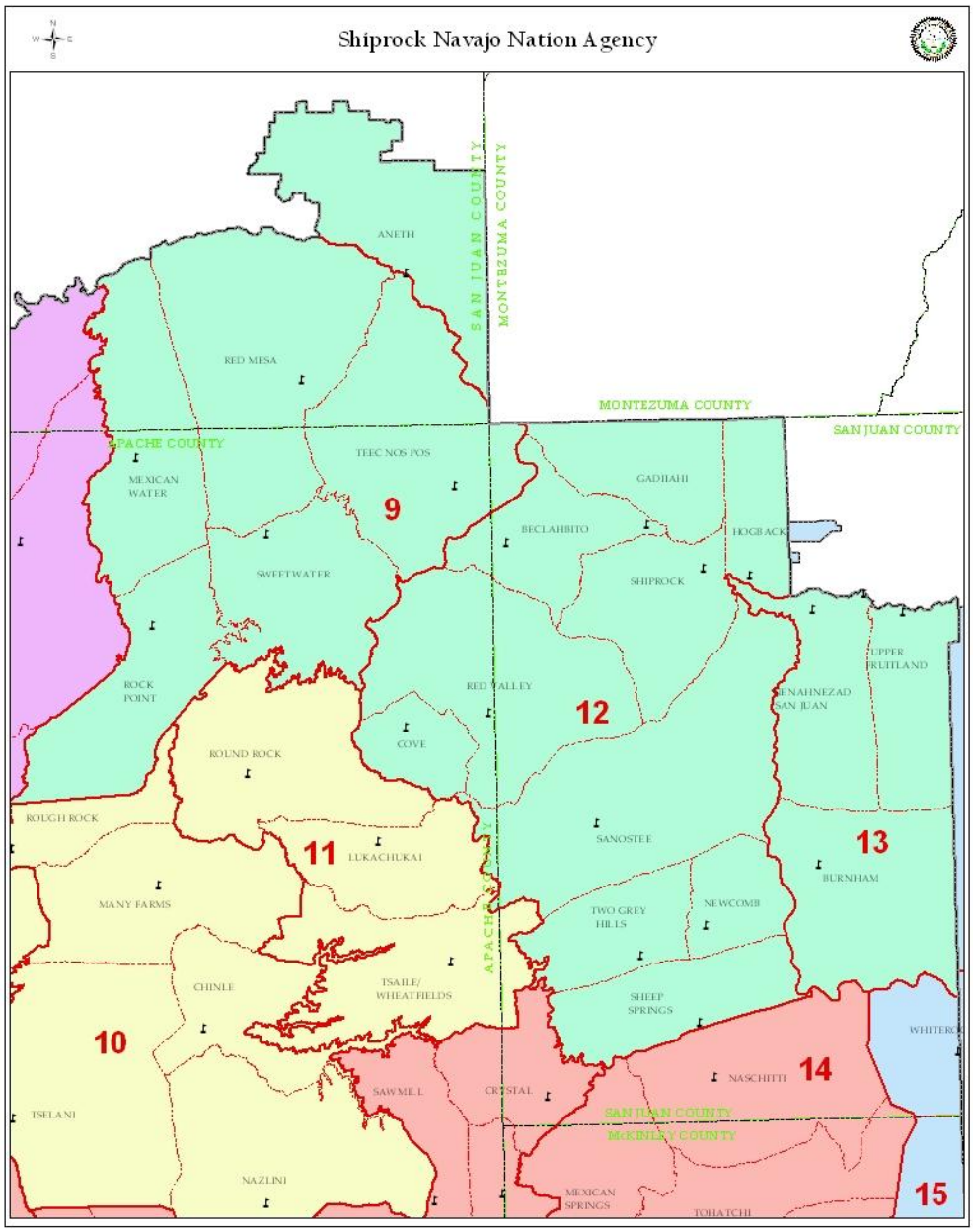
(3) Community capability, and

(4) Mitigation strategies.

Historic and Demographic Background

Aneth, Utah, is located on the Navajo Nation, within San Juan County, in the southeastern portion of the State of Utah. The Utah Navajo population is concentrated primarily in San Juan County. The southern third of Utah is part of the Navajo Nation.

Figure 1 . Location of Aneth Chapter, Shiprock Agency, Navajo Nation, Utah



Extracted from map database, Navajo Nation Land Department, 2009

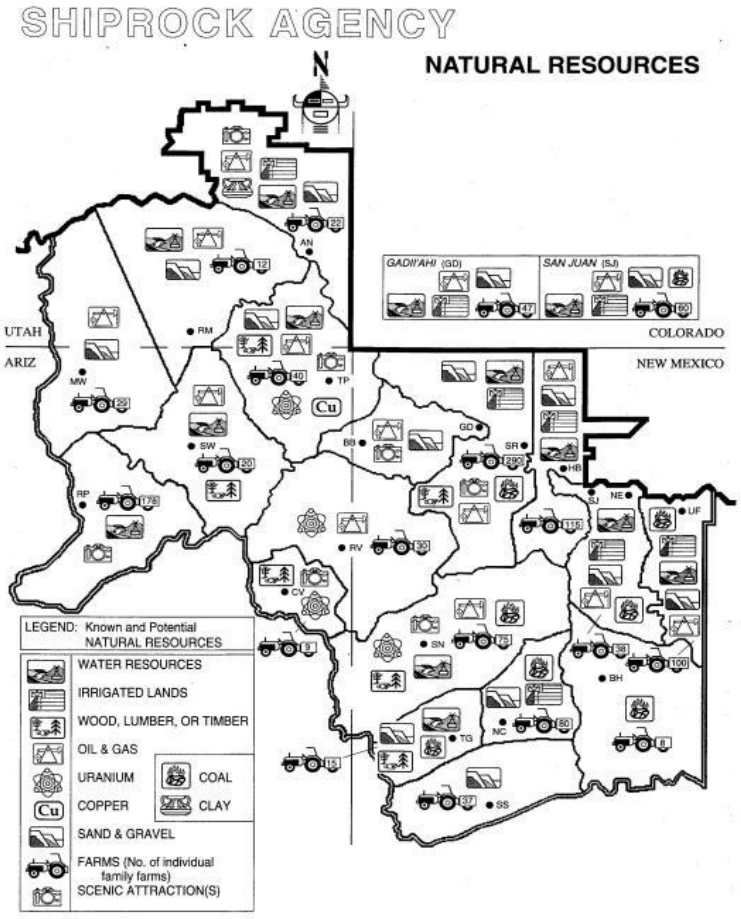
The estimated land size of the Chapter is 183,779.8 acres, and is located along the San Juan River in the southeastern portion of the State of Utah, in San Juan County. The Utah Navajo population is concentrated primarily in San Juan County. Utah Navajo lands were included as additions to the overall Navajo Reservation through several land transactions. On May 17, 1884, a Presidential Executive Order added the southeastern part of Utah, south of the San Juan River (Division of Community Development, 2004) On March 10, 1905, an area north of the San Juan River was added, including the Paiute Strip. The Aneth Extensions were added through a land exchange between the Navajo tribal government and the U.S. Parks Services. The land exchange occurred to allow the construction of the Glen Canyon Dam and the establishment of the City of Page, Arizona. The City of Page land site and the subsequent lands that would be covered by Lake Powell were exchanged for the McCraken Mesa and other lands commonly known as the Aneth Extensions (Division of Community Development, 2004). Small bands of Diné were living in southeast Utah, north of the San Juan River, as early as the 1700's, but it was not until the mid-1800's, after the northern boundary of the Navajo Nation was extended, that larger populations of Diné began to settle more permanently (McPherson, 2001). North of the San Juan River, hunting continued by the Diné, Utes, and Paiutes. The treaties of the Southern Utes and Diné both specified hunting rights on any unoccupied lands contiguous to both reservations.

Before the gas and oil industry became significant to the local economy, early settlers in the area along the San Juan River grew crops such as peaches, apples, pears, and alfalfa. Cattle raising was practiced by non-Navajo settlers and local Navajos until drought, harsh

winters, deterioration of range land from over grazing and poor management contributed to a decline in the local cattle industry (USDA; USDOI, 1980).

Local natural resources include soil, natural gas, oil, San Juan River, irrigable lands, local plants for ethnobotanical use, and numerous Anasazi Ruins. The nearest towns are Bluff, Utah (23 miles away), Blanding, Utah (38 miles away), Farmington, New Mexico (84 miles away and considered a "bordertown").

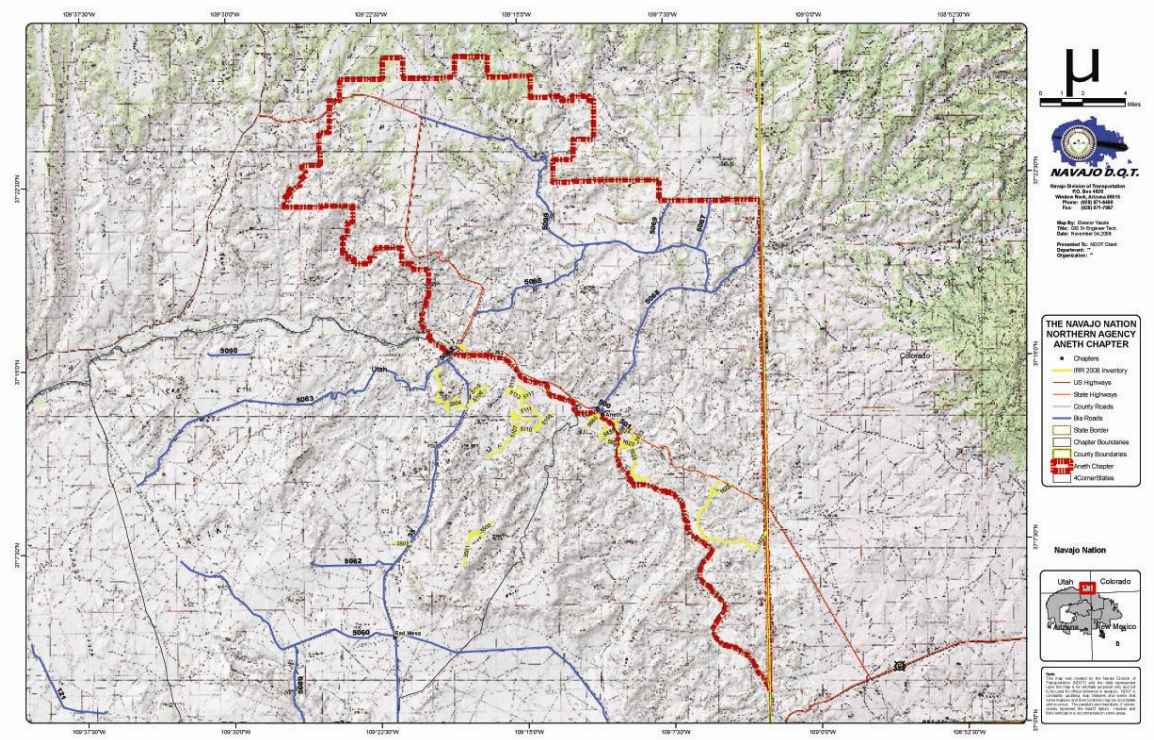
Figure 2. Natural Resources Map



Extracted from Chapter Images: 2004

The paved roads that run through the chapter are: State of Utah Routes 262 and 163; and San Juan County Routes 402, 404, 405, 407, 411, 413 and 461.

Figure 3. Aneth Roads

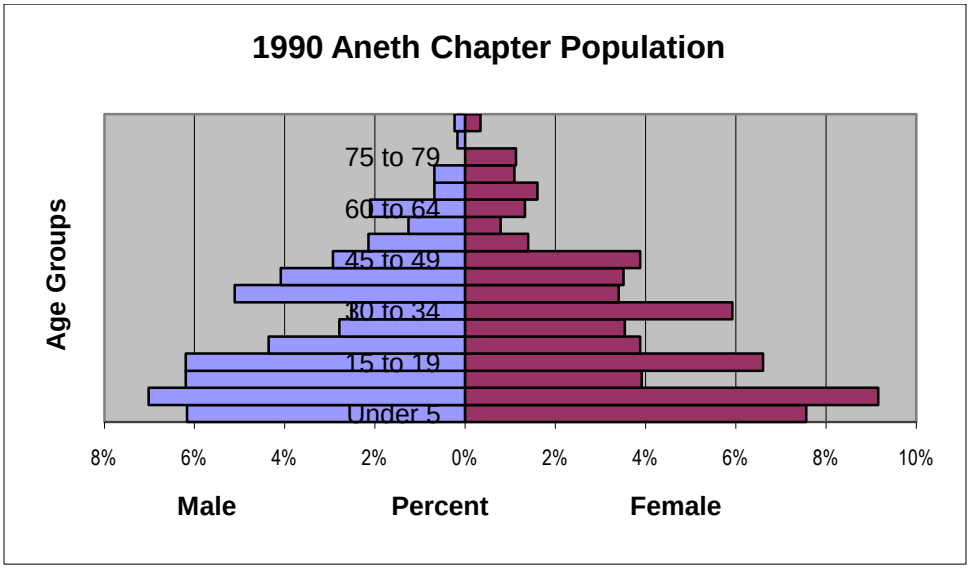


Navajo Nation Transportation Department

Population

The American Indian population, alone, based upon the 2000 Census was 2,236 (U.S. Census, 2000). The 1990 Census reported 1,949 American Indians, and in 1980, the American Indian population was 1,641. From 1980 to 2000, the American Indian population in Aneth increased by 3.6%.

Figure 4. 1990 Age-Sex Population Pyramid, Aneth Chapter



1990 U.S. Census, extracted and formatted February 2007

The 1990 population pyramid in Figure 4 shows a high fertility rate although having declined from the age 5-9 cohort. There is a higher sex ratio with more females than males. The population in Aneth is youthful, but there are significant decline of youth, especially among females, beginning with the 10-14 year and the 20-19 year age cohorts. This is also true for the males beginning at age 20. The decline of these age groups is possibly due to cultural expectations and responsibilities for the young girls. The impact of boarding schools and migration away of both sexes for employment opportunities may be other factors.

It also appears that the male workforce returns at ages 35+, but there is a drastic decline for both sexes from ages 50+ onward. This may be the result of mortality and associated health emergencies especially among cancer, diabetic and heart patients (Navajo Area Indian Health Service, 2005). The primary causes for outpatient visits to the Navajo Area Indian Health Services hospitals and satellite clinics in fiscal year 2004 were hypertension, diabetes, upper respiratory infections, regular child care, ear infections,

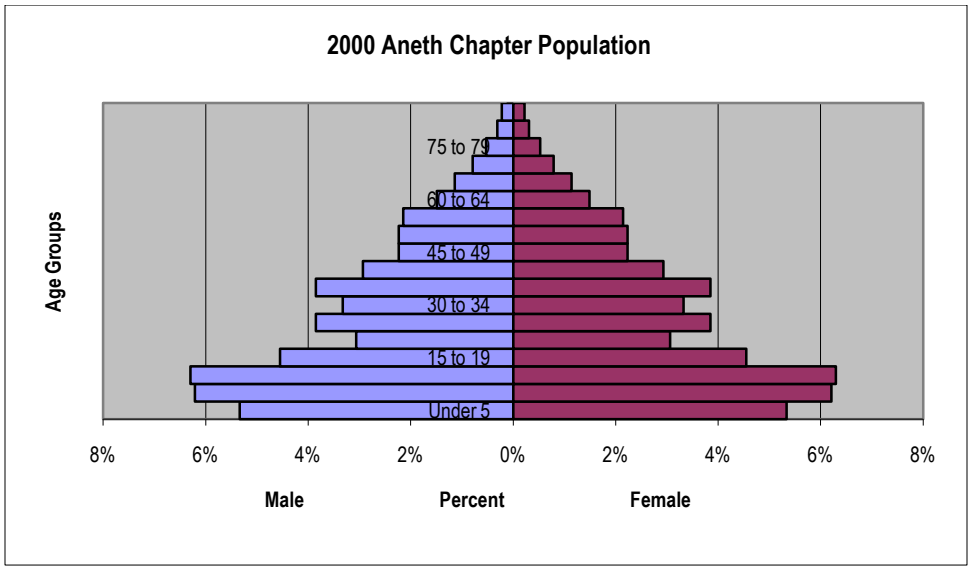
pregnancy and childbirth, accidents, musculo-skeletal conditions, and other procedures such as prevention checks (U.S. Department of Health & Human Services, 2007) . Cancer mortality rates for the Navajo area death rates (1999-2001) are lesser than that of all other races in the U.S., except for cervical cancer which is about double the U.S. rate for all races. Overall, it appears that the population of Aneth is also affected by many factors which

The early working years, ages 18 to 44, in the 1990 pyramid indicate the predominance and more even distribution between the genders of 15-19 year olds (the cohort with the youngest of those categorized in "early working years"), both male and female, and a less populated, but more evenly proportioned 40-44 years age cohort. The 30-34 years age cohort, also typed as early working years, has more females than males, and as a noticeable outlier in the 30-34 years age cohort, it is assumed that females immigrated back into Aneth, Utah. Why the return of females in the 30-34 years age cohort? One assumption is that the females returned to fulfill cultural and traditional responsibilities. Navajo females in the 30-34 years age cohort can be considered to be more independent than those of their previous generation. They have been schooled through at least high school, they have been exposed to the lifestyle(s) of contemporary Western (white) society, but given that they most likely were raised in the local Aneth area, where tradition and culture are still important socially, the traditional values remain an integral part in the lives of Navajo females, thus a return to fulfill their social responsibilities as expected in a matrilineal society.

The 1990 pyramid also shows a marked decrease in the Navajo female population in the 35-39 years age cohort. What contributed to the significant decrease? Emigration may have occurred due to not a single independent factor, but to a combination of factors including employment and living arrangements in extended family groups. There is an available

workforce among Navajo females of working age. One assumption is that the 35-39 years age cohort (1990 pyramid) experienced an emigration of females who left to further their independence in the workforce, perhaps after separation or divorce, and remained within their extended family network due to the unavailability of housing for themselves and their children. While they may have been physically living in Aneth, they may have commuted, and the enumeration process did not recognize the single females as the heads of households, rather they may have been included as a member of another household. Those who have remained may be uninfluenced by acculturation and were content, as taught by their female elders, with staying home caring for the home and family, tend to livestock, and may have even occasionally become employed part-time locally, or may have commuted briefly.

Figure 5. 2000 Age-Sex Population Pyramid, Aneth Chapter



2000 U.S. Census, extracted and formatted February 2007

The 2000 population pyramid in Figure 5 shows consistent high fertility with most populated age groups from six years to 14 years of age, and migration out of Aneth beginning within the twenty years of age cohort. Emigration could be due to economy and education.

Aneth is not as populated as Shiprock Chapter, New Mexico, whose 2000 population was 8,904 (Division of Community Development, 2004). Shiprock Chapter is 57 miles southeast of Aneth and is considered a border town as it abuts Farmington, New Mexico, a non-Native population center where a majority of goods and services are provided. Durango, Colorado is the next most populated town, located 97 miles northeast of Aneth. Both Shiprock, New Mexico, Farmington, New Mexico, and Durango, Colorado have hospitals, colleges, and other employment opportunities.

The income level of Aneth households, from 2000 U.S. Census Data, reported that of 581 households, 223 households had an income of less than $10,000, and 68 households had an income from $10,000 to $14,999 (Division of Economic Development, 2005). Aneth males had a 2000 median income of $35,536, in contrast to a $13,333 median income for Aneth females. By the year 2000, Navajo females in the 30-34 years age cohort can be considered to be more independent than those of the same cohort in 1990, yet may have still emigrated due to multiple factors, including employment, education, and the living arrangements in extended family groups, as in 1990, including emigration of females due to separation, or divorce, and whom remained with their extended families for housing. On the Navajo Nation, the female head of household with no husband present category increased 39% from 1990 to 2000 (Navajo Area Indian Health Service, 2005).

A comparative glance at the 1990 and 2000 Aneth Chapter population pyramids tell that since 1990, the population has become more stabilized. The 1990 male and female age cohorts in the 1990 pyramid are more disjointed and uneven than that of the 2000 pyramid that displays more proportioned age cohorts for both males and females. The symmetrical and

expansive representation of the 2000 pyramid indicates that the population had become more stabilized.

The differences between 1990 and 2000 may be as a result of better census enumeration techniques and immigration. The 2000 pyramid, representing a more stabilized population, supports the assumption from the 1990 pyramid that Navajo females are immigrating back to Aneth. There is a marked proportion represented in the female 35-39 years of age cohort.

The overall emigration of the population represented in the 1990 and 2000 pyramids can be assumed to be due to education and employment, but for males and females, the underlying assumptions can be varied and due to employment in more populated nearby areas such as Page, Arizona, Shiprock, New Mexico, and Kayenta, Arizona. Commuting for employment outside of Aneth is common.

The preschool years of 5 years and younger in both 1990 and 2000 are the most populated cohorts. According to the publication Chapter Images: 2004 (Division of Community Development, 2004) the school enrollment for the preschool years age cohort was 1,013. As births continue to occur, there will be a need for expanded educational resources, including facilities, health care, planning for jobs in the community for those who will remain, public safety; and, ultimately planning for resources for the aging population.

The youngest cohorts will experience some of the same situations as their predecessors. Emigration is assumed to be the most likely occurrence that will be shared throughout all cohorts. Emigration will continue as long as there is lack of access to employment, health care, vocational/technical training resources, colleges, universities, and housing. A contributing factor to emigration will be the lure of comforts of Western (urban)

life. The youngest will be exposed most to the contemporary way of life, as Western modernity becomes accepted and the youth are socialized to Western thought and practice.

Another readily visible observation of both the 1990 and 2000 pyramids, are the 65+ populations. It can be assumed that with the continued decline in the 65+ cohorts, there will be a loss of traditional and cultural values, including language loss. The youngest will be impacted most from cultural changes as the aging tribal population, who pass traditional knowledge and values to subsequent generations through stories and traditional lifestyle, continually decline. Each successive generation will be impacted to varying degrees from cultural change, even at Aneth, a location considered isolated and where the adherence to traditional culture is still strong.

Some economic characteristics for Aneth, in comparison with the United States and the State of Utah, illustrate that the Aneth median household income of $17,292 is 41% of the U.S. average median household income of $41,994, and 38% of the State of Utah median household income of $45,726 (U.S. Census, 2000). The median household income for overall Navajo Nation was $20,005, and Aneth median household income was approximately 86%of the Navajo Nation median household income average (Division of Community Development, 2004). The poverty levels are just as appalling. The number of Aneth families below poverty level are 48.8% greater than the U.S. level of 9.2%. The main occupations of the Aneth workers are 62.8% private wage/salary workers, and 37.2% government workers (Division of Community Development, 2004).

History

From the time the Holy People offered the Diné with land between the Four Sacred Mountains, the Navajo Nation has been a sovereign, self-governing people, living according

to the rules and prayers imparted to them by the Holy Ones. The guidance taught by the Holy People carried order, peace, beauty and harmony to the Navajo People and to their world. The Four Sacred Mountains surrounding Diné Bikeya (Navajo Homeland), are Sis Naajini (Blanca Peak) to the east, Doo Ko' oosliid (San Francisco Peak) in the west, Tso dzilh (Mount Taylor) in the south, and Dibe Nitsaa' (Hesperus Peak) to the north.

The Diné past, information about the history of the People, consist of many stories, passed orally through generations. For the Diné their origin began with the Holy People. The origin story begins with a description of the emergence of all living things through a series of worlds. The emergence story provides lessons to guide the Diné in their lives. Harmony is emphasized. Stories of animals in the emergence implies that people (five-fingered ones) are not superior to, or intended to live separate from other forms of life. The origin stories emphasize that the Diné associate with their current surroundings dating back to the beginning of mankind (Iverson, 2005). From a contemporary perspective, the first written references of accounts with the Diné originated from the Spaniards who first visited the region with Coronado in 1540 (Kelly & Francis, 1994). Documented references, by scholars and colonizers, increase in detail about encounters with the Diné through the end of the Mexican War in 1848, when the region was obtained by the U.S. from Mexico in 1864. In 1848 the Mexican war ended between the U.S. and Mexico. With the Treaty of Guadalupe Hildalgo, Mexico ceded more than 1.2 million square miles of territory including much of present day New Mexico, Arizona, Colorado, Utah and Nevada in exchange for $15 million and other considerations. No thought was given to the Native People who lived in the Southwest long before.

In 1863, Navajo political independence was essentially terminated by the U.S. Army when Kit Carson and his troops, with the help of some neighboring Utes and Puebloan allies, began rounding up the Navajos and burned Navajo cornfields, peace orchards, shot resistors, burned hogans, contaminated waterholes, and confiscated thousands of sheep and horses. Carson hoped to starve the Navajo People into submission, and his campaign was effective. (Bonvillian, 2001). The years around 1864 are significant in Navajo history as the People began encountering colonialism. Before 1864, most Navajos lived by farming, herding mainly sheep, goats, horses, hunting, gathering, and sometimes raiding. The Navajos obtained their first livestock from raiding the Spanish colonists.

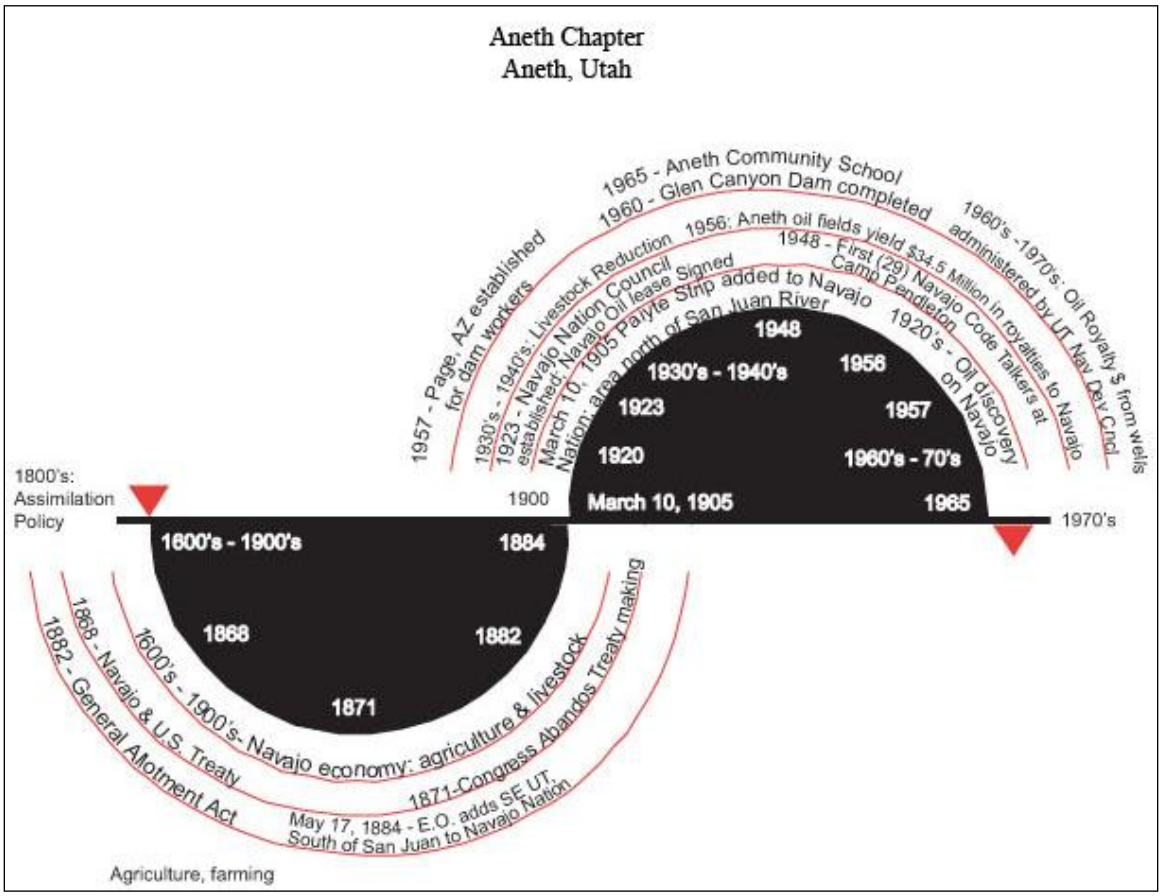
In February 1864, the first group of nearly 1,500 people left for Fort Sumner. Hundreds died on the march to Fort Sumner in the midst of winter. They died of starvation, exposure to the cold, abuse by New Mexicans who captured stragglers during the forced march, and other ravages. More than 8,000 Navajos, about half of the population, had surrendered and walked from Navajo Land to Fort Sumner, New Mexico, where they were imprisoned for four years. The journey, in Navajo history, is known as the Long Walk. While imprisoned at Fort Sumner, the People were unable to raise sufficient crops to support themselves. Four years later, in 1868, Navajo headmen signed a treaty with the U.S. that facilitated the creation of a reservation in a small part of their former homeland, and the Navajo People returned home.

After the return of the Navajo People to their homeland, they lived under federal rule, and continued to raise livestock and crops. Instead of each Navajo family directly consuming its produce, trading ensued, and trading posts became established by non-Indian colonists,

especially after the appearance of the transcontinental railroad in 1881 (Kelly & Francis, 1994).

Many Navajos attempted to reoccupy their homelands after their return and found non-Indian settlers increasingly closing them in. In response to addressing concerns of the Navajo People and white settlers, the federal government, through Presidential Executive Order, began adding additional land to the original Treaty Reservation boundary. The Navajo Nation now covers 27,000 square miles in Arizona, New Mexico, and Utah (Kelly & Francis, 1994). Much of the pre-conquest Navajo homeland also remained federal land, however, most is now under jurisdiction of the Bureau of Land Management (BLM), and the U.S. Forest Service (USFS).

Figure 6. Cyclic Timeline, Aneth Chapter



Oral versions of the Aneth Diné indicate that the history of the Diné in the area differs from the history of the Diné to the south, because of the Aneth Diné interactions with the Paiutes and Utes, Mormons, non-Mormon settlers, ranchers and traders. According to oral stories, many Aneth Diné did not make the traumatic journey to Fort Sumner during the Long Walk because they hid in the canyons of southern Utah, and in northern Arizona (Capitan, 2006).

Aneth is also known as Taa biich'iidi (Just like the Devil), a name derived from what some say were the unscrupulous business practices of the Aneth community's first anglo trader, Herbert Redshaw. The name Taa biich'iidi was not used rancorously, but may have

been appropriated by the way Herbert Redshaw moved around, slowly, and with a slight sway. At six feet fall, with a mustache, and large hands and feet, Redshaw also habitually cussed and he would cuss at those who made mistakes, telling them to "go to the devil" (McPherson, 2001). Another possible origin of the name Taa biich'iidi may have been due to the Navajo perceptions of traders being viewed as crooked. Some Diné perceived making a profit meant cheating customers. There were different cultural meanings for cheating. Stingy or tight, bilhatso, and bina'adlo' meant stingy and cheater. In the Diné culture, if someone tried to rise above other members of a clan, they became stingy, bilhatso. It is a leveling philosophy. Traders in Navajo terminology were stingy-tight cheaters because they charged more for a can of beans than they paid for it. In Anglo-American business, it was proper business practice, but was perceived otherwise in the Diné culture (Powers, 2001). The exact origin of the Navajo name for Aneth is unknown, but was applied to the Chapter.

In 1914, Herbert Redshaw arrived in Aneth, Utah as the government farmer (McPherson, 2001). Redshaw was an Englishman, born in Longford, Derbyshire, England, on April 8, 1863. At fourteen years of age, he traveled to Parsons, Kansas to live with his uncle where he farmed. He also wrangled cattle in Arizona and Texas. After the death of his wife, Ella Pratt, in 1907, Redshaw joined the Indian Service in Colorado in 1910, and worked as a dairyman. Redshaw later transferred to Shiprock, New Mexico for two years until William Shelton, the Indian Agent for the region, sent him to Aneth, Utah as the government farmer. Redshaw lived in Aneth until his retirement in 1931. As the government farmer, Redshaw lived at a government station and taught agricultural methods to the Diné, and he encouraged others he encountered to settle on the flood plain. By early 1920, Redshaw had convinced 25 Navajo families to settle along an irrigation canal that supplied water from the

McElmo Creek. Redshaw was also an advocate for Utes and Diné in their struggles to maintain or obtain lands. After Redshaw left Aneth, he later served as a San Juan County Commissioner between 1936 and 1940. In 1938, as the commissioner, and at the request of the Diné, he coordinated a meeting in Monticello, Utah, to increase public awareness about the effects of livestock reduction. On February 16, 1956, the Advisory Committee of the Navajo Nation Council certified Aneth Chapter as a recognized Navajo Chapter organization. Before Aneth was established, the agrarian and nomadic lifestyle of the Navajo took Utah Navajos as far away as Durango, Colorado. After the Navajo Treaty of 1868, and the subsequent U.S. assimilation policies, boarding schools were established, some children were forcibly removed and placed in boarding schools located on the Navajo Nation, and others were sent to LDS (Latter Day Saints) Mormon placement programs. In the Aneth area, the federal government established the Shonto, Navajo Mountain, Kayenta, Shiprock, and Aneth Boarding Schools (McPherson, 2001).

One of the most devastating occurrences in the socio-political history of the Navajo was livestock reduction (McPherson, 2001). Mr. John Collier, the Commissioner of Indian Affairs during the 1930's, in collaboration with the U.S. Soil Conservation Service, pressured the Navajo to drastically reduce the size of their herds of sheep to minimize the severe overgrazing of land. In the 1930's, Navajo families were basically self-sufficient. They grew crops and had herds of sheep and cattle; the livelihood for men and women depended upon the collective activities of the extended family that included clan relatives. The loss of sheep, through mass slaughters, or public sales, contributed to the dispossession of status for many Diné People, especially Diné women. Women were, and still are, considered to have high social status, due to the matrilineality and matrilocality of their clanship. Their status was tied

into the land they inherited and the sheep that were raised upon these lands. Without sheep, families starved and the women were unable to process wool and weave rugs. Rugs were sold to support the family and with the reduction of their herds, the wealthier Diné were no longer able to provide support to extended family members.

The southeastern area of Utah, was affected by the livestock reductions from 1933-1946. Across the nation, the Great Depression was also being experienced, including on the Navajo Nation. By 1934, it was reported that the herds of Utah Navajos were down to 36,000 from an estimated 250,000 to 500,000 before the return from the Long Walk in 1868 (McPherson, 2001). This political act significantly altered the Navajo economy. The income and wage differences before and after the livestock reduction programs contributed to the stratification of impoverished families. Diné families lost their political clout and non-landed individuals began dealing with representatives of the federal government (McPherson, 2001). Where Navajo wealth in the 1930's comprised sheep, rugs, and jewelry, without the herds of sheep that supplied wool for the rugs, the men had to resort to finding wage jobs, and the prospects were dismal. Many had to supplement their income from the sale of livestock and rugs, with welfare stipends.

During the 1930's, interest in oil and gas reserves prompted negotiations between the Navajo Nation and interested oil and gas representatives. At the onset of the negotiations and through the actual leasing by the Navajo Nation that allowed oil exploration and leasing, there were expectations that the Navajo economy would benefit. However, to date, there have been little benefits derived by the local people from oil and gas activities (Capitan, 2006). The companies derive profits, and the royalties paid to the Navajo Nation are directed to the tribal government. Some progress was recognized in 1971 through the establishment of the Utah

Navajo Development Council (UNDC) (Capitan, 2006), comprised of Navajo board members, and the organization became a conduit for delivery of necessary services in Aneth and nearby areas. The UNDC now manages a portion of funds received from oil and gas royalties for providing a variety of services in the Aneth area and for other Utah Navajos.

Although early political decisions resulted in the granting of hundreds of oil and gas leases within the Aneth area, the local benefits remain absent. In the 1970's, during the period of the American Indian Movement (AIM), AIM became a presence on the Navajo Nation. In the Aneth area, AIM became a supporter of the efforts of the Coalition for Navajo Liberation. The Coalition had formed to address contamination and pollution from the oil fields. Ultimately, matters were settled through the signing of an agreement that would address social, community, environmental, education, and employment concerns (McPherson, 2001).

Today, the Navajo Nation Council is the governing body of the Navajo Nation, guided by the principles taught by the Holy People, and empowered to enact laws on behalf of the Navajo People to ensure order, peace, beauty, and harmony within the Navajo Nation. Sovereign immunity is an inherent characteristic of the Navajo Nation as a sovereign nation. Navajo Nation laws, as laws of other countries, must be followed while on the Navajo Nation.

The territorial jurisdiction of the Navajo Nation is defined in the Navajo Nation Code as, "The territorial jurisdiction of the Navajo Nation shall extend to Navajo Indian Country, defined as all land within the exterior boundaries of the Navajo Indian Reservation of the Eastern Navajo Agency, all land within the limits of dependent Navajo Indian communities, all Navajo Indian allotments, and all other land held in trust for, owned in fee by, or leased by the United States to the Navajo Nation or any Band of Navajo Indians" (Navajo Nation Council; Office of Legislative Counsel, 1995). The code is a collection of Navajo laws

codified in the Navajo Nation Codes, asserts the inherent sovereignty and authority of the Navajo Nation as a "nation within a nation". The Navajo Nation Codes comprise designations, authorities, roles, and responsibilities of the Executive, Judicial, and Legislative Branches. The authorities, missions, and responsibilities codified in the Navajo Nation Codes function as the foundation for addressing the manner in which the tribal government operates.

The Senate Committee on Indian Affairs, in its Senate Report 100-274, described the current federal policy as, "The federal policy of Indian self-determination is premised upon the legal relationship between the United States and the Indian tribal governments. The present right of Indian tribes to govern their members and territories flows from a preexisting sovereignty limited, but not abolished, by their inclusion within the territorial bounds of the United States. Tribal powers of self-government today are recognized by the Constitution, Acts of Congress, treaties between the United States and Indian tribes, judicial decisions and administrative practice." (Navajo Nation Council; Legislative Branch, 2002)

The Supreme Court has upheld the authority of Indian governments over their reservations. Congress recognized the Navajos in the Treaty of 1868, and has done so ever since. The Navajo Nation relies on the Treaty of 1868 in maintaining the trust relationship and federal policy in its exchanges with the United States.

It is essential to have a basic understanding of how the economic trends in the Aneth area and on the Navajo Nation have contributed to the presence of man-made hazards.

Cultural Attitudes to Mitigation Planning

The subject of hazard mitigation is difficult for Diné People to speak of and difficult to prepare for. The notion of preparing for a disaster or a negative occurrence from a traditional perspective is "asking for disaster" (Navajo Nation Commission on Emergency Management,

2005). One plans for the future well being of one's family, the planting and harvesting of crops, gathering of wood, and shearing of sheep, but one does not plan for the proverbial "rainy day" because to do so may offend the rain. The elements in traditional belief are living beings, rain, wind, earth, and sky, who live and breathe as humans do. The elements are holy; the Holy Wind brought the Diné to life; the rain is both male (heavy rains, thunder) and female (gentle); the earth is our mother; the sky is our father.

The Diné People are protected by the holy elements and are provided with food, shelter, traditional medicine, and in return we offer essential prayers. An elderly woman was once told that she must be relocated from her childhood home and moved to another area as part of a land exchange between the Navajo Nation and the Hopi Nation. The woman's only concern was that if she left she was afraid that the wind would not know her name there and the Holy People might not know her (Benedek, 1992)".

Such beliefs are intrinsic to the Diné interpretation of the world. To purposely plan for protection from the elements may bring more of a disaster, invite negative impacts or harm, or worst, cause the elements to leave. For example, the Diné have suffered for many years from drought; the medicine people and the elderly believe that the rain has not come because the young have forgotten how to pray, and they have cut their hair (long hair represents rain).

There is no specific written information regarding the Navajo perspective on pollution and contamination. Rather, through storytelling that includes the meaning of prayers and songs, the Navajo People understand that the Holy Ones want all five-fingered people (humankind) to take care of one another, and the environment (Mother Earth) that they live in.

In April 1996, a 96 year- old Navajo female who lived in a hogan in Rocky Ridge, near Big Mountain, Arizona, in central Navajo Land, had a visit from two Navajo Holy

People. One was dressed in blue, and the other in white. They warned that the People needed to return to their traditional ways, lest drought and other ruin would continue. The Holy Ones departed, leaving behind their footprints encircled in corn pollen. Hundreds of Navajo People later visited the hogan, left gifts and offered prayers. Navajo President Albert Hale also visited the Rocky Ridge location and issued a memorandum to all Navajo Nation employees encouraging them to make a pilgrimage to the location to give thanks for the many blessings that the Navajo People have, and to pray for land, rain, the future, and for the children.

Navajo People believe there are deities who are present at all times. However, with the onset of dawn, the presence of deities is most pronounced. It is in the early dawn hours that prayers are offered and considered most effective in communicating with the deities. Blessings are requested for individuals, communities, and the environment.

The Navajo philosophy of Alchi Sila (facing towards, in a facing position) teaches that there are two opposing sides to everything, such as good and bad, or at least two differing perspectives. For example, there are two Navajo perspectives regarding litter which is a contemporary issue and challenge. One belief is that the deities will not bestow blessings to areas, or to individuals, when the deities observe the presence of objects such as litter, stained soil, or other forms of matter that are ordinarily not a part of the environment. To the deities, the additional materials are observed as riches. For example, outside a rural home where there is litter strewn about, personal items out of place, fencing and other structures in disrepair, pieces of broken glass littered on the landscape, the deities will see glittering items (glass cullet), and other items strewn about. The deities will see the litter, glass cullet, items in disrepair, as signs that individuals living at a particular place are wealthy because they have a lot of things strewn about. There can be no blessings for these areas, because the deities will

see many things outside of their proper places. They will go on to the next place, where they might observe very little material strewn around and they will bless that location . Another belief is that objects considered as litter by some, or unkempt surroundings, should remain, so that those in the future will know that there was once life, activity, or community, similar to the findings in the study of archaeology. This differing perspective emphasized that it should be known to future generations that the Diné once lived in certain areas within their own Diné Bikeyah (Barney, 2008).Walking in Beauty is intended for all five-fingered ones to practice.

Natural Resources and Land Use

Soils

Soil types are important in planning and Chapter decision making for land use. Some soil types present certain limitations for use, while other soil types present potential for use in development of housing, sanitation facilities such as sewage lagoons, and other Chapter structures.

The majority of soils in Aneth are Rock outcrop-Lithic Torriorthents-Badland that are shallow and very shallow, well drained soils that formed on uplands and mesas in residuum, colluvium, and alluvium derived from mixed sedimentary rock; also Rock outcrop and Badland (USDA; USDOI, 1980). Torriorthents are suitable for grazing, wildlife habitat, and building development. Rock outcrop and Badland soils are poor to very poor for agricultural use, but may have moderate potential for recreational use such as camping areas, picnic areas, or wilderness trails.

Other less extensive areas in Aneth comprise Nakai-Deleco-Monue soils that are characterized as shallow to deep, well-drained soils that formed on terraces, benches, and mesas in alluvium and eolian deposits derived from sedimentary rock (USDA; USDOI, 1980). The combination of Nakai-Deleco-Monue soils are for rangeland use and support vegetation such as Indian ricegrass, alpine muhly, and black brush. There are also areas composed of Aneth-Sheppard soils that are very deep and deep, somewhat excessively drained soils that formed on uplands and valley bottoms in eolian deposits and alluvium derived from sandstone. The uses of the Aneth-Shepard soils are primarily for livestock grazing. The vegetation types supported by these soils are Indian ricegrass, sand dropseed, galleta, four wing saltbrush, and mormon tea.

Tahona-Raplee soils are also present, although not extensively. These soils are moderately deep, well drained soils that formed on uplands, mesas, and pediments in residuum and alluvium derived from gypsiferous sedimentary rock. Rangeland and wildlife habitat, and building development are potential uses for Tahona-Raplee soils. Vegetation supported by the Tahona-Raplee soils are Indian ricegrass, big saltbush, alkali sacaton, shadscale, mormon tea, galleta, and blackbrush (USDA; USDOI, 1980).

Along the river, soils are varied and include Fruitland-Riverwash-Stumble, and Aquic Ustiflucents-Typic Fluvaquents. The combination of these soils are very deep, somewhat poorly drained to very poorly drained soils that formed on valley bottoms in alluvium derived from sedimentary rock. Uses of these soil types are suitable for irrigated crops, wildlife habitat, recreation, and depending on specific locations, building development. Vegetation supported by these soil types are rushes, sedges, cattails, vines, and cordgrasses. (USDA; USDOI, 1980).

Climate

The Aneth Chapter is located within the San Juan Watershed, at the southern border of the State of Utah where it is intersected by the Navajo Nation, and where a significant part of the drainage leads to the lower San Juan River. With the exception of Navajo Mountain, the region is primarily composed of high plateaus about a mile above sea level, which are cut by numerous washes and canyons that drain into the San Juan River (USDA; USDOI, 1980).

The San Juan River is the only major, flowing source of water in the northern part of the Navajo Nation. The river flows continuously through Colorado and New Mexico, and crosses into Utah near the Four Corners. Melting snows in spring and severe thunderstorms in the summer and autumn initiate significant fluctuations in the river levels. The San Juan River

is fed by dozens of tributaries that originate in the San Juan, and Sleeping Ute Mountains in Colorado, and the LaSal and Blue Mountains in Utah (McPherson, 2001).The climate of the area is influenced by the Sierra Nevada Mountains and the Rockies. The Rocky Mountains form a barrier against the intrusion of cold winds from the Great Plains, and the Sierra Nevada Mountains provides a barrier from much of the moisture originating from the Pacific (USDA; USDOI, 1980). Consequently, the climate in Aneth is similar to that of a cool desert. Precipitation is light and humidity is generally low, with a considerable diurnal range in temperature.

Precipitation in the Aneth area originates primarily from the Gulf of Mexico (USDA; USDOI, 1980). Thunderstorm activity is generated from high pressure that moves westward to the eastern part of Utah. The wet season of the year is late September and October.

The average annual rainfall in Aneth is less than ten inches a year, except in the upper elevations of Navajo Mountain (USDA; USDOI, 1980). In the desert type scheme of Aneth, precipitation is varied. Significant amounts of rainfall that fall on the dry desert soils produce rapid runoff and present considerable danger from flash flooding. In contrast, periods with no measurable accumulations of moisture have been reported for nearly every month of every year.

Snowfall is typically light and less than twelve inches each year in most areas of the chapter (USDA; USDOI, 1980). Infrequent heavy snowstorms affect transportation and can further impact community lives and daily activities. Winters in Aneth are cold, and a minimum of zero degrees or lower is not uncommon. Temperatures in the summer can exceed 100 degrees, with low humidity in summer. The evaporation rate is high due to the low humidity and general wind speed.

The average length of the growing season ranges from 140 days to more than 200 days (USDA; USDOI, 1980)

Vegetation

The Aneth Chaper lies within the physiographic region known generally as the Colorado Plateau. This region extends approximately from Moab, Utah, to Santa Fe, New Mexico, to Flagstaff, Arizona. On the Colorado Plateau, in the Four Corners area, is a zone that is characterized by limited moisture, hot summers, and long, cold winters. The native plants that grow in this zone are predominately drought-resistant species, however, some are found in natural riparian areas, irrigation ponds and ditches (Wheeler, 1994).

The vegetative community in the Aneth Chapter lies within altitudes from 4,400 to over 6,400 feet above sea level and lies within the high altitude, cold temperate desert generally referenced as the Great Basin Desert shrub bioregion (USDA; USDOI, 1980). The region is regarded as a grass-shrub zone and may include the transition of the pinyon-juniper zone. At an altitude of above 5,440 feet above sea level, the region is generally considered grassland-shrub dominated by saltbush and shadscale. Few forbs exist within this region due to the high soil salinity and poor nutrient content. The grass-shrub zone encompasses extended badlands and wind-scored plains and is considered the most depleted range within the region.

Direct precipitation will influence grass and sparse growth of shrubs, primarily greasewood and sagebrush. Occasionally, observances of dwarf juniper or pinon may be present in the landscape.

At altitudes from 5,500 to 7,500 feet, pinon-juniper is characteristic and dominated by woodland-browse species. Pine forests from 7,500 feet and above produce timber, range grasses and shrubs (USDA; USDOI, 1980).

Some common threatened and endangered plant species with a potential to occur in the region are Welch's Milkweed (Asclepia welshii) and Parish Alkalai Grass (Puccinellia parishii). Alkalai Grass habitat are known to occur between 5,000 to 7,200 feet in elevation (USDA; USDOI, 1980).

Cultural Ecology

From approximately 1500 B.C. to A.D. 1300, parts of the Four Corners area were inhabited by ancestral Pueblo people, referred to in the Navajo language as the Anasazi. Later, the Navajo, Ute Mountain Ute, and Southern Ute tribes inhabited the area and used native plants widely for their respective traditional and medicinal purposes (Wheeler, 1994).

Navajo names for plants refer to the actual or presumed uses of the plants. One category of plant names refers to food, another to tobacco, medicine, tea, and general characteristics of plants (Mayes & Rominger, 1994).

A variety of local plants continue to be used for traditional and medicinal purposes. However, impacts from man-made hazards such as oil and gas activities, and open dumping, diminish the availability of supplies of plants and herbs used locally (Capitan, 2006). Surface disturbing activities such as blading, grading, other forms of clearing, temporary roads, decimate widely used native plants. Some elderly individuals also suspect that air pollution prevents, or retards growth and re-growth of these plants. Spills and other releases are suspected to have rendered soil incapable of further growth in some areas.

Common native plants in Aneth Chapter that are still regularly used are as follows:

Beeweed (*Cleome spp*.), known commonly as beeplant or spiderflower. The uses of Beeweed are primarily for food and medicine. Young beeweed plants are boiled and eaten as pot herbs. The leaves are added to stews, and the seeds are ground and made into mush or bread. A tea is also made from the leaves for treatment of stomach aches. Beeweed stalks were used as fire drills to start fires. Beeweed leaves, soaked in water, have been used as a deodorant, and the leaves can be placed in moccasins or shoes as a deodorizer (Wheeler, 1994)

Bitterbrush (*Purshia tridentate*), also known as Antelope brush, or buck brush, is used to make a purple dye by cooking the seed coats (Wheeler).

Cattail (*Typha latifolia*), also known as Tule, is used for basketry (Wheeler, 1994). The stalks and leaves are woven into mats and baskets. Cattail down is used as tinder in ceremonial fire starting, and was used as fluff for padding in pillows and cradleboards (Lane, 2008)

Cottonwood (*Populus sp*.), also known as poplar, or Alamo, is used to create prayer sticks and looms (Wheeler, 1994).

Four-Wing Saltbush (*Atriplex canescens*), also commonly known as salt brush, wingscale, shadscale, and chamiso, is used to make a yellow dye. The leaves are also chewed to make a poultice to treat ant bites, wasp and bee stings. The roots are used to make a cough medicine, and the ashes of the leaves and twigs are rubbed on the scalp as a hair tonic (Wheeler).

Gambel Oak (*Quercus gambelii*), whose other names are scrub oak, white oak, and Gambel's oak, is used for fuel, as a brew tea from the leaves to lesson pain after childbirth, and as a gargle for sore throats. A tan dye is made from boiled bark. The leaves are chewed to make a poultice to treat wounds, burns, and insect bites. Tannin is an active ingredient in the poultice and is used as an antiseptic, and for clotting effect. All parts of this scrub can be used as first aid for cuts, swelling, and abrasions (Wheeler).

Goosefoot (*Chenopodium spp*.), also known as Lambsquarter, and sowbane, is used as a liniment. In the spring time, the young leaves are eaten raw or boiled as pot herbs (Wheeler).

Juniper (*Juniperus osteosperma*), also known as cedar, Utah juniper, cedron, or Sabina, is used to make flutes from the wood. A tea made from the berries of the tree is used to treat urinary-tract infections, headaches, and upset stomach. The twigs are boiled and used as medicine during childbirth. A juniper ash mixed with water is used as baking powder (Wheeler, 1994). The seeds are also strung into necklaces.

Mormon Tea (*Ephedra spp.), also recognized as ephedra, joint fir, and Brigham tea, is used to produce a light tan* dye by boiling the stems with alum. The steams are also boiled and used as tea for diuretic effects, as a mild decongestant, or stimulant. The boiled stems are also used to treat venereal disease and postpartum pain (Wheeler, 1994).

Sagebrush (*Artemesia tridentata*), known also as wormwood, blue sage, black sage, or big sagebrush, is used frequently as a tea, brewed from sagebrush leaves, as an all-around medicine, especially for treating colds, headaches, indigestion, and childbirth pains. A chest ointment can be made from the leaves. Boiling the leaves also produces a yellow-green dye (Wheeler).

Serviceberry (*Amelanchier* u*tahensis)*, also known as shadberry, Juneberry, or Utah serviceberry, has leaves used to treat nausea, animal bites, and skin irritations (Wheeler, 1994).

Skunkbush (Rhus aromatica), also referred to as three-leaf sumac, and lemonadeberry, is used to treat skin problems, stomach aches, and childbirth paints. The stems are used extensively in basket making. The fermented berries produce an orange-brown dye, and the leaves, in combination with ochre and pinyon pitch, produce a black dye (Wheeler).

Yucca (*Yucca baccata*), known by other names such as banana yucca, amole, datil yucca, broad leaf yucca, and Spanish bayonet, is used as a wash for raw wool before dying and weaving the wool into rugs (Wheeler, 1994). The yucca roots are also soaked and pounded to make a soap for washing hair. Ritual hair washing, or bathing in yucca suds is practiced in many Navajo ceremonies (Baldwin, 2007).

Sunflower (*Helianthus spp*.), also referred to as common sunflower, or annual sunflower, is used to remove warts with burned pitch from the stems, and the stems are also used to make flutes for certain ceremonies (Wheeler, 1994).

Land Status

The land status in Aneth Chapter is primarily Navajo Nation Tribal Trust Land . This designation further complicates management of land use in the Chapter. The land is tribal trust land, yet below the land, where minerals resources lie, are mineral estate (non-tribal trust land), over which the Chapter has no control.

Land status types in Aneth Chapter are Tribal Trust Land, Individual Indian Allotment, State Land, Private Land, Public Domain, and Administrative Reserve. Their designations are as follows:

Tribal Trust Lands are lands that are legal title in the U.S., held in trust for a Tribe. These lands usually include treaty land, lands added and made a part of an existing Indian Reservation. The Bureau of Indian Affairs (BIA) has the authority to grant any interest in land, except to sell it, with the consent of the Tribe. For example, the BIA has the authority to grant rights-of-way, easements, ingress and egress, and many lease types, with the consent of the tribe (Kee, 2007)

Individual Indian Allotment lands were created to deter assignment of lands under Tribal Trust status so that eventually the Indian land owner would become a tax-paying state citizen. Individual Indian Allotment lands are legal title in the U.S., held in trust for an individual Indian or group of individual Indians. These lands are still considered part of the Navajo Nation when they lie within the territorial jurisdiction of the Navajo Nation. Private land differs from Individual Indian Allotment lands in that the Indian allotments were allocated to "Indians", and can only be held in allotment by Indians; and Indian allotments are under the ultimate authority of the Bureau of Indian Affairs (BIA) for the allottee. Private land can be held by Indians or non-Indians (Kee, 2007).

State Land is legal title in the state government. The state within which state land is designated has exclusive power over state land (Navajo Nation Land Department, 1995).

Private Land is legal title in a person or legal entity. Private land belongs to individuals and the lands are subject to taxation. Individuals have total authority over the surface of their private land (though not necessarily the sub-surface mineral rights) and are responsible for any applicable taxes (Navajo Nation Land Department, 1995).

Public Domain is legal title in the U.S., and not held in trust. Public domain land belongs to the U.S. and is administered by the Bureau of Land Management (BLM). The BLM has the authority to confer various interests in land according to promulgated federal rules and regulations (Navajo Nation Land Department, 1995).

Administrative Reserve land is legal title in the U.S., conveyed into trust status. These land types belong to the U.S. for a certain administrative use, such as for schools, and they are set aside through Executive Order or statute (Navajo Nation Land Department, 1995).

The term "split-estate" is used to describe the surface and the mineral categories of land title that often become issues in oil and gas production and development in areas across the U.S., including tribal lands, where landowners and land users collide on matters such as rights to develop and ownership of underlying minerals. Off of the Navajo Nation, the surface owner is usually a private land owner, and the mineral owner can be the federal government,

the state, or a private interest. On the Navajo Nation, in Aneth, and on other tribal lands, split-estate issues are exacerbated further because tribal lands are held in trust by the federal government, typically the Department of Interior, Bureau of Indian Affairs, where tribal members are not considered owners, per se, of land.

The split-estate concept originated when over 30 million acres of the "public" lands in the West were released from federal ownership under the Stock Raising Homestead Act of 1916 (SRHA) (Darin & Stills, 2001). The SRHA removed the mineral estate from the surface estate. Originally, the Act was developed to reduce homestead abuses by providing surface ownership to individuals who homesteaded land, and the federal government kept possession of the underlying minerals. Under the 1916 Act, the BLM leases out minerals, including natural gas (coal bed methane) in a competitive bidding process. The Act also provides for a Right of Entry for the mineral lessee. Conflict can happen in split-estate issues when surface owners have minimal or no control over the actions of the mineral owners.

Generally, mineral ownership is divided among private, tribal, state, and federal interests. (Darin & Stills, 2001). Mineral ownership arrangements vary. Federal ownership is varied in that while the mineral estate is managed by the Bureau of Land Management, the surface estate overlying the mineral estate may be managed by other federal agencies such as the Bureau of Reclamation, National Park Service, U.S. Forest Service, Department of Defense (for a military reservation).

Tribal lands within an established federally-recognized Indian Reservation are held in trust by the U.S. government (Navajo Nation Council; Office of Legislative Counsel, 1995). On tribal lands, the BIA, in association with the tribe, manages the mineral estate. Some tribal

lands comprise fee lands; and where fee lands exist, the tribe has exclusive authority for leasing mineral rights (Kee, 2007).

Laws, Policies, and Guidelines Governing Natural Resources Development

Land status is important in understanding the underlying complexities of leasing, mineral rights, and subsurface rights related to oil and gas operations in the Aneth Chapter, and throughout the Paradox Basin and San Juan Basin. Both basins are geologic settings that occur in southeastern Utah and southwestern Colorado, with small portions in northeastern Arizona and northwestern New Mexico (Utah Geological Survey, 2003). Various local, tribal and federal organizations become involved in the land leasing processes and can influence the minimization of oil and production salt water hazards to environment and human health.

Tribal lands in the Paradox Basin province of Utah are part of the Navajo Nation. The oil and gas leasing activity on Navajo Nation lands is administered by the BLM in the Farmington, New Mexico Field Office (Haven, 2007)and therefore is responsible for overseeing oil and gas activity in the Four Corners area. Of the 675,011 acres of play areas in the Paradox Basin identified as Native American Reservation lands, the majority is on Navajo Nation tribal lands. A play is considered a prospect, and the play area is a volume of rock that contains similar geologic parameters such as petroleum reservoir, charge, and trap, that determines petroleum potential (Haven, 2007). The Ute Mountain Tribe is the other adjacent tribe with play areas in the Paradox Basin (Haven, 2007).

The most responsible agent, however, is the BLM. BLM policies, federal regulations, and laws, such as Mineral Leasing Act of 1920 and amendments, BLM Instruction Memoranda, Federal Land Management and Policy Act of 1976, BLM Forest Service Oil and Gas Gold Book, give the BLM the authority and responsibilities for leasing and development

of federal oil and gas resources. The BLM, in consultation with the Navajo Nation, issues Surface Use Agreements to the oil and gas companies. Most of these powers derive from the Surface Use Agreement.

The Bureau of Land Management (BLM), part of the Department of the Interior, administers the largest body of mineral estate about 261 million surface acres of land and minerals in the U.S. The BLM has trust responsibility to oversee minerals activities on 56 million acres of Indian Lands (Utah Geological Survey, 2006).

Two laws influence BLM's planning work: the Federal Land Policy and Management Act of 1976 (FLPMA), and the National Environmental Policy Act of 1969 (NEPA). The BLM Land Use Planning Handbook also contains a process that meets the requirements of both NEPA and the FLPMA for reaching planning decisions (such as new resource management plans). The BLM planning process encompasses the NEPA and FLPMA (Darin & Stills, 2001).

BLM's responsibility for oil and gas leasing is derived from the Mineral Leasing Act of 1920, as amended, and the Mineral Leasing Act for Acquired Lands of 1947, as amended. There are also other applicable regulations that form the structure of BLM's oil and gas leasing program that can be found in the Code of Federal Regulations (CFR) Title 43.

Methodology

The methods I used to identify, analyze, and classify the man-made hazards, and to design mitigation procedures were (1) discussions and interviews with Chapter officials, (2) analysis of secondary materials, published and developed by others, (3) categorization and ranking of types of man-made hazards, in order to develop policy recommendations and technical recommendations.

The man-made hazards in Aneth Chapter were identified through a process that included corresponding with Aneth Chapter officials, the Chapter Planning Committee, meetings with the planning committee, Montezuma Creek Health Clinic, and Navajo Nation Commission on Emergency Management (CEM). Local chapter officials contributed a significant role in cooperation with the Navajo Nation EPA, and other tribal government programs involved in mitigation planning.

The hazards were identified, discussed, and ranked according to their severity, during a number of meetings held with Chapter officials, the planning committee, staff of CEM, and of the health clinic The ranked hazards were examined further to determine the threats to human health, environment, and other assets within the Chapter. Staff from the CEM provided guidance and assistance to ensure that as many elements as possible of the FEMA guidance document for mitigation planning were addressed. All participants in the hazard ranking process were affiliated with the Aneth Chapter or the tribal government as officials, employees, or local citizens.

The significance of occurrences from man-made hazards was evaluated by focusing on frequency, damages to environment, impacts to human health, and other local resources, such as economic and local values associated with land, air, water, culture or tradition.

Methodological Elements

Man-made hazards in Aneth Chapter present varying levels of challenges to mitigation. Acknowledgment of existing differences in mitigation planning for natural hazards and disasters and mitigation planning for man-made hazards is key to planning the approaches in collecting data, past reports, studies, and interacting with Chapter officials and residents to acquire information to build a framework of relevant information for mitigation planning. The major dissimilarities are funding for planning mitigation of man-made hazards, misunderstanding that response actions are mitigation, exclusion of tribal political jurisdictions in state mitigation plans, and exclusion of mitigation planning for man-made hazards in state mitigation plans for natural hazards and disasters.

Federal funding for natural hazards mitigation planning exists; however, federal funding for planning mitigation of man-made hazards is non-existent. Similarly, documents such as state plans that are addressed to planning mitigation of natural hazards do not include mitigation planning for sovereign tribal entities. The lack of funding to support development of mitigation plans for man-made hazards significantly reduces the interest and impetus of local governments to formulate mitigation plans for man-made hazards.

Plans with a focus on response to incidents, such as emergency response plans, contingency plans, and prevention plans, concentrate on actions responding to an incident that has occurred, and generally are limited to naming the response organizations, and contact information, involved within political jurisdictions.

Mitigation planning deliberately focuses on prevention rather than response. Unclear understanding of mitigation planning from a perspective of prevention can prevent mitigation

planning from occurring, and defer planning specifically to facilities to manage as accidents and response specifically within leased areas of their facilities, and without consideration of broader impacts in the community.

The Aneth Chapter, with its abundance of natural resources, particularly oil and gas assets, has become increasingly concerned about the potential impacts to human health and environment due to man-made hazards. Without federal or tribal statutory requirements, mitigation for man-made hazards will not be given a priority status in any area on the Navajo Nation, and where development trends continue to introduce use of new technology, as in Aneth Chapter, environmental and health impacts will remain unaddressed.

The significance of occurrences from man-made hazards was evaluated by focusing on frequency, damages to environment, impacts to human health, and other local resources, such as economic and local values associated with land, air, water, culture or tradition.

Some man-made hazards mentioned by Aneth Chapter officials and Chapter residents were eliminated from more thorough examination due to(1) no occurrences, (2) rare occurrences, (3) little or no impacts or damages experienced from rare occurrences. Within the Aneth Chapter, there has been little uranium mining activity. Some community members expressed concern over unremediated uranium mine sites. Adjacent to Aneth, in Mexican Hat, Blanding, and Monticello, uranium mining occurred, and some Chapter residents were once employed as miners. Mining was excluded from examination because no uranium mining is occurring, two former uranium mines sites have been closed, and the Navajo Nation has banned uranium mining.

Man-made hazards identified by the Aneth Chapter include:

- oil and gas activities that pollute air, contaminate soil, and impact cultural practices,

- open dumps,
- above ground storage tanks, and
- abandoned and unremediated sites where past mining occurred.

"Man-made hazards", as defined by the Federal Emergency Management Agency (FEMA) (U.S. Department of Homeland Security, 2003) are considered to be *technological hazards* and includes *terrorism. Technological hazards* can occur from human activities such as manufacturing, transportation, storage, and use of hazardous materials. Technological emergencies are accidental and their consequences are not intended. On the Navajo Nation, as on other tribal lands, the remoteness and rural nature of tribal communities such as the Aneth Chapter, the occurrence of man-made hazards are primarily due to the lack of control in complex systems failures, weaknesses in emergency response systems, lack of proper training, technological and political challenges, and inadequate knowledge and understanding of the causes, sources, consequences, and differences in reaction to hazard types.

In 2005, in response to occurrences of significant flooding, and to meet minimal eligibility requirements for federal disaster assistance, the Navajo Nation developed a Multi-Hazard Mitigation Plan (Navajo Nation Commission on Emergency Management, 2005) that addressed natural disasters only. The plan was not Chapter-specific, but was developed broadly to encompass the entire Navajo Nation. In the plan, the mitigation of man-made hazards was not required, but was recommended for later inclusion.

Other tribal and regional plans that have been developed with a mitigation aspect are focused on procedures for dealing with natural hazards and disasters. They are not specific to the management and mitigation of man-made hazards on the Navajo Nation. For example, the Navajo Nation All Hazards Plan (Navajo Nation Department of Emergency Management,

2002), developed by the Navajo Nation, focuses on natural hazards, disasters, and details how the tribe will issue forth resources to provide for an emergency response. Similarly, the State of Utah's Natural Hazard Plan (State of Utah, 1999) focuses on natural hazards and disasters, but includes a mitigation procedure as part of the emergency response. Its jurisdiction, however, does not include tribal lands.

In planning for profiling of man-made hazards in Aneth, a participatory process was initially envisioned to receive information directly from Aneth Chapter officials and residents, about the man-made hazards they perceived to be most significant in the community. To the extent possible, participatory processes were pursued to profile hazards, and to develop recommendations for mitigation strategies. While representatives from some Navajo Nation agencies and Aneth Chapter officials participated in the planning process, there was little participation by Aneth Chapter residents. Representatives from the Navajo Nation, Department of Emergency Management surmised that cultural attitudes towards planning most likely discouraged and prevented participation to the extent envisioned, even though residents were invited to participate.

The man-made hazards in Aneth Chapter were identified through a collaborative process that included dialogue, meetings, and site visits with with Aneth Chapter officials, Chapter Planning Committee members, and representatives from the Montezuma Creek Health Clinic, Navajo Nation Commission on Emergency Management (CEM), and Navajo Nation Environmental Protection Agency (NNEPA). Chapter representatives, such as the Community Service Coordinator, provided input and participation on behalf of local people in cooperation with the staff of the NNEPA and the CEM.

For each man-made hazard, a general description of the hazard was developed and presented with its associated threats or problems, followed by details on the man-made hazard specific to Aneth, such as past occurrences of spills, discharges, or releases, and types of pollution from the occurrences of releases. Information provided by the Chapter and other organizations or individuals are also presented within the general descriptions.

Descriptive Information of Man-Made Hazards in Aneth

The geographical location of Aneth proves a setting for unique man-made hazards and natural disasters. Man-made hazards recognized in densely populated, urban areas, are different in contrast to the remote, rural setting of Aneth Chapter. While the types of man-made hazards vary, technological advancements have generated citizen concerns about impacts to human health, environment, wildlife, and local cultural values tied to the environment.

In 2002, in response to months of flaring from oil and gas operations in the Aneth oil fields, and insistence by the Chapter to address citizen concerns regarding health and environmental impacts, the United States Environmental Protection Agency (USEPA) provided a $20,000 grant to the Navajo Nation to begin studying emissions from facilities that emitted toxic substances such as hydrogen sulfide, volatile hydrocarbons, and sulfur dioxide to the local air shed. The University of New Mexico Health Sciences Center, Community Environmental Health Program, and Masters in Public Health Program, in partnership with Diné College, Tsaile, Arizona, were funded in part by the USEPA grant to the Navajo Nation as sub-grantees to design a survey for community residents in Aneth, Red Mesa, and Montezuma Creek, Utah, to collect air monitoring data in partnership with the NNEPA, including geospatial data, and to analyze and interpret the collected data.

The preliminary results of the study, which concluded in 2004, found sulfur dioxide emissions in excess of established public health standards, and provided the following recommendations:

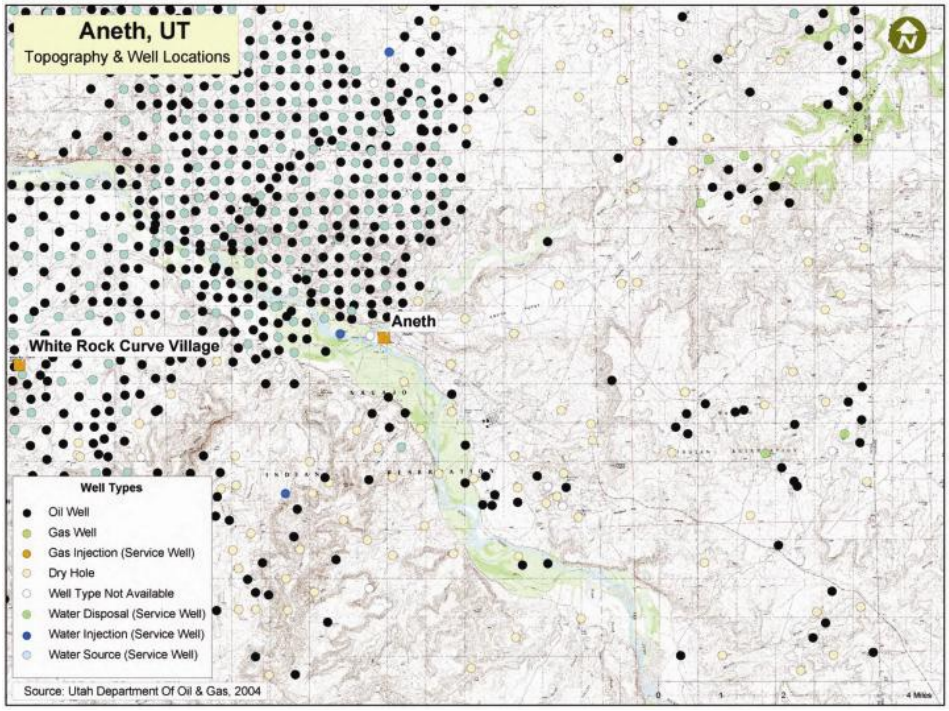
(1) More sensitive environmental and in-home monitoring, especially for hydrogen sulfide.

(2) Conduct a comprehensive environmental assessment of all media, including air, water, and soil.

(3) Conduct a comprehensive community health assessment, including identification of possible exposure pathways.

The study did not suggest the amount of funding or time that would be required to respond to the needs identified. To date, no further assessments, or studies have commenced, and many community members and Chapter officials continue to be concerned about threats and impacts to their health and environment as a result of industrial man-made hazards (University of New Mexico, 2009).

Figure 7. Well Locations, Aneth, Utah



Well types and locations in Aneth, Utah extracted from Aneth Report Appendices, University of New Mexico, Community Environmental Health Program, 2004

Man-made hazards present potential impacts to people and environment. Providing descriptive information about the hazards will be helpful to understanding why the hazards are considered to be problems in Aneth Chapter, and how the recommendations for mitigation were developed. The descriptive information will encompass the types of releases, spills or contamination; health and environmental impacts, policies or processes for managing some hazards, such as permitting that essentially allows for some pollution or contamination. The hazards will be presented in the following order:

- Releases from oil and gas facilities
- Oil and production water spills

- Open dumps
- Above ground storage tanks, and
- Sewage lagoons

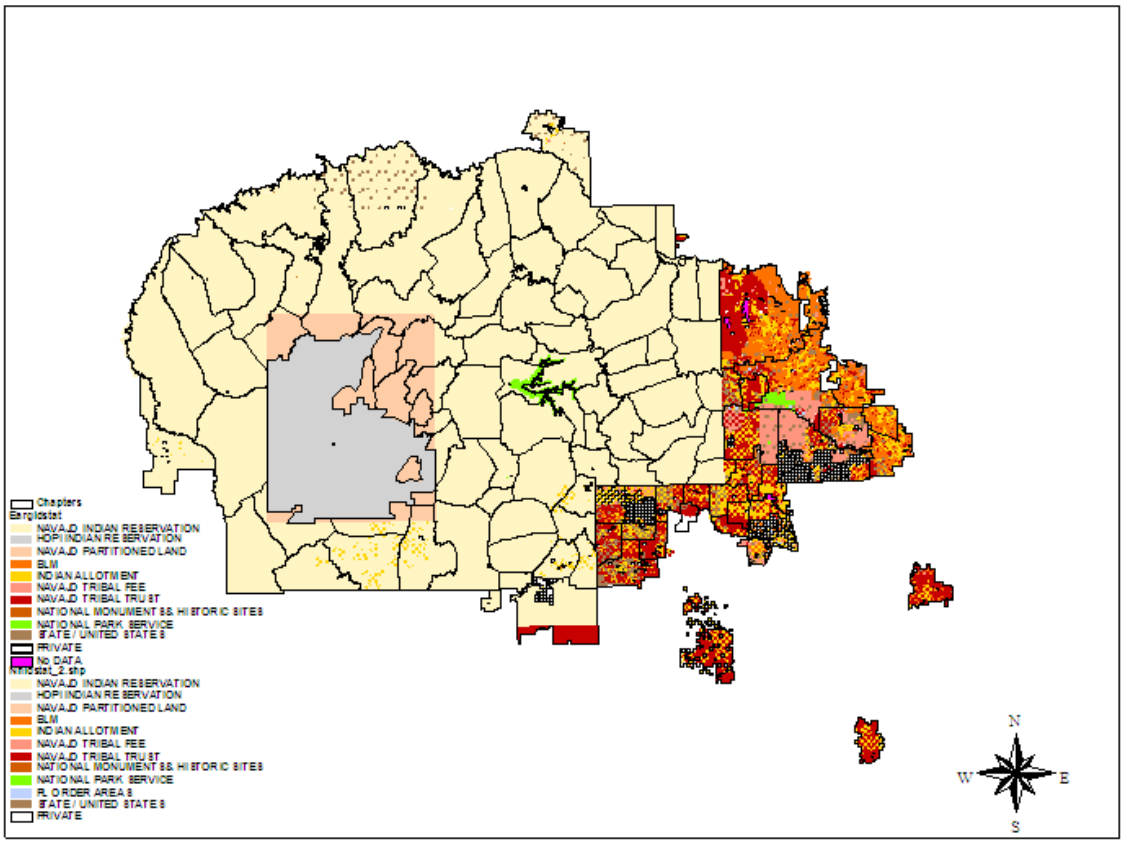
Releases from Oil & Gas Facilities in Aneth Chapter

Some discussion of the oil and gas industry helps to provide an understanding of the facets of oil and gas activities as related to tribal lands in general, and the intertwined and applicable tribal and federal environmental, regulatory and mineral leasing aspects.

Two types of leases for oil and gas exploration and development are issued by the BLM– competitive and non-competitive (Darin & Stills, 2001). The Federal Onshore Oil and Gas Leasing Reform Act of 1987 required that all public lands available for oil and gas leasing had to be first offered by competitive leasing. Non-competitive oil and gas leases can be issued only after public lands have been offered competitively at oral auction and for which no bids were received. Since the enactment of the Energy Policy Act of 1992, both lease types are issued for a 10-year period, and both types of leases continue for as long as oil or gas is produced in paying quantities.

The leases grant the lessee the right to exploration, drilling, extraction, removal, and disposal of oil and gas deposits (except helium), that are found on leased lands. On tribal lands, as in the case of Aneth, the surface is "owned" by the Navajo Nation, and the surface is leased from the Navajo Nation in order to access the minerals below the surface. The lessee or her/his operator is not allowed to construct a residence on the land, farm the land, or remove any minerals other than oil and gas from the leased land (Navajo Nation Council; Office of Legislative Counsel, 1995).

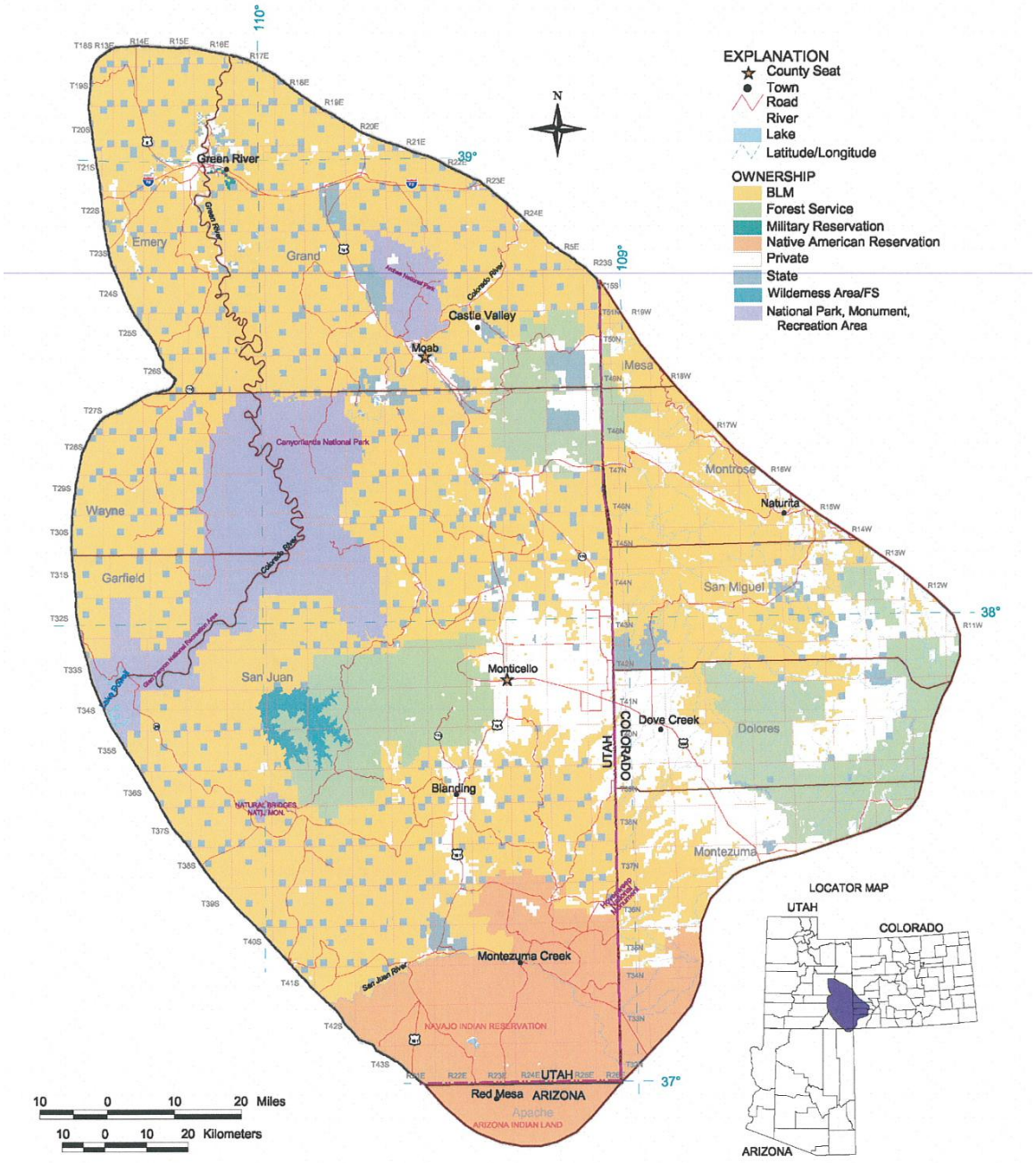
Figure 8. Land Types on Navajo Nation



Navajo Nation Land Department

The geology of the Paradox Basin, where Aneth lies, is the significant controlling aspect that has determined past, current, and future hydrocarbon exploration and development. The Paradox Basin is the central basin province in which the majority of oil and gas activities occur in Aneth. The Paradox Basin is located predominantly in southeastern Utah and southwestern Colorado, with only a small amount in northeastern Arizona. The Paradox Basin is the largest of four oil producing basin provinces in terms of major oil play areas. Oil plays are explicit geographic areas (e.g., volume of rock), with similar geologic parameters that have petroleum potential such as the source rock, migration paths, reservoir characteristics, and other factors (Utah Geological Survey, 2006). In Utah, the predominant oil producing basic province is the Paradox Basin.

Figure 9. Surface and Mineral Ownership for Paradox Basin



Minerals Ownership for Paradox Basin extracted from Quarterly Technical Progress Report, Major Oil Plays in Utah and Vicinity, 2006

Information on past occurrences of releases from oil and gas activities, including information provided by Chapter officials, and tribal organizations such as the Navajo Nation Environmental Protection Agency, has shown that discharges from oil and gas operations are the most frequent and threatening man-made hazard in the Aneth Chapter. Oil and gas activities can present man-made hazards in the form of releases, such as oil spills or gas emissions. Releases from oil and gas operations conducted at certain facilities may comprise toxic chemicals that contribute to air pollution and impact human health. Pathways for contamination are through air, soil, ground water, or surface water.

Human health and ecosystems can be damaged by toxic air pollutants emitted from oil and gas activities, and from hydrocarbons that pollute surface water, ground water, and soil.

At the Chapter level, Aneth can be considered one of hundreds, if not thousands, of locations where oil and gas development has raised increased focus on land use, and environmental impacts. The Chapter has long recognized the range of threats and potential impacts to environment, land, water, air, open spaces, the wildlife and ecosystems.

Loss of wildlife habitat and continued destruction to new habitat are a key environmental concern with oil and gas activities (Darin & Stills, 2001). Oil and gas wells entail development of well pads and compressor stations and related facilities that strip the land of vegetation, contributing to loss of topsoil, increased erosion and invasion of opportunistic weeds. Miles of roads are developed that disturb the surface, exacerbate erosion, and fragment wildlife habitat. Miles of pipelines and power lines cross once open areas and become industrial areas. Compressor stations generate noise and air pollution, and locating the compressor stations disturbs the surface. The daily activities in the area of compressor stations can significantly contribute to erosion problems. Wells and pipelines also pose human health

and safety risks. Pipeline explosions, although rare, have occurred along pipeline routes all over the U.S., and wells, while properly drilled, cemented and cased, can cross contaminate aquifers that provide drinking water supplies.

In Aneth, the wide range of impacts is visible, and existing and new leases have and will continue to pose disruptions to people and the land. Visually, the oil and gas facilities are disruptive, and land users residing within a range of 1-2 miles of on-going oil and gas activities experience disruptions such as sudden loud noises that also startle livestock and people. Daily visits to the lease sites by maintenance crews are common, as is round-the-clock drilling.

There are varying concerns and priorities about impacts of oil and gas activities, however, all the concerns share similarities related to exploration, drilling, continued operations, abandonment of wells, and reclamation.

The multifaceted regulatory and leasing aspects in oil and gas development contribute to the challenges involved in development and implementation of mitigation measures. To begin a planning process with stakeholders, especially the local citizens, should ideally begin with a sound understanding, or working knowledge, of the regulatory roles, leasing procedures, and political realities of exploration and development of resources in Utah, the Navajo Nation, and the U.S.

The Surface Use Agreement contains stipulations the company must abide by. However, the remoteness of oil and gas facilities in Aneth limits enforcement by the authorities responsible for enforcing the Surface Use Agreements, the BLM and Navajo Nation.

In the Aneth area, a number of violators have been penalized by federal agencies for violations of federal environmental laws. Violations of the Clean Air Act (CAA) and Clean Water Act (CWA) have occurred in the past in Aneth. The most notable are as follows:

1. 2005 Mobil Exploration and Producing U.S., Inc., Clean Air Act Violations: Mobil Exploration and Producing U.S., Inc., also reached a settlement with the U.S. Environmental Protection Agency, and the Department of Justice, for nearly $1 million for alleged Clean Air Act violations at Mobil's oil production facility in the Four Corners area near Aneth, Utah (U.S.Department of Justice, 2005). The complaint filed in the U.S. District Court for Utah, alleged that Mobil operated unpermitted equipment, exceeded air pollution emission limits established in the operating permit for sulfur dioxide and volatile organic compounds, failed to monitor its main flare and equipment leaks, and failed to notify the EPA that Mobil was demolishing its gas plant that may have had asbestos.

In the settlement, Mobil agreed to promptly comply with interim air pollution limits, investigate and correct all significant flaring events from its main flare, and implement better air pollution measures from its main flare.

2. 2004 Mobil Exploration and Producing U.S., Inc., Clean Water Act Violations:

In 2004, a $5.5 million settlement was reached between Mobil Exploration and Producing U.S., Inc., and the U.S. Environmental Protection Agency, for Mobil to reduce oil spills and construct a drinking water pipeline to remote homes situated in oil fields near Aneth, Utah. The settlement resulted from 83 identified oil spills at the company's wells along the banks of the San Juan River and its tributaries, on Navajo

Nation lands leased by the company (U.S.E.P.A., 2004). Mobil, at its McElmo Creek Unit and Ratherford Unit near Aneth, Utah, discharged produced water and oil, without a permit, into waters of the United States (San Juan River), failed to develop and implement an Spill Prevention Control, and Countermeasures Plan (SPCC Plan), and failed to properly notify relevant authorities of an oil spill, and failed to develop and implement a Facility Response Plan.

3. 2002 Texaco Exploration and Production, Inc., and Envirotech, Inc. (contractor to Texaco), Clean Air Act Violations:

Texaco Exploration and Production, Inc., reached a settlement with the U.S. Environmental Protection Agency and Department of Justice, to pay $848,622 to settle charges over oil spills and related violations at its oil and gas field in Aneth, Utah (U.S.E.P.A., 2002). The settlement included a $369,922 penalty, and two supplemental environmental projects (SEP's) totaling $478,700. SEP's are voluntary environmentally beneficial projects that a violator agrees to undertake as part of an enforcement settlement. SEP's go above what is expected punitively of the violator to return to compliance with environmental requirements. The supplemental environmental projects were recommended by the Navajo Nation Environmental Protection Agency and Aneth Chapter. Texaco was also required to expend approximately $1.2 million over a course of three years to improve its operational practices at the oil field.

Texaco Exploration and Production, Inc., failed to develop and implement an adequate spill prevention, control, and counter measures plan (SPCC Plan), and released oil and oil and water mixtures without notifying the EPA.

Man-made hazards involve human activity or inducement, such as error, negligence, intent, or malfunctioning of a particular system. Impacts to the environment can result when man-made hazards for which mitigation, or emergency management actions have not been implemented or are ineffective (U.S.Department of Homeland Security, 2003). Environmental impacts can be observed through changes in the ecosystem, such as migration of species, loss of wildlife habitat, destruction of vegetation, and disruption in human activity

Environmental and Health Impacts from Toxic Air Pollutants

The risks to human health and environment are from toxic air pollutants emitted from oil and gas facilities. To better understand the risks, this section will address types of toxic air pollutants released from oil and gas facilities and how people and environment are exposed to the air toxics.

Air pollution is any substance found in the air that is not part of its natural composition or any substance whose concentration is higher than the concentration found in the air's natural composition (Institute of Tribal Environmental Professionals, 2007). Air pollutants can be in one of two physical forms: *Particulate matter* such as dust, smoke, mist and ash; *gases* such as carbon monoxide and sulfur dioxide.

Sulfur dioxide emissions can damage human health and environment. Sulfur dioxide pollution is a source of acid rain which decreases visibility, and can damage water sources and vegetation (Institute of Tribal Environmental Professionals, 2007). High amounts of sulfur dioxide can cause serious health problems, such as respiratory illnesses.

Volatile organic compounds are a key element of smog that exacerbates respiratory illnesses such as asthma, emphysema, and bronchitis.

Historically, episodes of air pollution in any area are distinguished by elevated levels of ozone primarily during summer months of May to late August (Institute of Tribal Environmental Professionals, 2007). The episodic ozone occurrences typically begin in May and marks the onset of the ozone season in most parts of the United States, including Aneth, Utah.

Individuals concerned about the levels of ozone can become acquainted with the use of the Air Quality Index (AQI) and forecast conditions. AQI estimates report daily air quality, and are available for ozone, and for particulate pollution (that occurs year-round) (Institute of Tribal Environmental Professionals, 2007). The focus of the AQI is on health effects that might be of concern for individuals after they experience breathing polluted air. Impacts to health might be experienced immediately or days later. The U.S. Environmental Protection Agency has developed national air quality standards for five major air pollutants to protect public health. The Clean Air Act regulates the five major air pollutants: ozone (ground level), particulate matter (particle pollution), carbon monoxide, sulfur dioxide, and nitrogen dioxide.

There are other concerns such as odors emanating from oil and gas operations. These are offensive and impact daily activities of adjacent land users. Offensive odors rarely cause physical harm. Unpleasant odors generated by oil and gas activities in Aneth have been reported to cause different levels of distress, and are considered a nuisance by some. Objectionable odor impacts on residential areas, or other sensitive receptors such as schools, day care centers, and commercial locations, should be considered, analyzed, and mitigated.

Notification policies for generators and receivers of unpleasant odors are non-existent. Generators of projects that emanate objectionable odors could be identified; similarly, receivers in residential, or other areas where sensitive receptors (e.g., schools, day care centers,

commercial establishments), should be identified. As generators, oil and gas operators need to be informed by receivers (citizens) when there are significant noxious occurrences.

The permits issued by the Bureau of Land Management for drilling and production activities do not regulate odor emissions (Darin & Stills, 2001). Because offensive odors rarely cause physical harm, there are no specific requirements for control of offensive odors in Navajo Nation or federal regulations. There are currently no standards for significant odor problems for oil and gas activities, although, with interest, the Chapter can raise the issue of identifying generators and receivers and work with oil and gas operators, including pertinent tribal programs and departments, to develop mitigation measures such as changes in operation, add-on controls, or processing changes (e.g., location or relocation of stacks, vents, carbon absorption, incineration practices) for potentially significant sources of odors. Locally, a standard for significant odors should also be developed to help with understanding the type(s) of odors produced by generators, and received by the general public.

Buffer zones are commonly used to buffer generators and receivers. However, even with predictable prevailing winds, it would be almost impossible to establish an effective buffer zone between a source and receivers. The significance in mitigating offensive odors by working cooperatively with oil and gas operators, local residents, Chapter, and tribal and federal governments, is one logical approach to resolving concerns of receivers.

Hazardous air pollutants will harm human health and environment. There are over 900 substances classified as hazardous air pollutants. The facilities in Aneth identified to emit hazardous air pollutants are the Title V operating facilities that have air permits for their operations. When a facility emits a pollutant in excess of the amount stated in the permit, the facility must report it to the Navajo Nation, and immediately work to correct the emission

discharge. The facility must also follow-up with a notification of the type of corrective action undertaken to correct the problem. Depending upon the type of corrective action needed, the problems can take from minutes, hours, to a few days to correct.

Major Emitters of Air Pollution in Aneth

In Aneth Chapter, the major, regulated emitters of air pollution are Title V operating facilities. Under Title V of the Clean Air Act, Title V facilities are described as large, stationary sources of air pollution, such as power plants and refineries.

Figure 10. Title V Facilities, Aneth, Utah

Resolute Natural Resources Company, Unit 1, Aneth, Utah

Oil and gas separator, Resolute Natural Resources Company, Aneth, Utah

The Title V operating facilities in Aneth, Utah are:

1. Resolute Natural Resources Company, Aneth Unit 1
2. Resolute Natural Resources Company, Aneth Unit

Two (2) Title V facilities in Aneth, Utah are oil and gas operations and have been issued operating permits by the Navajo Nation Environmental Protection Agency, Operating Permit Program (tribal permitting authority). The Navajo Nation, under its Operating Permit Program, requires all Title V facilities to obtain a permit that combines all of the Clean Air Act requirements into one permit record (Nelson, 2006).

The 1990 Clean Air Act amendments require large, stationary sources that emit nitrogen oxides, volatile organic compounds, sulfur dioxide, particulate matter, carbon monoxide and/or toxic air pollutants to obtain air quality permits (West Group, 1999).

There are two types of air permitting programs for large, stationary sources:

(1) New Source Review (NSR) program, and

(2) Title V Operating Permit Program (OPP).

The NSR program is a pre-construction review program for new sources, or existing sources with significant modifications. Title V OPP is for large, existing, stationary sources.

Each of the Title V facilities in Aneth have been identified to release carbon monoxide, volatile organic compounds, sulfur dioxide, nitrogen oxide, particulate matter, and toxic air pollutants, in amounts over 100 tons per year (Nelson, 2006).

The Title V facilities in Aneth process crude oil and natural gas. The location of Title V sites consist of tank batteries, recycling facilities, and several wells and headers. Common processing activities that are observed, and for some, often experienced by some individuals in proximity to processing activities are flaring and venting.

Title V operating permits are legally enforceable documents issued to a facility when after it commences operation. The permits contain enforceable limitations for criteria pollutants and hazardous air pollutants emitted from permitted facilities. The essential information in the permits comprise (Nelson, 2006):

- Source information and exact location by latitude, longitude, or UTM,
- description of the processes and products by SIC, including any alternate operating scenario(s),
- Emission rates and supporting information,

- Description of all equipment, including pollution controls,
- List of emission unit(s) with accompanying listing of activities considered insignificant, and how an exemption would apply, including supporting documentation such as citations and descriptions of all related requirements and exemptions,
- Narrative of test methods,
- Compliance plan,
- Compliance certification,
- Certification of truth, accuracy, and completeness

Criteria pollutants are particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, and lead. Criteria pollutants are found nearly everywhere, and can be harmful to humans of their amounts in the ambient air exceeds certain levels. In the U.S., National Ambient Air Quality Standards (NAAQS) have been established for each of the criteria pollutants, and the Navajo Nation has adopted the NAAQS for its air quality management purposes (Nelson, 2006). The NAAQS has limits for the ambient levels for each pollutant. The air permits for Title V facilities contain levels related to the NAAQS and the facilities are not to exceed the levels stated in the air permits.

The processes of flaring and venting in crude oil production contribute to emissions of criteria pollutants. Flaring and venting are practiced to control emissions. Flaring is the controlled burning of natural gas that cannot be processed for sale or use due to economic or technical reason (Darin & Stills, 2001). Venting is the release of natural gas that cannot be sold or used due to technical or economic reasons. Emissions from flaring and venting depend on operating practices of the facility, quantity of process activity, local regulatory

requirements and enforcement, economic access to gas markets, and opportunities for on-site utilization . In natural gas battery and pipeline flaring, the occurrences are at producing facilities such as wells, compressors, dehydrators, and gathering pipelines, to burn off gas during emergencies, maintenance shutdowns, equipment failures, and other upset conditions.

The burning effectiveness of flaring is often understood to be about 99% (Darin & Stills, 2001) . However, the remaining 1% of unfinished combustion can create particulate matter (ash and soot), carbon monoxide, volatile organic compounds (benzene, toluene, xylene), small quantities of sulfur compounds such as carbon disulphide, and carbonyl sulfide, and unburned hydrocarbons. Benzene is commonly known as a carcinogen, and carbon disulphide is also classified as a hazard to the central nervous system. Depending upon the duration, frequency, and degree of exposure, effects vary. Although incomplete combustion products also vary, many of the products generated are not unique to flaring, and are common products of other incomplete combustion in emissions from automobiles, forest fires, barbeques and cigarettes.

Oil and Production Salt Water Spills

According to a 2004-2005 inventory of oil and produced water spills on the Navajo Nation, six (6) oil and gas operations had from zero to 124 spills in Aneth, Utah (Navajo Nation Surface and Ground Water Department, 2005). The intent of the inventory was to illustrate where spills were occurring, the amount of spills, and which companies were responsible for the spills, and to analyze and plan measures for environmental compliance. The threshold of significance for oil spills is five (5) gallons. Minor oil spills are from 5-25 gallons, and major oil spills are 25 gallons and greater. Under the CWA, operators can be penalized for not reporting spills, and can be further sanctioned if waters of the Navajo Nation

are contaminated by the spills. The following table illustrates the number of spills that occurred at the six units operating at Aneth.

Table 1. Oil and Production Water Spills from Oil and Gas Operations

Company	Number of Spills	
	2004	2005
Chevron/Texaco, Aneth Unit	18	9
Mountain States Petroleum, Boundary Butte	1	0
Elm Ridge Resources, Gothic Mesa	0	6
Exxon-Mobil, McElmo Creek	50	124
Exxon-Mobil, Ratherford Unit	41	83
U.S. Oil & Gas, Inc., White Mesa	3	5
Total	113	227

Note. The data on number of spills are summarized from the Navajo Nation Environmental Protection Agency, Surface and Ground Water Department, Inventory & Mapping of Oil & Produced Water Spills on the Navajo Nation, 2004-2005.

The inventory found that the McElmo Creek Unit, owned and operated by Exxon-Mobil Corporation, had the largest volume of oil spilled for both oil and related produced salt water in 2004 and 2005, and the Boundary Butte Unit, owned and operated by Mountain States Petroleum, had the fewest number of spills in 2004 and 2005.

Environmental and Health Impacts

Salt water is a common waste product of oil production, and is generally disposed through pumping into deep disposal wells. Production salt water is about twenty (20) times more saline than seawater. The salinity of production salt water can destroy vegetation, render

land barren, and harm livestock. It takes approximately ten barrels of water to produce one barrel of oil or gas (Darin & Stills, 2001).

Waste pits are often sited beside well pads, and contain water contaminated with production toxics, salt, and oil. If livestock or wildlife drink the waste fluid, the animals can die. Production toxics can also seep into soil, migrate and contaminate ground water. Saline from the production fluid can render soil permanently damaged.

Aneth is located in an area where geological time has produced a combination of depositional and structural events that have shaped the proper setting for oil production and capture in the major oil producing provinces in Utah and the Four Corners Area. Oil and gas activities such as exploration and production within Aneth have increased in conjunction with national energy policies. With the increase in exploration and development, increases in pollution and contamination have accompanied the activities of oil and gas operators.

Open Dumps

Solid waste open dump sites pose numerous potential risks to human health and environment. An open dump differs considerably from a landfill. Open dumps are unregulated and unpermitted areas where trash is dumped and waste is left to degrade. Burning often occurs, waste types are unknown, and no environmental precautions are taken. Sanitary landfills are permitted, regulated, discrete areas of land specifically engineered to receive waste. Access to sanitary landfill locations are limited and hazardous wastes are not accepted. At sanitary landfills litter is controlled, burning is prohibited, and environmental precautions are taken with respect to air and water quality, leachate, and landfill gas (U.S.E.P.A., Office of Solid Waste, 1988).

Risks to human health related to illegal dumping are considerable. Areas where open dumping are unmanaged and easily accessible to people comprise numerous physical and biological hazards (U.S.E.P.A., Office of Solid Waste, 1988).

Environmental and Health Impacts

Examples of physical hazards present at open dumps are sharp edges from broken metal, glass, nails, and other shattered and instable objects. There are also potentially harmful chemical hazards such as fluids or dust, threats of fire or explosions, explosive gases generated by the decomposition of waste, including airborne contaminates. Disease vectors such as flies, mosquitoes, and rodents, are attracted to open dumps. Birds are also attracted to waste in open dumps and can serve as disease carriers. Waste tires discarded at open dumps can become breeding grounds for mosquitoes (U.S.E.P.A., Office of Solid Waste, 1988).

Open, stagnant water at open dumps can help in multiplying the population of mosquitoes, further exacerbating the potential for West Nile virus complications in humans. Mosquitoes can also contribute to carrying other diseases that produce dengue fever, including encephalitis. Open dumps can purposely be set on fire, ignite spontaneously, and depending on the location of the dump, impact or impact proper drainages of runoff, and contribute to the susceptibility of flooding when wastes obstruct drainages such as culverts, creeks, drainage basins, and ravines. Open dumps in remote areas are also responsible for causing wild land forest fires and erosion as the wild land fires decimate essential trees and undergrowth to keep soil stable. Open dumping in forested or wood land areas also negatively impact plants and wildlife. Runoff from open dump sites may contain chemicals that may further contaminate wells and surface water that are used as drinking water sources by humans, livestock, or

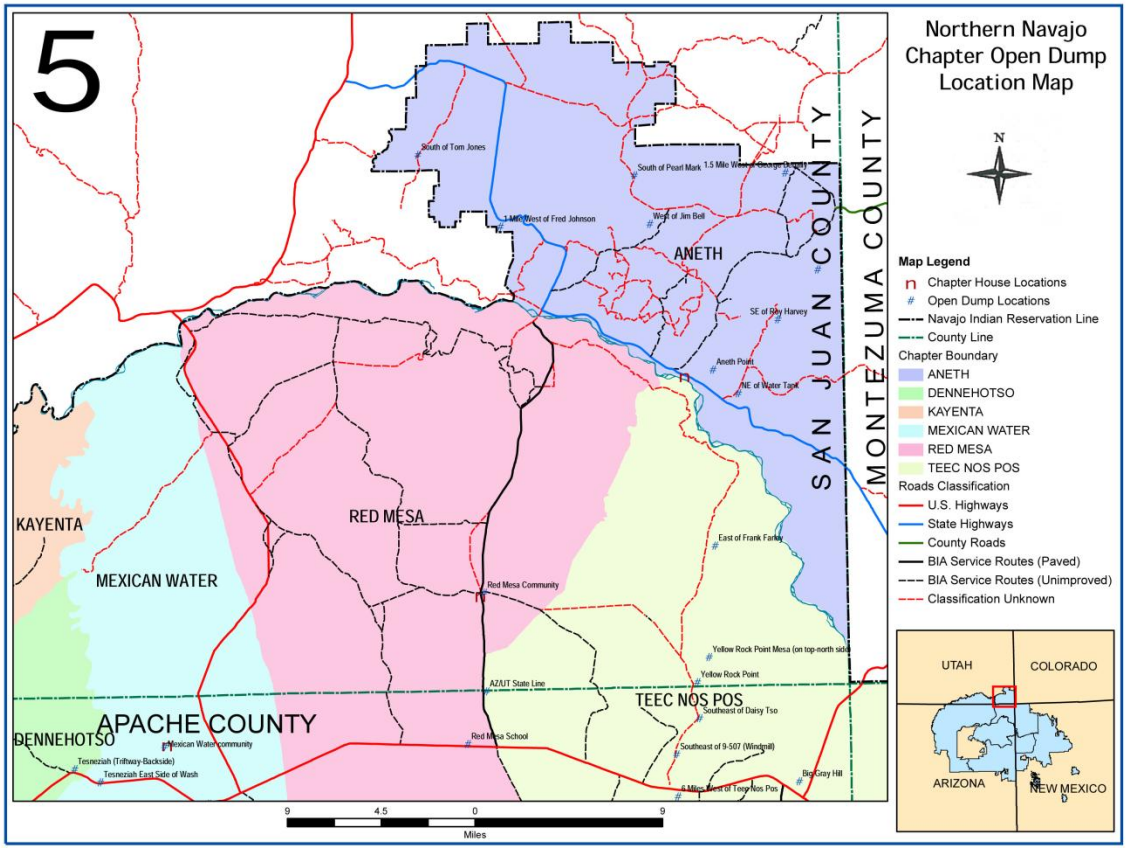
wildlife. Rural open dump sites can be used as dumping grounds to conceal criminal activities (U.S.E.P.A., Office of Solid Waste, 1988).

In 1996, the Navajo Nation Environmental Protection Agency completed an inventory of open dump sites on the Navajo Nation and recorded 465 open dump sites. Open dump sites ranged in size from less than half (1/2) acre to over ten acres. According to the Division of Community Development, Solid Waste Management Program, approximately 65 open dump sites have been closed since 1998 (Littlesinger, 2006).

In 1998, the Division of Community Development inherited the responsibility for addressing closures of open dumps, providing technical assistance to Navajo Chapters to address local open dumps issues, and to plan for related infrastructure to manage waste, such as recycling, landfill development, and disposal facilities. Funding to properly close open dumps has been challenging to obtain, and often funding requests for closure of open dump sites compete with other requests for housing, business development, and critical infrastructure (Luther, 2006).

In the Aneth Chapter, nine solid waste open dumps have been identified. The open dumps primarily comprise household waste generated from remote and rural households, although some household waste originates from housing areas where solid waste collection routes are established and used.

Figure 11. Aneth Open Dumps Locations



Extracted from Division of Community Development profile of Navajo Nation open dumps.

According to Aneth Chapter officials, open dumping occurs throughout the Chapter, despite periodic efforts to curtail the illegal dumping activities. It has also been suggested that the number of open dumps has increased, with recent open dumping along the San Juan River where household waste, abandoned furniture, batteries, and oil have been noted (Capitan, 2006) Aneth Chapter officials point out that the newer open dumps that appear along the San Juan River are not listed on the Navajo Nation priority listing of open dumps.

Aneth Chapter has endeavored to establish and maintain a solid waste collection site for its constituents lacking solid waste collection services due to the rural and remote expansiveness of the Chapter. However, due to the inability to pay for disposal, or the

reluctance of individuals to pay for disposal costs, the open top bin introduced and located at the Chapter to collect household waste was returned to the waste disposal company because the Chapter could not meet the payments to keep the bin. Future attempts are planned to re-introduce an open top bin for Chapter residents to use.

For those individuals diligent in the proper disposal of their household waste, they travel to transfer stations or locations with open top bins at San Juan, Blanding, Bluff, and Shiprock, New Mexico. Businesses in the Chapter contract with waste management companies located outside of the area, such as Farmington, New Mexico, and Cortez, Colorado (Bloedel, 2007).

The Navajo Housing Authority (NHA), contracts with Waste Management, Inc., a waste collection company with regional collection routes that includes Aneth, and Blanding, Utah. The tenants of the NHA are provided with residential waste collection services by Waste Management, Inc. (Bloedel, 2007).

The Division of Community Development, Solid Waste Management Program, has developed a prioritized listing of open dump sites to be cleaned up or closed on the Navajo Nation. The nine (9) open dumps in Aneth are listed in prioritized order for clean up and/or closure as follows (Littlesinger, 2006):

Table 2. Aneth Open Dumps

Site Name	Priority Number
NE of Water Tank	P168
½ Mile West of George Benally	P169
South of Tom Jones	P307
South of Harry Bililly	P310
West of John Benally	P331
SE of Roy Harvey	P378
South of Pearl Mark	P379
Aneth Point	P388
One Mile West of Fred Johnson	P412

Note. From Open Dumps Priority Listing, Division of Community Development, Solid Waste Management Program.

Out of 465 sites, the open dump site referred to as NE of Water Tank ranks in priority position 168, and the site referred to as 1 Mile West of Fred Johnson ranks in position 412. The larger the number in ranked order, the less significant the open dump. The smaller the number in ranked order, the more significant the open dump is on the prioritized listing.

Figure 12. Pictures Aneth Open Dumps

NE of Water Tank

West of George Benally

South of Tom Jones

South of Pearl Mark

Open dumps in the Aneth Chapter are not currently a priority for clean-up or closure by the Solid Waste Management Program (Littlesinger, 2006). Overall, the Aneth open dumps do not meet the criteria established by the solid waste program to be identified as significant sites.

Prioritization of open dumps sites was developed based upon the open dump evaluation criteria developed by the Solid Waste Management Program, and with guidance

from the Indian Health Service, Navajo Area Office, and participation from the Bureau of Indian Affairs, Navajo Area Office (Luther, 2006). The criteria consist of:

- Proximity to surface water,
- Substantial potential for ground water contamination,
- Is site located in a flood plain,
- Proximity to housing areas,
- Presence of on-site population of disease vectors, and
- Open burning practiced at the site.

Above Ground Storage Tanks

Above-ground storage tanks (ASTs) contain flammable and combustible liquids that pose fire and explosion hazards. Although locating ASTs with business and industrial growth to meet consumer demands and needs for fuel distribution, inadequate management, or unregulated AST expansion can compromise nearby residences and structures.

Explosive and flammable hazards in the form of above-ground storage tanks (ASTs) are being introduced increasingly to store and dispense fuel for business related activity, and also to circumvent more stringent requirements for locating of underground storage tanks (USTs). On the Navajo Nation, USTs are regulated through the Navajo Nation Underground Storage Tank Act; ASTs are not regulated (Haven, 2007).

In areas where zoning is non-existent, or where adequate management is lacking, use of ASTs can contribute to broader community challenges related to emergency response, preparedness, workplace accidents, releases that contaminate soil, exposure to harmful vapors, and promote health related illnesses due to exposure. Disproportionate requirements for evaluating distances have the potential to adversely impact the health and safety of occupants

of residences and other structures. Locating explosive and flammable operations should be evaluated not only from a technical measurement of safe distance, or as may be required under other statutory law, but should include the fundamental consideration of equal protection regardless of funding source.

ASTs containing fuel are considered flammable and combustible. Flammable and combustible liquids are classified by their flashpoints. Flammable liquids will ignite and can burn easily at normal temperatures. Combustible liquids have the ability to burn at temperatures that are usually above normal working temperatures. The Workplace Hazardous Material Information System (WHMIS) specifies that flammable liquids have a flashpoint below 100°F (37.8°C). Combustible liquids have a flashpoint at or above 100°F (37.8°C) and below 200°F (93.3°C). At normal room temperatures, flammable liquids can produce enough vapor to form burnable mixtures with air, and can result in serious fire hazard. Flammable liquid fires burn very quickly and also give off a lot of heat and clouds of thick, black, toxic smoke. Combustible liquids at temperatures above their flashpoints can also release enough vapor to form burnable mixtures with air, and hot combustible liquids can be serious fire hazards as flammable liquids. Most flammable and combustible liquids flow effortlessly. Small spills can cover large areas. Materials such as wood, cardboard and cloth can easily absorb combustible and flammable liquids. After spills are cleaned up, unsafe amounts of liquids can still remain in surrounding materials and continue to release hazardous vapors.

There is no existing database on the number of ASTs, their location, container sizes, contents, availability of contingency plans, proximity to structures, history of any past releases, age of containers, method of installation, owner/operator(s), for Aneth, and the entire Navajo Nation, due to absence of regulations for ASTs (Luther, 2006). It is known that ASTs

are being utilized at schools, tribal fleet maintenance yards, tribal airports, sites of sand and gravel operations, tribal ranches, federal facilities (e.g., BIA maintenance yards), and in association with convenience stores.

No spills have been reported to the Chapter, or to the Navajo Nation Government for any ASTs in Aneth. Based upon the absence of any information on past spills or releases for ASTs in Aneth, the likelihood of future occurrences of spills or releases from ASTs in Aneth is unlikely. There were also no reports of past fires or explosions of ASTs in Aneth, therefore, the likelihood of future occurrences of fires or explosions from ASTs in Aneth Chapter is also unlikely. While it is unlikely that human health and environment could be impacted from future occurrences of spills, fires or explosions, the potential for impact to human health and environment still exists.

Due to continued business and economic growth in all areas of the Navajo Nation many chapters are experiencing new services that include fuel storage and distribution locations. As a result, above ground storage tanks are being located in areas that could impact adjacent structures by fire or explosion.

Sewage Lagoons

There are three sewage lagoons in Aneth. Two lagoons are owned and operated by the Navajo Tribal Utility Authority (NTUA), and one lagoon is owned and operated by the Bureau of Indian Affairs for the Aneth School. According to the Red Mesa NTUA sub-office, there have been no releases of waste from the sewage lagoons in Aneth. All are maintained regularly, and any future lagoon expansions, or new sites for new lagoons will be planned properly.

Based upon the absence of any documented past releases or overspills from the sewage lagoons in Aneth, there is little likelihood of future occurrences of releases or overspills, although it is possible that spills have occurred but have remain unreported. Although it is unlikely that human health and environment could be impacted from future releases or overspills from the sewage lagoons, there are still concerns of the potential for impact to human health and environment.

Potential impacts from overflows of sewage lagoons are disease-carrying organisms, and fecal coliform. Fecal coliform are bacteria born in both human and animal waste that can cause illness or can designate the presence of other harmful bacteria.

Sewage lagoons are not considered a significant man-made hazard in Aneth.

Results of Analysis and Recommendations for Improving Environmental Planning and Mitigation Process

Many opportunities exist for the Aneth Chapter to encourage interest in environmental and mitigation planning. The Aneth Chapter is its most valuable asset and its most knowledgeable resource for its future. Contemporary approaches such as technical methods and policy development, in combination with cultural and traditional guidance, can result in strategies to mitigate the man-made hazards unique to Aneth.

Technical and Policy Approaches

A number of technical and policy approaches are recommended for improving the environmental planning and mitigation process in Aneth Chapter. The technical strategies will entail collaboration with stakeholders within the community, and jurisdictions with authorities to manage natural resources and local development in Aneth. Policy approaches will include planning and development of strategies by the Aneth Chapter that are Chapter-driven to

achieve participation and promote policy considerations and local decisions that represent traditional, cultural, and contemporary interests of community members.

Technical Recommendations

The actual location and number of man-made hazards is unknown by the Aneth Chapter. Information gleaned from past assessments, reports, including anecdotal information are not entirely current or consistent. Assessments to characterize the man-made hazards identified by Aneth Chapter shouldbe a technical undertaking that can improve environmental planning and mitigation processes. The following technical recommendations will facilitate a better understanding of where the man-made hazards exist, and assist in identifying the proper responsible parties for joining in mitigation planning with Aneth Chapter.

1. Classify and map vulnerable locations.

To effectively mitigate threats, the characteristics of specific hazards need to be identified. Mapping is one key method to identify hazards to vulnerable areas, including planning, evaluation of structural and non-structural mitigation measures, retrofitting, new construction, land use control, development, insurance, etc.

The Aneth Chapter, in collaboration with key mitigation programs or organizations such as the Navajo Nation Department of Emergency Management, Division of Community Development, Indian Health Service, Environmental Protection Agency, Land Department, and others, will identify areas most vulnerable to the man-hazards identified by the Chapter. Maps should be created to illustrate related hazard characteristics and delimitation of impacted areas.

2. Restrict new development in the Chapter.

This premise must be fully understood and supported at all levels of Chapter, Tribal, and Federal government. Decision makers responsible for approving land withdrawals for any types of development need to be adequately trained and educated in the application of pertinent laws, policies, or codes, that exist to increase protection of public and non-public property and assets, including cultural property.

Key Chapter Officials should monitor and ensure that any new development undertaken in the Chapter does not increase vulnerability.

3. High concentration areas should be situated in areas of moderately low hazard vulnerability.

Areas proposed for development comprised of dense population, such as housing development clusters, or businesses, should be planned for and located in areas that are fairly low risk. Policies or local code development should be implemented and disseminated to project proponents, developers, Tribal programs, and Chapter organizations such as the Chapter Planning Committee, Grazing Officials, and others, to increase their understanding of the importance of developing areas within the Chapter that are, or may be, incompatible with population density and proximity to man-made hazards.

Unlined waste pits receive waste by-products of drilling and production activities, and can contribute to soil and water contamination, and can minimize future development when the drilling sites, well pads, and drilling pits are abandoned. Amendments to existing regulations, or development of new regulations, regarding disposal of drill cuttings, production fluid, and other waste by-products from drilling and production, could be proposed by the Chapter to the Navajo Nation and the BLM. On the Navajo Nation, regulations prohibiting

on-site disposal of waste from drilling and production into associated waste pits are non-existent.

4. Use controls .

Physical barriers such as fences can be effective to prevent access to waste pits associated with production activities. Fences can prevent livestock and wildlife from drinking contaminated production water. Monitoring by the Chapter can generate reports of unmanaged areas where fencing is in disrepair, or observations of livestock or wildlife at the production or drilling sites (Capitan, 2006) Other forms of environmental institutional land use controls include limiting use of real property, surface water, ground water, engineering controls, easements, covenants, restrictions, environmental notices, or other controls that will protect human health, environment, and cultural areas.

The Navajo Nation, through the Navajo Nation Code at 6 N.N.C. § 1101 (Navajo Nation Council; Office of Legislative Counsel, 1995) discusses the preparation of a Comprehensive Community Plan for a community. Development of such plans are to include, but not be restricted to, an open space plan, land use plan, thoroughfare plan, or community facilities plan. Within this framework, environmental institutional controls can be developed by Aneth Chapter to mitigate risks posed to human health, safety, welfare, environment, or cultural interests.

Policy Recommendations

1. Form partnerships to increase communication and action in mitigation and environmental planning.

Aneth Chapter is situated within a number of political jurisdictions including San Juan County, the State of Utah, the Navajo Nation, USEPA Region IX, and the Chapter itself as a

local government. Understanding the roles and responsibilities of county, the state, Navajo Nation, and itself as a local government, in addressing issues related to its constituencies, better prepares the Chapter to promote their mitigation and environmental planning efforts. The formation of partnerships will lead to the creation of other partner affiliates with common interests, goals and objectives related to mitigation planning.

Through some of the participatory processes during the development of this professional project, the Chapter acquired new knowledge of Navajo Nation programs and federal programs that were interested in raising awareness in collaboration with the Chapter, about mitigation of man-made hazards. Similarly, Navajo Nation programs, and representatives of FEMA, offered their technical assistance to the Chapter in support of mitigation planning.

Depending upon the political nature within Aneth and in the interests and functions of the tribal government, San Juan County, and the State of Utah, local development can be designed to coincide with mitigation rather than response to hazard incidents as they occur. The Aneth Chapter can exert its local governance capabilities by seeking effective and efficient ways to grow an informed network to organize a successful mitigation planning initiative. Effective mitigation planning for the future of Aneth can significantly alter the knowledge base, and increase the local capabilities in addressing mitigation of local man made hazards.

Communication is essential to future collaborative efforts and in establishing and maintaining partnerships.

2. Increase collaboration with owners and operators of facilities known or suspect as man-made hazards.

Participatory planning processes that address pollution prevention, waste minimization, voluntary reductions in emissions, emergency preparedness, and mitigation, will increase the understanding of the goals and objectives of the facilities and their operations; and, furthermore, increase the awareness of facility owners and operators of the specific concerns of public interest with regard to protection of human health, environment, and cultural property and values.

The Aneth Chapter and facilities owners and operators should identify priority measures for hazard mitigation as related to human health, environment, cultural property and values.

At the local level, the Chapter can become informed of the regulatory stipulations in the Surface Use Agreements, become knowledgeable about monitoring aspects of the particular oil and gas activities, and report non-compliance activities to the regulatory authorities. The monitoring role undertaken by the Chapter can increase local knowledge and interest in expanding the people's capability to monitor oil and gas operations, to minimize contamination from releases, and to encourage companies to develop mitigation plans in addition to response or contingency plans

3. Aneth chapter officials and community members become involved and more informed about NEPA process.

The National Environmental Policy Act (NEPA), adopted in 1969, to ensure the public and decision makers are aware of impacts to the environment before proceeding with any major federal action, is one practical avenue to learn more about oil and gas activities, and

leasing, on tribal lands, to participate in the leasing process, and offer recommendations for mitigation of impacts.

4. Aneth chapter officials become more informed and involved about the BLM leasing process within the NEPA process.

The BLM leasing procedures makes the leasing process a federal action, and development of an environmental analysis, known as an environmental assessment (EA) is required. The BLM is also required to seek comments from other federal agencies, such as the BIA, and local governments (Navajo Nation, and Chapters) that might be impacted by a project. The NEPA process is intended to disclose likely impacts, alternatives, and mitigation measures. A public participation component in the NEPA process provides for obtaining input from concerned citizens, or any other stakeholder, to comment on the issues and alternatives to impacts as a result of the project.

The NEPA process, as applicable to oil and gas development, essentially comprises four (4) phases: (1) Commenting on land use plan development (for a BLM land use plan), (2) Lease sales, (3) NEPA analysis for full field development, or for exploratory pilot projects, (4) Applications for Permits to Drill (APDs) .For the duration of the lease that is approved for continued oil and gas production and development, there will be accompanying environmental effects.

The specific issues that should be raised by the Chapter, as an "interested party" and stakeholder, are soils, water, hazardous waste, plants and wildlife, archaeological and historical sites, visual quality, and air quality.

Surface water and ground water can be impacted by drilling activities. In Aneth, a past release impacted surface water, and a major company (a lessee) was fined by the

U.S.EPA for violating the Clean Water Act. The leasing decisions of the BLM and the Navajo Nation should ensure protection of water quality standards. Involvement in the NEPA process can provide the Chapter with information on the likelihood of impacts to water quality due to oil and gas operations.

5. Consult with appropriate Navajo Nation programs on proposed development and potential impacts.

Hazardous wastes anticipated during the proposed projects are required to be listed in NEPA documents. The Chapter can consult with the Navajo Nation Hazardous Waste Program and learn about the wastes that derive from development activities, and the waste types that are hazardous and need to be managed according to tribal or federal regulations. This can alleviate misunderstanding of the differences between hazardous waste and non-hazardous waste, and depending upon the extent of monitoring by the Chapter, can assist in reporting illegal waste disposal practices to the proper tribal or federal enforcement authorities.

For concerns related to plants and wildlife, the Chapter can consult with the Navajo Nation Fish & Wildlife Department, Natural Heritage Program. The department maintains a listing of federal endangered and sensitive species, including a listing of Navajo endangered and sensitive species. Learning about the habitat of threatened or endangered federal and tribal species will encourage planning considerations in areas that contain critical habitat, and during the NEPA process, the Chapter can provide comments about their concerns to new development that may impair habitat, and protect cultural ecology.

Archaeological and historical sites are found throughout the Navajo Nation, including Aneth. In ascertaining the locations of archaeological and historical sites, the BLM is to

consult with the State Historic Preservation Office and the Navajo Nation about such sites in the area proposed for development.

If the Chapter believes that an area contains significant cultural resources that may have been overlooked, the Chapter can ask the BLM and the Navajo Nation to conduct a thorough cultural resources survey before any surface disturbing activities begin, or before the issuance of any leases.

Soils will be impacted from exploration activity, construction of access roads, well pads, and pipelines. The results can be increased erosion, loss of important topsoil, and increase in runoff. The Chapter can request that it be included in the environmental review process and contribute to the review of environmental documents and provide comments to discourage severe soil impacts during project activities. The project proponents required to complete environmental documents often work directly with the tribal government, rather than individual Chapters, and this practice often results in bypassing Chapter review and Chapter comments for activities and impacts directly at the Chapter level.

The presence of oil and gas wells can be disruptive to the vista of any area. The BLM environmental assessment process asks the existence of a land use plan. Aneth does not yet have an approved comprehensive land use plan, and the BLM is aware of this. Generally, if a land use plan was in existence before an application for drilling is submitted, the land use plan, if it contains reference to an ordinance regarding visual quality, will serve as the guide for siting, or may even prohibit placement of an operation.

6. Become familiar in tracking Applications for Permit to Drill(APDs).

The APD is the most common application of a lease-type document initiated for development in Aneth. The lessee needs an approved APD before he/she can pursue any

activity that disturbs the surface of a leased parcel. An APD is in the fourth and final stage before drilling actually occurs. It is at this point that public involvement should be engaged. For an APD, at a minimum, the NEPA process requires an EA for environmental analysis. This is also the last stage where the public can provide input, voice concerns, and appeal, if necessary, if an APD was approved unlawfully.

A proper APD will contain a drilling plan and a surface use plan. The drilling plan will explain the drilling program, map out the surface and underground areas that will be disturbed, provide geological information, predict hazards (releases of oil to adjacent waters), and recommend avoidance measures to releases, or mitigation of the effects from releases. The surface plan will explain the location of drill pads and roads, specific information of pad construction, details for managing waste material, and reclamation of the surface. The BLM must approve the drilling plan and surface use plan before activities can begin.

Before the BLM can approve an APD, it must post a public notice of the action proposed by the lessee. The public notice will contain information such as the terms of the lease, a map, and a general description of the affected land. Upon receipt of an APD, for thirty (30) days the BLM must also provide notification to, and consult with "interested parties" pertaining to the APD. The thirty (30) days period is an important period during which the public can notify FLM of their concerns regarding the proposed drilling activity. At the APD public notice and consultation stage, if there were prior inadequate NEPA analyses (Stage 1, the RMP stage, Stage 2, the lease stage, or Stage 3, project level stage), challenging an APD can halt development until the NEPA process is properly followed and completed.

Aneth Chapter officials do not regularly receive the EA's for APDs (Capitan, 2006). The process for commenting during the NEPA process has become standardized and is more

beneficial to the applicants for the APDs and environmental assessments to be routed through the tribal government for commenting (Draper, 2006). This routing process is considered acceptable to the BLM and APD applicants in fulfilling the NEPA public participation process. The Chapter can request the BLM and the Navajo Nation to directly involve the Chapter by providing public notice at the Chapter, or by mailings directly to the Chapter on any APD applications and environmental assessments.

Bonding requirements are another aspect in approving an APD. An operator must provide a bond before an APD is approved and before proceeding with any surface disturbing activities. The bonding is to ensure compliance with well plugging and reclamation of the leased area, including any subsequent restoration required, including surface waters that may have been impacted by drilling operations (Draper, 2006).

Through public involvement, the minimum bonding ($10,000.00 per lease, per operator; $25,000.00 blanket amount for all leases in one state, or all leases on the Navajo Nation; and $150,000.00 for all leases nationwide) can be raised if the expected costs of reclamation are considered to be substantial.

With Chapter involvement, clean up estimates can be reported to the BLM officials who have the discretion to raise bond minimums (43 C.F.R. ß 3104.5(b)). Bonding can be important if an operator abandons operations. Bonding is also important leverage in negotiating the initial design of a project. The bonding monies can be used to restore or reclaim the surface lands.

Continued land use for oil and gas development can impair the landscape and render the land unsuitable for land uses such as grazing, cultivation, and building residences. Once an operator obtains a valid lease from the BLM, the operator has a contractual right to develop

for oil and gas. The leasing stage becomes critical, once the lease is formalized, the operator's right to develop, if challenged, is very rarely denied. The operator will drill a number of exploratory wells, referred to as "wildcat" wells, to test for commercially acceptable quantities of oil and gas. If and when the operator's Application for Permit to Drill (APD) is approved, the operations can last for decades.

7. Learn about existing tribal programs, their missions and authorities

Gaining knowledge about the authorities and goals of tribal programs with a focus on waste management and minimization can assist the Chapter in addressing unsafe waste disposal. For example, the Resource Conservation Recovery Program (RCRP) of the Navajo Nation Environmental Protection Agency developed an enforcement initiative to address illegal dumping throughout the Navajo Nation. The goals of the initiative are to:

- Reduce and prevent illegal dumping on the Navajo Nation.
- Increase public awareness of illegal dumping.
- Promote integrated waste management by working collaboratively with the Division of Community Development, Solid Waste Management Program.

The RCRP utilizes administrative and judicial enforcement approaches as authorized through the Navajo Nation Solid Waste Act. The Navajo Solid Waste Act, Prohibited Acts, Section 201-Disposal, indicates that no person shall:

- Dispose of any solid waste in a manner that will harm the environment, endanger the public health, safety and welfare or create a public nuisance.
- Dispose of any solid waste in a place other than a facility that is in compliance with these (Solid Waste) Regulations and other applicable laws.
- Dispose of any waste not defined as Solid Waste in a solid waste landfill facility.

Further, Section 204: Open Dumping, states:

- All open dumping shall be prohibited.

Illegal dumping is subject to various fines and penalties. Within the boundaries of the Navajo Nation, if an individual illegally disposes of their solid waste, the administrative remedies are initially sought:

- Waste must be picked up at the site.
- Waste litter will be picked up along road ways.

Littering is also addressed in the Navajo Nation Code, Title 17, subsection 381: Littering (the Littering Law) (Navajo Nation Council; Office of Legislative Counsel, 1995). The code establishes another means of addressing improper waste disposal. A Navajo Nation officer can issue a citation or a Notice of Violation. Any person found guilty of littering may be sentenced to serve not less than four (4) hours, nor more than twenty (20) hours, picking up and clearing litter from the highways, roads, or public places of the Navajo Nation. An individual can also be issued a citation for Criminal Nuisance (T17-486(A)(1)) if:

- By conduct either unlawful in itself or unreasonable under all the circumstances, he or she knowingly or recklessly creates or maintains a condition which endangers the safety or health of others.
- In addition, under the Navajo Nation Solid Waste Act, you can be assessed a civil penalty of at least $500.00 or a criminal penalty, upon conviction, of at least $500.00 or 180 days in jail.

Management and control of open dumping, since the inception of Navajo Nation laws regarding open dumping, has essentially been through civil enforcement, including to a lesser degree, criminal enforcement. Civil enforcement has been minimally successfully through the

issuance of notices of violations to individuals reported anonymously or directly to the enforcement section of the Navajo Nation Environmental Protection Agency. However, with current staffing of the Enforcement Department (Navajo Nation Environmental Protection Agency), there are resource limitations on the staff of four (4) enforcement officers in traveling throughout the Navajo Nation to investigate all reports of open dumping.

Public education has been an effective tool that has been useful in deterrence of open dumping. Tribal programs that routinely educate the public about open dumping and other integrated solid waste management issues include (1) Resource Conservation Recovery Program (RCRP), of the Navajo Nation Environmental Protection Agency, (2) Solid Waste Management Program (SWMP), of the Division of Community Development, (3) and the local Chapter where informational material are regularly posted, and presentations are conducted by tribal organizations upon invitation by the Chapter. Other tribal programs that provide public outreach on solid waste topics, as related to pollution prevention, and violations of other environmental laws, are (1) Water Quality Program, (2) Air Quality Program, (3) Environmental Health, (4) Pesticide Program.

Closure and clean-up of open dumps on tribal lands is challenging due to the lack of infrastructure and local economic conditions. On the Navajo Nation, there is a significant lack of infrastructure such as public drinking water systems, wastewater systems, and housing. Solid waste facilities are not priorities of Chapters when there are more critical infrastructure and economic needs.

Further, The Indian Lands Open Dump Cleanup Act of 1994, enacted October 22, 1994 (Public Law 103-399), that identified Congressional concerns of solid waste open dumps on American Indian or Alaska Native (AI/AN) lands, assigned considerable responsibility to

the Indian Health Service to address solid waste deficiencies, report their progress in addressing their responsibilities, identify concomitant levels of funding for open dumps to become compliant with regulations, and develop solid waste plans for every AI/AN entity. The Indian Health Service subsequently fulfilled its responsibilities; however, the congressional mandate was not funded to meet the reported estimated provided by the Indian Health Service.

Local mitigation actions that can be undertaken independently by the Chapter, and in cooperation with jurisdictions, can mitigate the potential hazards to human health and the environment. Significant issues and recommended mitigation actions related to open dumping are:

New open dumps are being created, possibly due to scattered housing development, and the general reticence of individuals about open dumping.

New open dumps can be created due to increased development and the continued reticence and disinterest in open dumping issues. Local intervention can be accomplished by conducting interviews with individuals or families living in proximity to active open dumps and new open dumps that appear to be developing in adjacent or new locations. Interviews can provide insightful information into the perceptions people have about open dumping, social and economic circumstances that may prevent proper disposal practices, or other barriers. Information derived from the interviews can be used to develop incentive programs, land use controls such as fencing to deter access to certain areas where open dumps are being created, development of local codes or ordinances prohibiting open dumping within the Chapter, or strategy options with other tribal programs and department, such as the Solid Waste Management Program, Navajo Nation Environmental Protection Agency, Legislative

Branch, and Judicial Branch, to increase civil enforcement activities in the area, or to develop collaborative outreach programs.

8. Collect fees for solid waste disposal and increase enforcement

At Aneth, there have been past efforts to establish local and sustainable solid waste transfer station operations. However, the Chapter has been unable to independently support such operations. There continues to be a lack of accessible, sustainable, and proper solid waste disposal facilities due to funding constraints, uncertainty over future funding for operation and maintenance, and the disinterest, inability, or refusal of users to pay a tipping fee.

Citizen support in paying for proper waste disposal is essential to developing a sustainable waste disposal facility. Public opposition to paying disposal fees must be understood; and, conversely, the public needs to better understand the risks of open dumps to human health and environment, including culture, and wildlife habitat. Citizen participation in discussions, and planning and development of fee schedules, can foster willingness to participate in a fee-based waste disposal program.

Cost-sharing arrangements with adjacent chapters, or with current recipients of waste disposal services, such as the NHA housing area, local businesses, and schools, could be feasible. The Solid Waste Management Program has provided technical assistance to many Navajo Nation Chapters in analyzing the feasibility of options such as cost-sharing with countries, states, and other non-tribal entities. The Indian Health Service has provided matching funds to develop solid waste facilities, such as transfer stations. Counties and states have contributed funds to construction of transfer stations, and other collection sites, including providing funds for maintenance when cost-sharing agreements have been established.

Characterization of open dump sites is essential to planning closure and clean-up actions. The Solid Waste Management Program has conducted some characterization of nine open dumps within the Chapter, although within the program's priority scheme, the open dumps in Aneth Chapter are not in the top half of the 465 open dumps on the Navajo Nation prioritized listing for closure and clean-up, even if funds became available. The lack of local resources, such as knowledge and experience in performing waste characterization inventories, and funding to undertake such projects, exacerbates existing interrelated constraints at the Chapter level, and at the level of the tribal government.

The nine open dumps in Aneth primarily comprise surface scatter, with some waste buried in scattered locations throughout the dump sites. No evidence of hazardous waste was observed by Wilbur Capitan, Aneth Chapter Coordinator, and me, at the dump sites. Pollution in areas predominately comprised of surface scatter can be collected, transported, and co-mingled at a predetermined primary receiving location. In previous years, the Navajo Nation Environmental Protection Agency, with funding received from U.S.EPA, developed local projects known as "Operation Green Day" in each participating Chapter. Operation Green Day activities at participating Chapters centered on collection and disposal of solid waste. The Chapter and Navajo Nation EPA provided on-site health and safety training for volunteers before organizing in groups to pick up surface scatter. The collected waste was then disposed at a central location where a 30 cubic yards open top bin was located. The Green Day expenses, composed of transportation and disposal fee for the bin and occasionally heavy equipment, were paid for by the Navajo Nation Environmental Protection Agency. With the assistance of the tribal government, the Chapter can undertake similar collaborative projects that will address health, safety and well-being issues related to open dumping. Similar

collaborative proposals could be introduced to other jurisdictions, such as local businesses, schools, counties, towns, and the state.

Civil and criminal enforcement of violations of the Navajo Nation Solid Waste Act, littering, and other related violations such as dumping in forested areas, water ways, etc., lie with the tribal government. In Aneth, there is no Chapter level code that addresses open dumping. Solid waste violations are addressed primarily by applicable tribal programs, such as the Enforcement Department of the Navajo Nation Environmental Protection Agency, or the Navajo Nation Resource Enforcement Department, Resource Enforcement Officers. Navajo Nation police officers can also enforce the Solid Waste Act through issuance of a citation for criminal nuisance (T17-486(A)(1)) if it can be established that the littering was conducted knowingly or recklessly.

The protocol followed by the Enforcement Department of the Navajo Nation Environmental Protection Agency, in addressing complaints or reports of solid waste violations is:

1) Receive complaint or report. A standard complaint form is completed by a complainant and submitted in writing, or reported anonymously via telephone to the Resource Conservation Recovery Program (RCRP), or the Enforcement Department.
2) If the complaint is received by the RCRP Program, the program proceeds with a civil inquiry/investigation by traveling to the site of open dumping to obtain evidence such as correspondence or other items with names or addresses from the items dumped. If names or addresses or found, the RCRP staff will directly visit the individual(s) to issue a Notice of Violation that describes the solid waste

found, and the location of the waste. The violator(s) are notified that they must clean up the dumped solid waste within ten days.

3) If the waste is not cleaned up within ten days, the records of the inquiry/investigation are forwarded to the Enforcement Department of the NNEPA. The Enforcement Officers will issue a citation for littering. At this point, the matter becomes a criminal issue.

4) The citation for littering is forwarded to the Office of the Prosecutor for further disposition, including scheduling of pre-trial hearing, etc.

Under the Navajo Nation Local Governance Act, once a Chapter has been certified under the Act, the Chapter has the authority to develop its own local codes. Local code or ordinance development can be developed by the Chapter that addresses illegal dumping. In conjunction with code or ordinance development, the Chapter can also develop a local program to prevent illegal dumping, monitoring illegal dumping trends, plan on-going clean-up efforts, and communicate with other tribal and non-tribal organizations that address illegal dumping issues to plan, develop, and implement effective prevention strategies.

Aneth Chapter can propose that existing laws, such as the Navajo Nation Solid Waste Act, be amended to increase the current civil and criminal penalties, or to strengthen the effectiveness of the Act to achieve increased compliance. Amending the Act from meeting the elements of "knowingly and recklessly" to a "preponderance" could attain more compliance with the Act, deter violations, and increase the number of penalties and related fees. Accomplishing such as amendment would require public noticing and legislative support from appropriate committees of the Navajo Nation Council, and would not be any more difficult than other amendments made to tribal acts and codes (Garnenez, 2007).

Generally, Aneth Chapter is not unique with respect to their perspective that illegal dumping is not being addressed effectively. The remoteness of Aneth may be the most significant reason for the Chapter's solid waste challenges. The greater the distance to transport waste to a permitted landfill, the greater the transportation costs. Transportation of waste from Aneth is further challenged with a network of unpaved roads, and costs to individual households for which waste disposal fees are extra expenses that they are unable to afford. . Lack of waste disposal locations and alternatives to waste disposal are common in rural and remote areas, especially on tribal lands. Areas that lack pick-up service for waste experience increases in household and other wastes being dumped. Densely concentrated areas are more easily provided pick-up services (municipal household waste collection services) than rural and remote areas where housing and businesses are scattered, spaced wide apart, and collection routes are not completely accessible by established and maintained transportation routes. Transfer stations and collection sites with roll-off bins that collect disposal fees may not be conveniently located, although the disposal fees may be minimal. Waste such as tires, appliances, and car batteries may be prohibited at transfer stations or not accepted at roll-off bins locations. Aneth Chapter has not served as a site for special collection of potentially hazardous waste. Designation of special days for collection of potentially hazardous waste has occurred only recently on the Navajo Nation. In 2007, special collection days were held, one day each, at Ganado, Arizona, and Kayenta, Arizona. In 2006, one day of collection was held at Tuba City, Arizona, Window Rock, Arizona, and Holbrook, Arizona, a border town. The Holbrook, Arizona collection site was coordinated with the Hopi Tribe, and Navajo County. The special collection days were funded through U.S. EPA, and with the Holbrook, Arizona location, a combination of county, state, and federal funding (Roan, 2009).

9. Site suitability and incompatibilities need to be addressed

Inconsistencies in locating explosive and flammable hazards, such as above ground storage tanks (ASTs), near people and property have not been addressed in Aneth. The incompatibilities in development are not exclusive to Aneth, rather they exist throughout the Navajo Nation. However, within the Aneth context, the extent of oil and gas operations that currently use, or will use, above ground storage tanks for production purposes, can increase risk of spills, releases, fires and explosions. Contemporary municipalities often regulate location of explosive and flammable operations through permitting, zoning, or other similar means. In Aneth, siting explosive and flammable operations is unregulated and residences can occupy adjacent areas.

For federally funded projects, such as DHUD housing development, there is an applicable authority for use on the Navajo Nation to drive evaluation of proximity to explosive and flammable hazards. DHUD assistance requires grantees and recipients to comply with a NEPA (National Environmental Policy Act) driven environmental review and documentation process that includes an examination of proximity of DHUD-assisted project to explosive and flammable hazards. While DHUD-assisted projects require the evaluation of separation distance to the explosive and flammable hazard, projects assisted with private, tribal, or other federal sources such as the Indian Health Service (IHS), and Department of Interior (DOI), do not specifically require the evaluation of separation distance to residences or other structures.

DHUD technical procedures have been developed that include standards for determining acceptable separation distance near materials of an explosive or flammable nature. The procedures are found at 24 CFR Part 51C.

The DHUD regulation essentially applies to acceptable separation distance (ASD) standards for blast overpressure and thermal radiation, and does not apply to toxic fumes that could be released during a fire or explosion. The regulation also excludes high pressure gas and liquid petroleum transmission pipelines, and mobile conveyances, such as tank trucks, ships, railroad tankers, and barges. The regulations do not specifically provide recommendations for addressing geographic differences. For example, due to geographic variations, and regional development activities, some communities will be more affected by threats to explosive and flammable hazards than others.

For local purposes, on the Navajo Nation and in Aneth, the rural expansiveness may disguise significant threats, as the reservation's rural central places do not have the industrial development related environmental problems of densely populated industrial centers elsewhere, or in the primary and secondary growth centers of the Navajo Nation.

Summary and Conclusions

According to the results and analysis produced in this professional project, the Aneth Chapter has a variety of local resources that can be used to develop a local mitigation plan for man-made hazards. Of the recommendations presented as technical, policy, and originating from the Chapter, a combination of the recommendations, with emphasis on the varied interests of the stakeholders in Aneth, including traditional and cultural concerns, can generate a well-informed mitigation planning document that attends to minimizing impacts to human health, potential damages, casualties, physical, and economic losses due to pollution and contamination from man-made hazards.

Community capacity building is the most significant instrument that Aneth Chapter can pursue to plan for implementation of mitigation measures for man-made hazards. The

Chapter must realize its existing capabilities and understand that any capability limitations can be addressed through collaboration, cooperation, or use of other tools. Aneth's capacity to lead efforts in mitigation planning can involve training to understand risks, clean up concerns, including validating use of science with traditional knowledge to evaluate and address exposure to risks with practicing traditional or subsistence lifestyles in potentially contaminated areas, assessing local contemporary Chapter capability resources, and identify non-Chapter resources that can provide technical assistance to the Chapter in the implementation of mitigation goals and objectives. There is a strong cultural perspective regarding community capability that can be relied upon in continued community capacity building.

Once certified as an LGA-Chapter under the Navajo Nation Local Governance Act (LGA), the Aneth Chapter, will have significant authority to enact local policies or codes that can address mitigation of man-made hazards. Where the Chapter lacks authority to enact specific local laws, codes, or ordinances, the Chapter can collaborate with the tribal government and other jurisdictional entities to elevate Chapter citizen concerns, present recommendations, or engage in other meaningful communication to increase awareness of the potential impacts from man-made hazards.

The LGA of 1998, codified through Navajo Nation Council Resolution CAP-34-98, at Title 26 of the Navajo Nation Code (NNC), gives Navajo Chapters the local authority to conduct all local planning for the community, and provides Navajo Chapters with the ability to engage in other local governance processes (Navajo Nation Council; Office of Legislative Counsel, 1995). With regard to mitigation planning and implementation, the following provisions of the LGA are appropriately applicable for the Aneth Chapter.

Subchapter 1, B., Purpose

1. The purpose of the Local Governance Act is to recognize governance at the local level. Through adoption of this Act, the Navajo Nation Council delegates to Chapters governmental authority with respect to local matters consistent with Navajo law, including custom and tradition.
2. Enactment of the Local Governance Act allows Chapters to make decisions over local matters. This authority, in the long run, will improve community decision making, allow communities to excel and flourish, enable Navajo leaders to lead towards a prosperous future, and improve the strength and sovereignty of the Navajo Nation (Navajo Nation Council; Office of Legislative Counsel, 1995).

The exercise of decision-making is another specific authority provided to Chapters through the LGA. Aneth Chapter can enact ordinances through Chapter resolutions to achieve exercise of the authorities.

Subchapter 3, Section 103, Chapter Authority

1. To issue home and business site leases or permits.
2. To amend the land use plan to meet changing needs of the community.
3. To acquire property by eminent domain.
4. To adopt zoning ordinances consistent with the land use plan (Navajo Nation Council; Office of Legislative Counsel, 1995).

The Aneth Chapter is developing its land use plan and the Chapter anticipates using the plan for development of land use policies consistent with meeting the needs of the Chapter residents for housing, business, and other forms of growth. According to Aneth Chapter officials, a final draft of its land use planning document may be approved by the chapter's planning committee, and the Office of Chapter Government Development in 2009 (Capitan, 2006).

Over time, as Aneth Chapter has grown, improper or insufficient planning at the tribal government level has contributed to the factors involved in the evolution of man-made hazards in Aneth. While there has been some discussion at the Aneth Chapter level, and

within some programs in the Navajo Nation government on the merits of mitigating man-made hazards, there have been no specific approaches to mitigation that have addressed social and cultural values, equity in development, environmental justice, concerns on the part of local Chapter residents, Chapter officials, or sustainability issues; nor are there overarching comprehensive plans within the context of planning for the interrelated systems that have an interest in the management of natural resources, community and economic development. The Chapter has an opportunity for taking a leadership position regarding mitigation of man-made hazards by encouraging and driving discussions and reviews about the impacts of man-made hazards and using the discussion forums to interject sustainability considerations, and within a context of social and environmental justice.

The Aneth Chapter relies heavily on tribal programs to intervene in many issues, such as responding to Chapter reports of open dumping, spills, releases, and assessments. The local capacity for initiating or performing assessments as a means of case development can be developed. Similarly, building the local knowledge base in aspects such as monitoring of activities and incidences, can serve in protecting cultural and traditional resources in the Chapter that can be impacted by man-made hazards. Aneth Chapter is situated in an ideal location for monitoring the pathways that transport pollution, and can become actively involved in planning for addressing local and regional concerns about pollution and contamination from local and regional sources. Accessibility to grants, or partnerships with Navajo Nation, or non-tribal programs, are within reach and can increase the local capability for self-monitoring, technical recordkeeping, and policy development to better manage man-made hazards.

Mitigation of hazards associated with oil and gas activities will be perhaps the most challenging in comparison to mitigation associated with other hazards identified by the Chapter. Implementation of mitigation measures will be complicated due primarily to the multiple political jurisdictions and policy decisions made at all levels, including from the local Chapter level, tribal government, and on up to the federal government level. The policy makers and decision makers should consider the history, values, culture, availability of natural resources, and site suitability to discriminate between areas that may not be tolerant to new development, or modifications to existing development that exacerbate existing hazards, or introduce new man-made hazards.

The cultural and traditional ties to the land, its natural resources, and worldview of the local people, are what define the Aneth community. Many original settlers, descendents, and extended families, remain in the area and are struggling to characterize their cultural, economic, and environmental self-determination, in relation to their context to the urban and global connections they deal with. This will continue to be an on-going challenge and debate for Aneth Chapter and other Navajo Nation Chapters, including thousands of other small tribal communities.

What needs to transpire among the interest groups and stakeholders in Aneth, such as the policy makers in counties, states, the tribal government, including grassroots people whom are mainly comprised of those who still maintain and practice traditional and cultural values and beliefs, is to acknowledge the voices of those who will be most affected, and to include a democratic process that will address the potential inequities, and underrepresentation related to changing social, economic, and environmental forces. Over time, colonization has changed Diné values and practices. There are differing views among the Diné about preserving places

and landscapes. The opinions of the Diné about the values of cultural preservation are not about the advantages, but how it should happen without denying people of the advantages that can be derived from economic development, and the roles of modern social and political institutions (Kelly & Francis, 1994).There needs to be a focus on connecting people to share common interests, including sharing burdens, resources, and development of healthy relationships with other community members.

Policies should not simply focus on economic issues locally, regionally, or nationally. A holistic approach that involves the Chapter, public, and government at all levels, needs to collectively address economic and environmental issues that involve natural resources and mitigation of man-made hazards because of the correlation of natural resources development and the extractive activities that involve human-induced hazards.

While the ideal planning perspective includes and encourages dialogue and involvement at all levels of community, policy and decision making, especially with regard to development, the mitigation of man-made hazards in Aneth Chapter may finally be taken foremost and seriously when a significant incident occurs and retrospective assessment reveals that prevention could have saved valuable resources.

Local and regional mitigation planning can be dramatic if the support of Chapter officials, businesses, facilities owners and operators, Chapter residents, and others from numerous jurisdictions and resources with ties to Aneth, can participate in defining the planning area, and actively participate in the Chapter's certification process, development of enforceable regulations, enforcement capability, common purpose, and learning to use political tools to make changes. The Chapter and jurisdictional stakeholders, each have a role and responsibility to provide for the proper growth. However, in fulfilling its responsibilities,

each jurisdiction has, perhaps unwittingly, allowed its governing role to become narrowly focused to managing only within discrete political boundaries. In Aneth, political trends have assisted, sometimes maximized, but clearly have complicated the mix of jurisdictions, and their effectiveness in addressing man made hazards. However, the trends can be used to address issues shared at the Chapter level, county, tribal, and state levels. The political effectiveness also lies with the voting membership within the chapter, and can impact political decisions made by the tribal government, including political issues favorable for the Utah Navajo in voting numbers in county and state elections. Political influences through voting can encourage interest and action in mitigation planning.

For as long as the Aneth Chapter population, and the regional population continues to grow, there will be additional development and introduction of technology that can be accompanied by the potential for ma- made hazards. Within the same context, and with regard to oil and gas extraction activities, the Chapter will have to deal with the multi-faceted aspects of extractive development that will include the accompanying man-made hazards.

The development of this professional project has revealed some pathways to environmental protection for the Chapter, which could be the first Navajo Nation Chapter to move towards the development a plan for mitigation of man-made hazards. To realize the local potential, the analysis and recommendations through this project affords numerous points of reference for consideration, planning, and action.

LIST OF APPENDICES

Glossary of Terms..... **Error! Bookmark not defined.**

Glossary of Terms

Acceptable separation distance (ASD): The actual distance beyond which the explosion of combustion effect of a hazard is not likely to unnecessarily expose individuals to injury or buildings to damage from blast overpressure or thermal radiation flux levels in excess of the standards cited in 24 CFR Part 51 Subpart C. 51.203, as documented by DHUD (Department of Housing and Urban Development, 1999).

Air Pollution: Any substance found in the air that is not part of its natural composition or any substance whose concentration is higher than the concentration found in the air's natural composition (Institute of Tribal Environmental Professionals, 2007).

Air Pollutants: Air pollutants can be in one of two physical forms: particulate matter or gases. Air pollutants can be classified as primary pollutant, or secondary pollutant (Institute of Tribal Environmental Professionals, 2007).

Ambient Air: The air that surrounds us outdoors and to which we are constantly exposed (Institute of Tribal Environmental Professionals, 2007)

Blast overpressure: The pressure above normal atmospheric pressure on the surrounding medium caused by an explosion. Blast overpressure is measured in pounds per square inch (psi) (Department of Housing and Urban Development, 1999).

Clean Air Act Amendments: The 1990 amendments to the Clean Air Act by Congress were intended to improve the regulation of emissions of air toxics. The amendments also required all federal agencies to make sure that federal projects would not result in violations of federal air quality requirements, including federal lands designated for non-degradation of air quality (West Group, 1999).

Clean Water Act Amendments: The 1972 amendments to the Clean Water Act (CWA) provide for regulating point sources of pollution to waters of the United States. The amendments require anyone wanting to discharge a pollutant to first obtain a NPDES discharge permit, otherwise the discharge will be considered illegal (West Group, 1999).

Criteria Air Pollutants: Certain pollutants in the air that are found almost everywhere and that can be harmful to humans if amounts in the ambient air are above certain levels. In the U.S, the National Ambient Air Quality Standards (NAAQS) sets limits for criteria pollutants. In the U.S., NAAQS have been set for six criteria pollutants: particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, and lead. These pollutants are referred to as criteria pollutants because concentration standards for these pollutants were based on health and welfare standards (Institute of Tribal Environmental Professionals, 2007).

Cullet: Broken glass that appears as having been crushed; crushed glass that can be observed as reflective when scattered.

Forbs: Herbs other than grasses.

Gases: As air pollutants, gases include substances such as sulfur dioxide and carbon monoxide (Institute of Tribal Environmental Professionals, 2007).

National Environmental Policy Act (NEPA): Directs all federal agencies to examine the environmental consequences of federal action that significantly affects the quality of the human environment (West Group, 1999).

Mitigate: To cause to become less severe or aggressive; to reduce severity, or make less painful (FEMA, Integrating Manmade Hazards into Mitigation Planning, 2003).

Mitigation: Any continued action taken to reduce or eliminate long-term risk to life and property from a hazard event. Mitigation is also known as prevention when performed before a hazard event, and promotes long-term reduction of hazard susceptibility. The purpose of mitigation is to lessen the need for response as opposed to just increasing response capability. Mitigation can save lives, minimize property damage, and can be cost-effective and environmentally sound. Significant costs of disasters and hazard events can be reduced for individuals, communities, and all levels of government. Mitigation can protect needed community infrastructure, facilities, reduce liability, and lessen community disruption (U.S. Department of Homeland Security, 2003).

Particulate Matter: Small solid or liquid particles such as ash, dust, smoke, and mist. Sources include diesel engines, power plants, wind blow dust, and wood stoves (Institute of Tribal Environmental Professionals, 2007).

Preparedness: Plans and other preparations made with the intent to save lives, property, and to promote response operations (U.S. Department of Homeland Security, 2003).

Primary Pollutant: Found in the atmosphere in the same chemical form as when it was emitted from its source, such as carbon monoxide (Institute of Tribal Environmental Professionals, 2007).

Response: Actions and steps taken to provide emergency assistance, save lives, reduce property damage and swift recovery immediately after a hazard event or disaster (U.S. Department of Homeland Security, 2003)

Recovery: Actions and steps taken to return to a normal or better operating condition following a disaster (U.S. Department of Homeland Security, 2003).

Secondary Pollutant: Formed in the air as a result of chemical transformations of other pollutants or other substances. Tropospheric ozone is an example of a secondary pollutant. It is formed when nitrogen oxides react with organic compounds in the presence of sunlight (Institute of Tribal Environmental Professionals, 2007).

Sulfur Dioxide: A colorless gas compound made up of sulfur and oxygen. It sources include coal-burning power plants and industries, coal-burning stoves and refineries (Institute of Tribal Environmental Professionals, 2007).

Technological Hazards: The cause or source of an incident or something that happens from human activities such as transportation, storage, manufacture, collection, and use of hazardous materials. In a mitigation context, it is assumed that technological situations such as emergencies are accidental and their consequences are not intended (U.S. Department of Homeland Security, 2003).

Thermal radiation: The intense heat originating in waves from combustion (Department of Housing and Urban Development, 1999) .

The Mineral Leasing Act: A 1920 law enacted by Congress that promotes the mining of coal, phosphate, oil, oil shale, gas, and sodium, on the public domain. The Act and its amendments also governs leasing of public lands for developing deposits of petroleum, gas, coal, natural gas, sodium, phosphates, and other hydrocarbons in the United States. Under the Mineral Leasing Act, and later amendments, the right to produce federally-owned oil and gas (petroleum) is obtained in ten year increments through competitive bidding going to the highest bidder (Bureau of Land Management, 2007).

Man-made hazards: Hazards that are technological in nature, including terrorism. Technological hazards can occur from human activities such as manufacturing, transportation,

storage, and use of hazardous materials. Technological emergencies are accidental and their consequences are not intended (U.S. Department of Homeland Security, 2003).

Volatile Organic Compounds (VOCs): Are liquids that evaporate readily under standard ambient conditions, thereby creating pollutant gases (Institute of Tribal Environmental Professionals, 2007).

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