1976 - [redacted]
PUBLIC SERVICE Co. of NEW MEXICO
ANONYMOUS

190

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PNM RAPTOR STUDY

Introduction

The PNM raptor (birds of prey) study entails observing certain hawk, eagle and falcon species in various habitats as they utilize electrical transmission lines in northwest, north-central, south-central, and southwest New Mexico. It is done in conjunction with helicopter line patrol of such utilities. Birds of prey use various portions of transmission line pole structures such as: pole tops, cross-arms, side arms, x-braces, and static wires (lightning shields). Transmission lines of three voltage levels are involved: 115 kV, 230 kV, and 345 kV. Distribution lines are not addressed in this study as there are very few regularly flown. One, a 46 kV line from Albuquerque to Santa Fe is flown approximately 10 times a year. Data from it will be used but the emphasis of the study is directed toward transmission lines.

1976

Birds of prey are attracted to these man-made facilities because they afford tall vantage points for observing potential prey, roosting, perching and nesting. The heights of the portions of structures utilized by the birds varies from 35 feet (x-braces) to 80 feet (tops of poles). Cross-arms vary from 65 to 70 feet above ground. The variation in height is dependent on the voltage level of the transmission line. Higher voltages have higher poles and more widely spaced conductors.

Nine species have been observed on structures. They are: Cooper's hawk (Accipter cooperi), red-tailed hawk (Buteo jamaicensis), rough-

legged hawk (B. lagopus), ferruginous hawk (B. regalis), Swainson's hawk (B. swainsoni), golden eagle (Aquila chrysaetos), peregrine falcon (Falco peregrinus), prairie falcon (F. mexicanus), and American kestrel (sparrow hawk) (F. sparverius). Cooper's hawks and peregrine falcons have been found to be rare. However, the other seven species are observed in varying degrees of abundance at different times of the year. Marsh hawks (Circus cyaneus) have been seen frequently but not on structures. It is believed the other hawk, eagle and falcon species occurring in New Mexico have not been observed due to geographical, altitudinal, habitat, and behavioral characteristics. Species that vary in aburdance, common to rare, that have not been observed include Harris hawk (Parabuteo unicinctus), gray hawk (Buteo nitidus), zone-tailed hawk (B. albonotatus), black hawk (Buteogallus anthracinus), bald eagle (Haliaeetus leucocephaus), osprey (Pandion haliaetus), caracara (Caracara cheriway), aplomado falcon (Falco femoralis), and merlin (F. columbarius).

New Mexico encompasses a rich diversity in physiographic, physiognomic and corresponding biotic characteristics. Fenneman (1962), Bailey (1913), and Merriam (1898) have recognized these aspects and subsequently identified physical divisions faunal distributions and life zones respectively for the State. The transmission line system aerially inspected traverses major representations of features. The hawk, eagle and falcons utilizing transmission lines reflect the effects of physiognomic and habitat complexities in such areas.

The study will incorporate physiographic, habitat and physiognomic

features in portraying an ecologic picture of certain bird of prey species in New Mexico. The following factors are believed to be pertinent in compiling a statewide perspective:

1. How extensive is the utilization? Are certain areas (physiographic, life zones, etc.) evident as being more important than others?
2. What seasonal trends occur?
3. What yearly trends appear for the state?
4. What habitats appear as most important in the study?
5. Limited nesting information will also be available as a result of the study.

PNM RAPTOR STUDY

Raptor data presented in the following discussion is intended to update that of the 1975 PNM environmental analysis of the 230/345 kV conversion. That report contained data for both the WA and AF 230 kV transmission lines; only the latter is used here.

The 1975 report contained raptor data from December 1972 to March 1974. The updated AF data is for 1973 through 1976. The interpretations of the data can be used as a predictive model for raptor utilization of the new 345 kV transmission line which will parallel the AF line. This is because design and heights of wood pole structures for the new line and the existing line are similar, and therefore it is anticipated that raptor use of the structures will be similar.

METHODS

Data was collected during aerial inspection of the AF 230 kV transmission line. The helicopter flies approximately ten feet above and 35 feet to the side of the line. Air speed averages 50 knots. All features (cross arms, etc.) are in full view of the observer.

Pole structures are numbered consecutively. Thus, the specific location of an observed raptor can be noted. Also, portions of the structures utilized can be recorded.

Plant communities traversed by the lines are identified, then ruling spans for each line are used to extrapolate mileage of each community crossed.

NATURAL FEATURES OF THE AREA

VEGETATION

Three major plant communities are traversed by the AF 230 transmission line: grassland, juniper-grassland and pinon-juniper. The last two represent 12 percent of the area traversed; grassland accounts for the remainder. The vegetative discussion found in the appendix of this report details the important components and their variation. However, a general portrayal of the plant communities is provided here to establish a basis for understanding the prey populations associated with those communities.

Pinon-juniper woodlands are dominated by pinon (*Pinus edulis*) and one-seeded juniper (*Juniperus monosperma*). The understory is characterized by the shrubs big sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus nauseosus*), yucca (*Yucca glauca*), greasewood (*Sarcobatus vermiculatus* and prickly pear/cholla (*Opuntia* spp.). Important grasses are galleta (*Hilaria jamesii*), blue grama (*Bouteloua gracilis*, sideoats grama (*B. curtipendula*) and ring muhly (*Muhlenbergia torreyi*).

Juniper-grassland is generally an ecotonal area between high woodlands of pinon-juniper and lower grassland or grassland/shrub communities. *J. monosperma* is the major tree species. The understory contains plant

assemblages common to higher or lower elevations. These shrubs would be found, in less abundance, along with additional grasses such as Indian ricegrass (Oryzopsis hymenoides), three-awns (Aristida spp.), sacaton (Sporobolus wrightii) and alkali sacaton (S. airoides).

The nature and quality of the grassland varies considerably. Generally, the southern areas (approximately 25 miles northwest of Ambrosia Lake) are dominated by galleta, Indian ricegrass and dropseed (Sporobolus sp.), tumbleweed (Salsola kali) and lesser amounts of big sagebrush, shadscale (Atriplex confertifolia) and green joint fir (Ephedra viridis). Further north and in the general vicinity of Four Corners power plant the shrub species change somewhat with snakeweed (Gutierrezia sarothrae) attaining more importance, along with green joint fir and shadscale. The advent of the Navajo Indian Irrigation Project (NIIP) will alter the vegetative nature of the grassland from Hunter Wash northward.

ANIMALS

Several studies provide data on the area's characteristic fauna. The more pertinent ones are the environmental studies for the NIIP and the Western Gasification Company (WESCO) coal gasification project. These contain species composition and quantitative data. The low productivity and structural uniformity of much of the area account for the generally low populations of vertebrates which could serve as prey bases for raptors. A major exception here is the occurrence of prairie dog colonies which are important food sources to buteos and the golden eagle.

RESULTS AND DISCUSSION

Seven raptor species have been observed to utilize the AF line. Table 1 illustrates the number and percent of yearly totals for raptors observed. In descending order of importance, they are the American kestrel (Falco sparverius), red-tailed hawk (Buteo jamaicensis), golden eagle (Aquila chrysaetos), prairie falcon (F. mexicanus), ferruginous hawk (B. regalis), rough-legged hawk (B. lagopus), and peregrine falcon (F. peregrinus). The peregrine falcon was observed only once, in 1973. Swainson's hawk (B. swainsoni) and marsh hawk (Circus cyaneus) have been observed throughout the data collection period in the immediate vicinity of the AF line but not on the transmission structures.

Red-tailed hawks have increased in numbers from 1973 to 1976.

Species such as the ferruginous hawk, golden eagle and prairie falcon exhibited declines in 1976. It is suggested that ferruginous hawks and golden eagles are down in numbers because of the drastic reduction of prairie dogs that has occurred in the last one and a half years. The dog colonies have declined from the area in which the AF line bypasses Bisti Trading Post to a point three miles east of the Navajo Mine/Four Corners Power Plant. Those two raptor species have been observed diving from transmission line structures and acquiring prairie dogs.

Tables 2-5 portray the relative abundance of birds of prey observed on the AF line from 1973 to 1976. The relative abundance, expressed in birds/mile, remained fairly constant for all species in grassland. More

TABLE 1

Yearly Numbers of Each Raptor Species Observed Utilizing the Four Corners-Ambrosia Lake 230 kV Transmission Line

	1973[1]	1974[2]	1975[3]	1976[4]	Overall
Buteo jamaicensis	28 (16.7)[5]	45 (18.2)	56 (20.6)	46 (27.1)	175 (20.5)
Buteo regalis	10 (5.9)	31 (12.6)	18 (6.6)	4 (2.4)	63 (7.3)
Buteo lagopus	7 (4.2)	15 (6.1)	10 (3.7)	8 (4.7)	40 (4.7)
Aguila chrysaetos	27 (16.1)	44 (17.8)	52 (19.1)	27 (15.9)	150 (17.5)
Falco sparverius	77 (45.8)	89 (36.0)	101 (37.1)	72 (42.3)	339 (39.5)
Falco mexicanus	19 (11.3)	23 (9.3)	35 (11.8)	13 (7.6)	90 (10.5)
Falco peregrinus	1 (.006)	0	0	0	1 (.001)
	169 (0.23)	247 (0.26)	272 (0.24)	170 (0.23)	858

[1] 721 miles flown

[2] 927 miles flown

[3] 1134.1 miles flown

[4] 721 miles flown

[5] figures in parentheses are percent of yearly total

TABLE 2

Relative Abundance of Raptors Utilizing the AF 230 kV Transmission Line in Grassland, Grassland-Juniper and Pinon-Juniper Habitats 1973

	Grassland (632.8)[1]	Juniper Grassland (65.1)	Pinon Juniper (23.1)	Overall (721.0)
Buteo jamaicensis	24 (0.04)[2]	-	4 (0.17)	28 (0.04)
Buteo regalis	10 (0.02)	-	-	10 (0.01)
Buteo lagopus	7 (0.01)	-	-	7 (0.01)
Aguila chrysaetos	27 (0.04)	-	-	27 (0.04)
Falco sparverius	77 (0.12)	-	-	77 (0.11)
Falco mexicanus	16 (0.03)	-	3 (0.13)	19 (0.03)
Falco peregrinus	1 (0.001)	-	-	1 (0.001)
Overall	162 (0.26)	-	7 (0.30)	169 (0.23)

[1] represents mileage of habitat flown

[2] represents bird/mile

TABLE 3

Relative Abundance of Raptors Utilizing the AF 230 kV Transmission Line in Grassland, Grassland-Juniper and Pinon-Juniper Habitats 1974

	Grassland (813.6)[1]	Juniper Grassland (83.7)	Pinon Juniper (29.7)	Overall (927)
Buteo jamaicensis	43 (0.05)[2]	-	2 (0.06)	45 (0.05)
Buteo regalis	30 (0.04)	-	1 (0.03)	31 (0.03)
Buteo lagopus	15 (0.02)	-	-	15 (0.02)
Aguila chrysaetos	44 (0.05)	-	-	44 (0.05)
Falco sparverius	85 (0.10)	1 (0.01)	3 (0.10)	88 (0.09)
Falco mexicanus	21 (0.03)	-	2 (0.06)	23 (0.02)
Falco peregrinus	-	-	-	-
Overall	238 (0.29)	1 (0.01)	8 (0.27)	246 (0.27)

[1] represents mileage of habitat flown

[2] represents bird/mile

TABLE 4

Relative Abundance of Raptors Utilizing the AF 230 kV Transmission Line in Grassland, Grassland-Juniper and Pinon-Juniper Habitats 1975

	Grassland (994.4)[1]	Juniper Grassland (103.4)	Pinon Juniper (36.3)	Overall (1134.1)
Buteo jamaicensis	51 (0.05)[2]	1 (0.01)	4 (0.11)	56 (0.05)
Buteo regalis	18 (0.02)	-	-	18 (0.02)
Buteo lagopus	10 (0.01)	-	-	10 (0.009)
Aguila chrysaetos	52 (0.05)	-	-	52 (0.05)
Falco sparverius	97 (0.10)	-	4 (0.11)	101 (0.09)
Falco mexicanus	32 (0.03)	1 (0.01)	2 (0.05)	35 (0.03)
Falco peregrinus	-	-	-	-
Overall	260 (0.26)	2 (0.02)	10 (0.27)	272 (0.24)

[1] represents mileage of habitat flown

[2] represents bird/mile

TABLE 5

Relative Abundance of Raptors Utilizing the AF 230 kV Transmission Line in Grassland, Grassland-Juniper and Pinon-Juniper Habitats 1976

	Grassland (632.8)[1]	Juniper Grassland (65.1)	Pinon Juniper (23.1)	Overall (721.0)
Buteo jamaicensis	45 (0.07)[2]	1 (0.02)	-	46 (0.06)
Buteo regalis	4 (0.006)	-	-	4 (0.006)
Buteo lagopus	8 (0.01)	-	-	8 (0.01)
Aguila chrysaetos	26 (0.04)	1 (0.02)	-	27 (0.04)
Falco sparverius	69 (0.11)	1 (0.02)	2 (0.09)	72 (0.10)
Falco mexicanus	13 (0.02)	-	-	13 (0.02)
Falco peregrinus	-	-	-	-
Overall	165 (0.26)	3 (0.05)	2 (0.09)	170 (0.23)

[1] represents mileage of habitat flown

[2] represents bird/mile

variation was detected in juniper-grassland and pinon-juniper, where overall abundance ranged from .01 to .05 birds/mile in the former and .09 to .30 in the latter. No single raptor species was significantly more abundant in juniper-grassland. Depending on the year, red-tailed hawks, prairie falcons and kestrels have been more abundant in pinon-juniper than in grassland or juniper-grassland. Ferruginous and rough-legged hawks were observed only in grassland, as was the lone peregrine falcon. The two former species were usually observed in the sectors inhabited by prairie dog colonies. Rough-legged hawks were winter residents only (table 6). Ferruginous hawks occurred in the area throughout the year but were more common in winter than any other season. Red-tailed hawks, on the other hand, were observed throughout the year, most often in spring, summer and fall. Their numbers per mile of AF line flown have not varied significantly from year to year. Prairie falcons were most abundant in 1975, a trend similar to that observed on transmission lines in the Chihuahuan desert of southern New Mexico. However, their numbers/mile have not varied greatly from 1973 to 1976. Red-tailed hawks showed an increase in 1975 and 1976, also similar to what has been seen in southern New Mexico. Golden eagles exhibited a relatively stable abundance in the 1973-1976 period. Their numbers increase during fall and winter months.

PORTIONS OF TRANSMISSION STRUCTURES UTILIZED

The most frequently utilized portions of the AF 230 structures were tops of poles, cross arms, diagonal arms and static wires. These features are illustrated in the following figures of typical 230 and 345 kV structures.

TABLE 6

Monthly Numbers of Raptors Observed Utilizing the AF 230 Transmission Line 1973-1976

1973 AF 230

	GRASSLAND													JUNIPER-GRASSLAND												PINON-JUNIPER											
	J	F	M	A	M	J	J	A	S	O	N	D		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Buteo jamaicensis			2				-	7	2	2		7	24			-	-			-	-	-	-		-	0			-	1		-	1	-	1		2	4
Buteo regalis			1	2			2		1	3		-	10			-	-			-	-	-	-		-	0			-	-		-	-	-	-		-	0
Buteo lagopus			-	-			-	-	-	1		6	7			-	-			0	-	-	-		-	0			-	-		-	-	-	-		-	0
Aquila chrysaetos			3	-			4	2	1	13		4	27			-	-			-	-	-	-		-	0			-	-		-	-	-	-		-	0
Falco sparverius				20			11	4	1	9		10	77			-	-			-	-	-	-		-	0			-	-		-	-	-	-		-	0
Falco mexicanus			-	1			5	3	-	2		3	16			-	-			-	-	-	-		-	0			-	2		-	-	1	-		-	3
Falco peregrinus			-	-			-	-	1	-		-	1			-	-			-	-	-	-		-	0			-	-		-	-	-	-		-	0
			5	23			22	16	6	31		30	163			0	0			0	0	0	0		0	0			0	3		0	1	1	0		2	7

1974 AF 230

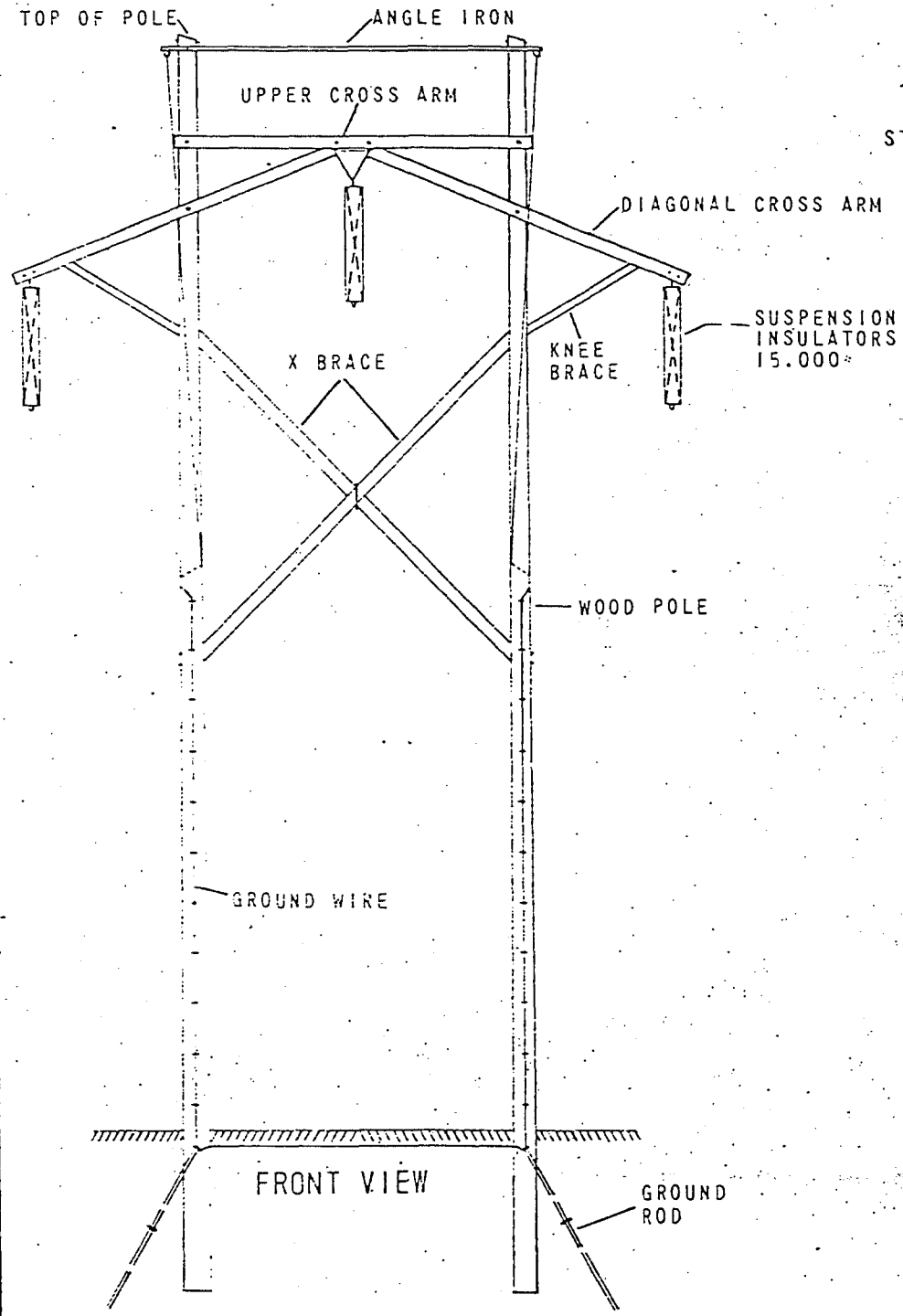
	GRASSLAND													JUNIPER-GRASSLAND												PINON-JUNIPER											
	J	F	M	A	M	J	J	A	S	O	N	D		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Buteo jamaicensis	2	-		7	3	6			1		15	5	43	-	-	-	-	-	-	-		-		-	-	-	2	-	-	-	-			-		-	2
Buteo regalis		1	1	1	9	1			3		15	6	38	-	-	-	-	-	-	-		-		-	-	0	1	-	-	-	-			-		-	1
Buteo lagopus	1	-	1	-	-	-			-		2	8	15	-	-	-	-	-	-	-		-		-	-	0	-	-	-	-	-			-		-	1
Aquila chrysaetos	2	1	7	-	2	1			2		13	12	44	-	-	-	-	-	-	-		-		-	-	0	-	-	-	-	-			-		-	0
Falco sparverius	-	2	1	14	10	8			8		15	8	65	-	-	-	1	-	-	-		-		-	-	1	-	-	-	1	1	-		-		-	1
Falco mexicanus	-	1	3	3	1	4			1		-	5	21	-	-	-	-	-	-	-		-		-	-	0	-	-	1	-	-	-		1		-	2
Falco peregrinus	-	-	-	-	-				-		-	-	0	-	-	-	-	-	-	-		-		-	-	0	-	-	-	-	-	-		-		-	0
	5	5	13	44	16	22			14		65	44	238	0	0	0	1	0	0			0		0	0	1	1	2	1	2	1	0		1		0	8

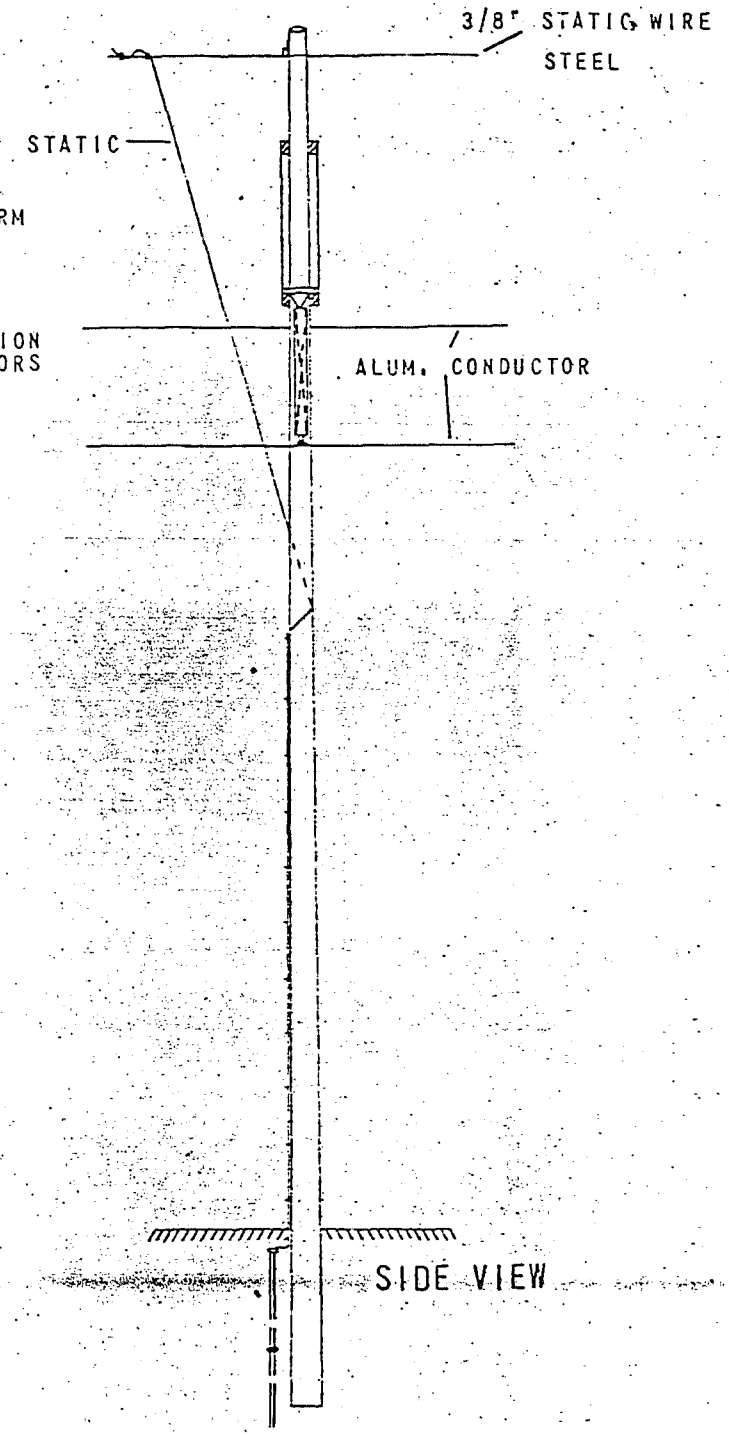
1975 AF 230

	GRASSLAND													JUNIPER-GRASSLAND												PINON-JUNIPER											
	J	F	M	A	M	J	J	A	S	O	N	D		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Buteo jamaicensis	5	1	4	-	2	9	7	3	4	-	5		40	-	-	-	-	-	-	-	1	-	-	-		2	-	-	1		-	-	1	-	-	-	
Buteo regalis	4	3	-	-	-	1	1	3	4	4	4		18	-	1	-	1	-	-	-	-	-	-	-		0	-	-	-		-	-	-	-	-	1	
Buteo lagopus	1	1	1	-	-	-	-	-	-	-	1		10	-	-	-	1	-	-	-	-	-	1	-		0	-	-	-		-	-	-	-	-	-	
Aquila chrysaetos	11	1	5	7	5	6	5	1	-	1	2		52	-	-	-	-	-	-	-	-	-	-	-		0	-	-	-		-	-	-	-	-	-	
Falco sparverius	4	3	4	11	1	3	9	14	24	14	12		97	-	-	-	-	-	-	-	-	-	-	-		0	-	-	3		-	-	1	-	-	-	
Falco mexicanus	5	1	1	1	-	1	3	2	2	2	5		32	1	-	-	-	-	-	-	-	1	-	-		1	-	-	1		-	-	-	-	-	-	
Falco peregrinus	-	-	-	-	-	1	-	-	-	-	-		1	-	-	-	1	-	-	-	-	-	-	-		0	-	-	-		-	-	-	-	-	-	
	30	11	17	21	13	19	25	24	34	30	29		260	0	0	0	0	0	0	0	1	1	0	0		2	0	0	5		0	0	2	1	0	0	

1976 AF 230

	GRASSLAND													JUNIPER-GRASSLAND												PINON-JUNIPER											
	J	F	M	A	M	J	J	A	S	O	N	D		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Buteo jamaicensis	2			1	16		13	1	5				45	-	-		-	-		-	-	1				1	-	-		-	-		-	-			1
Buteo regalis		-		4	-		-	1	2				7	-	-		1	-		-	-	-				0	-	-		-	-		-	-			0
Buteo lagopus				2	-		-	-	-				2	-	-		-	-		-	-	-				0	-	-		-	-		-	-			0
Aquila chrysaetos		1		1	-		2	7	7				26	-	-		-	-		1	1	-				2	-	-		-	-		-	-			0
Falco sparverius		8		6	8		15	12	17				69	-	1		-	-		1	-	-				2	-	-		-	-		1	1			2
Falco mexicanus		3		-	-		3	2	3				13	-	-		-	-		-	-	-				0	-	-		-	-		-	-			0
Falco peregrinus	-	-		-	-		-	-	-				0	-	-		-	-		-	-	-				0	-	-		-	-		-	-			0
	23	12		11	22		33	31	31				165	0	0		0	0		2	0	1				5	0	0		0	0		0	1			3





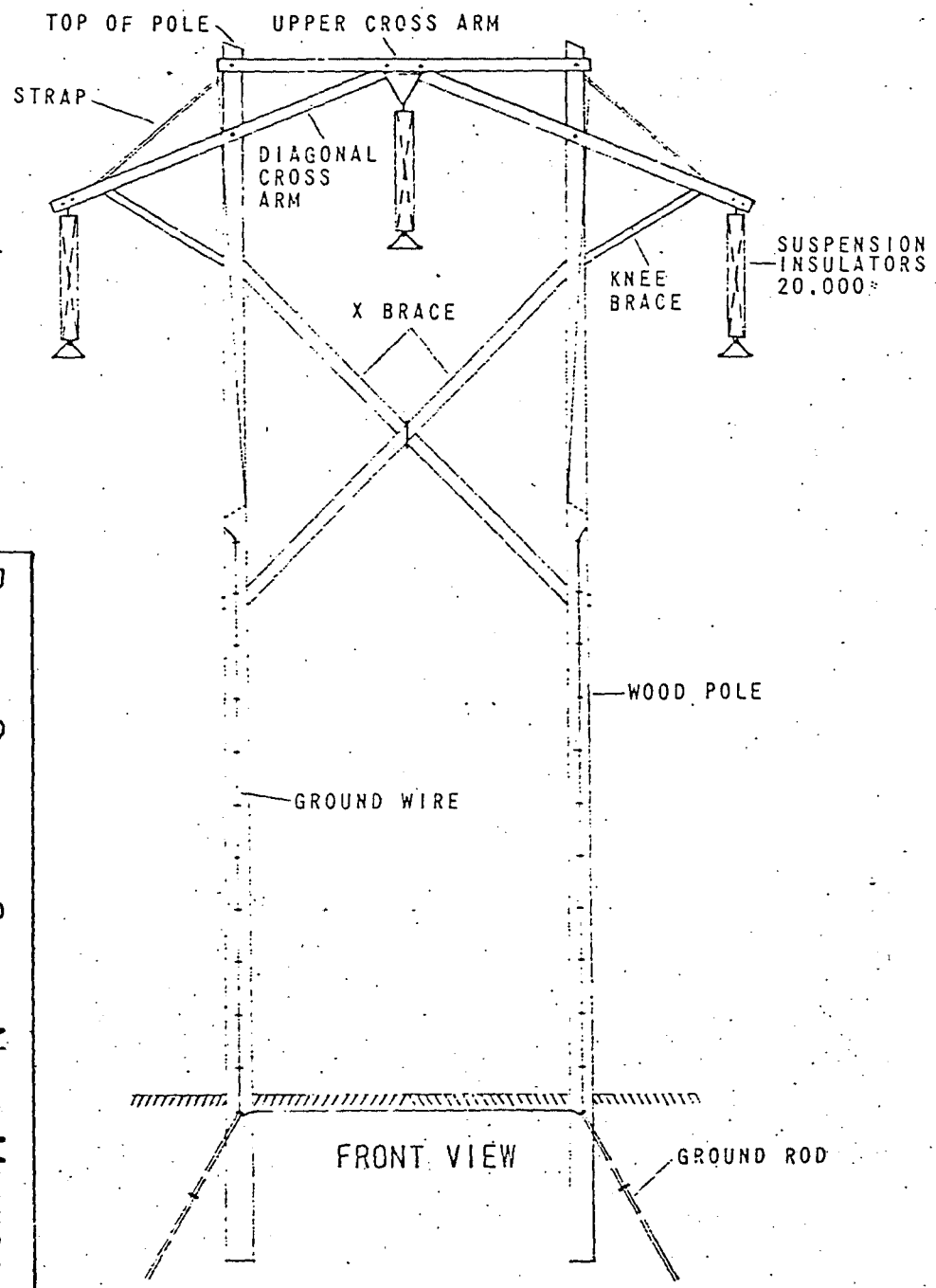
PUBLIC SERVICE CO OF NEW MEXICO

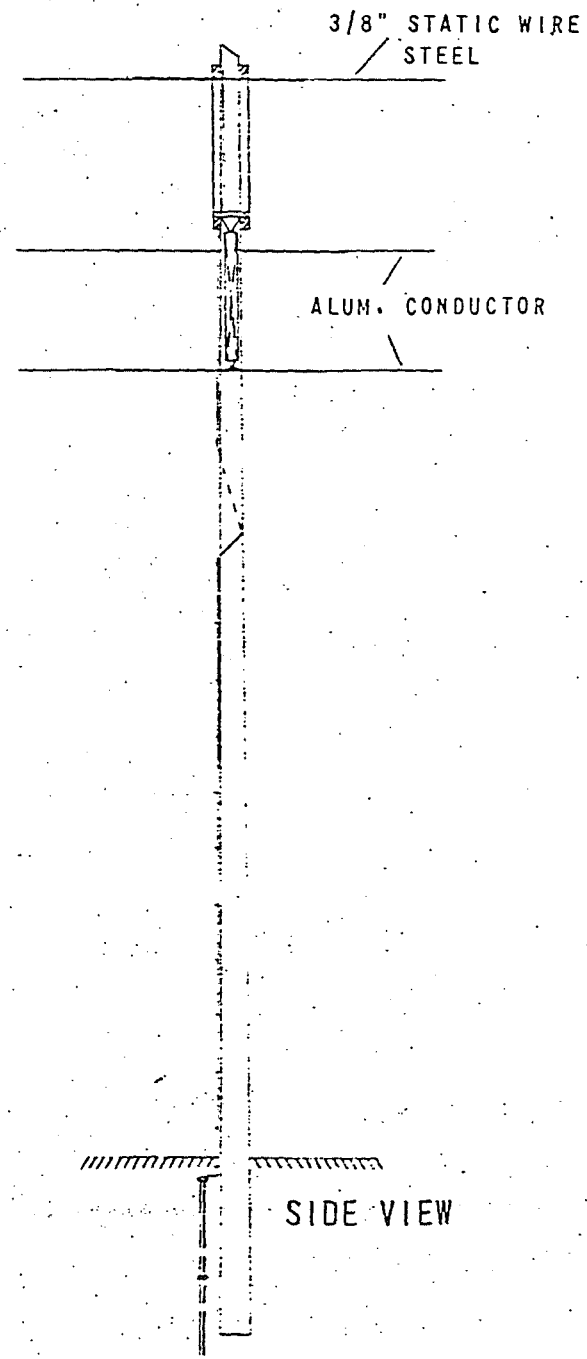
230 KV TANGENT STRUCTURE

DR JCH

DATE 9-29-76

EXHIBIT 1





PUBLIC SERVICE CO OF NEW MEXICO

345 KV TANGENT STRUCTURE

DR	DATE	EXHIBIT 11
JCH	9-29-76	

TABLE 7

Portions of the AF 230 kV Line Structures
Utilized by Birds of Prey (N = 115)

	% Utilization
Cross arm	18.3%
Diagonal arm	13.9%
Angle arm	-
Top of pole	66.1%
Static wire	1.7%
X-Brace	-
	100.0%

Table 7 shows the percentage of observed use of each of the 230 kV structure's features. Only the kestrels used static wires, most frequently during migratory periods when individuals may use the static wire adjacent to a structure harboring two or three other kestrels. The buteos and golden eagles generally are seen on the tops of poles. X-braces are occasionally used for nest sites. This will be discussed in the nesting section.

It is anticipated that the same portions of the new 345 kV line will be used in an approximately equivalent fashion as the data in table 8 demonstrates. This is because the 345 kV structures will have the same general configuration as the 230 kV structures. The major differences

are that the 230 kV structures are shorter and have an angle arm at the top between the two poles. The new 345 kV structures will lack the angle arm and be approximately ten to fifteen feet higher.

NESTING

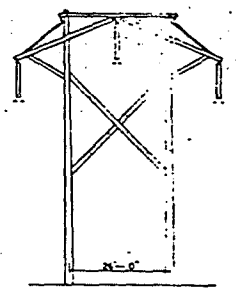
The AF line was utilized by red-tailed hawks for nesting in 1975 and 1976. In 1975 structures 509 and 608 had one nest each. No egg count for the nest on structure 509 was obtained. However, subsequent observations of the nest did not reveal young or fledglings leading to the conclusion that either no eggs were laid (although an "incubating" bird was observed in the spring months) or none were successfully hatched. On structure 608 two eggs were laid and two young successfully reared. In 1976 the nest on structure 509 was not occupied. However, the pair nesting on 608 laid three eggs and reared three young red-tails.

TABLE 8

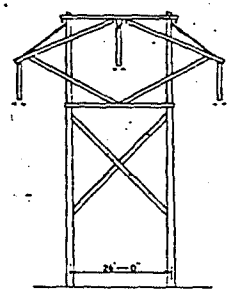
Portions of FW, WW and OJ 345 kV Line
Structures Utilized by Birds of Prey

	% Utilization
Cross arm	18.1%
Diagonal arm	14.2%
Arm brace	1.5%
Top of pole	65.2%
Static wire	1.0%
X-brace	-

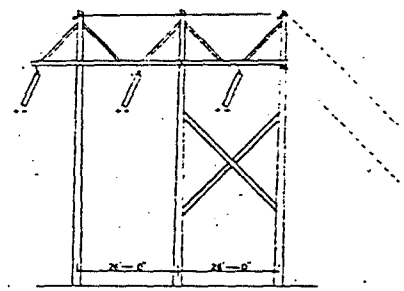
Figure 1



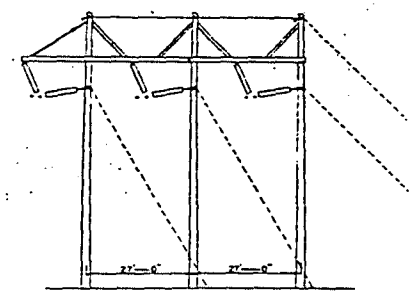
TANGENT STRUCTURE
BD-500



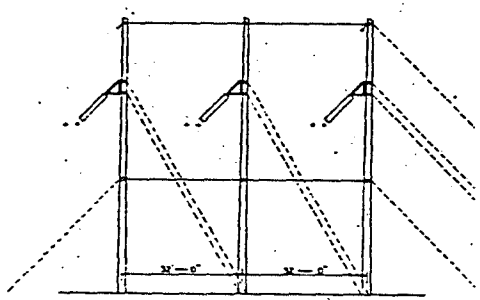
TANGENT STRUCTURE
BD-500A



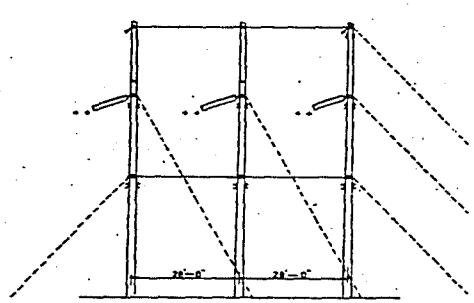
1° TO 6° ANGLE STRUCTURE
BD-501



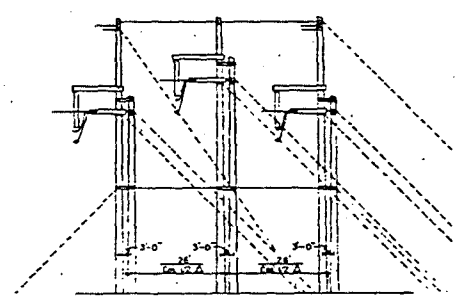
6° TO 12° ANGLE STRUCTURE
BD-502



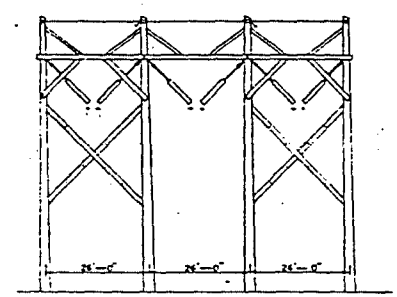
12° TO 20° ANGLE STRUCTURE
BD-503



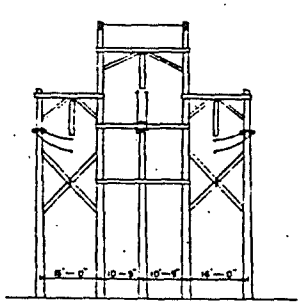
20° TO 40° ANGLE STRUCTURE
BD-504



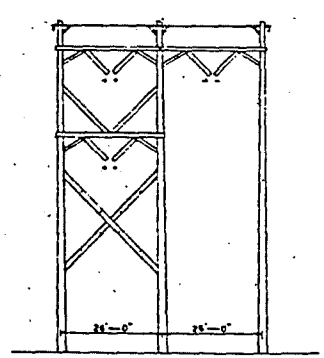
40° TO 90° DEAD END ANGLE
BD-505



LONG SPAN TANGENT
BD-506



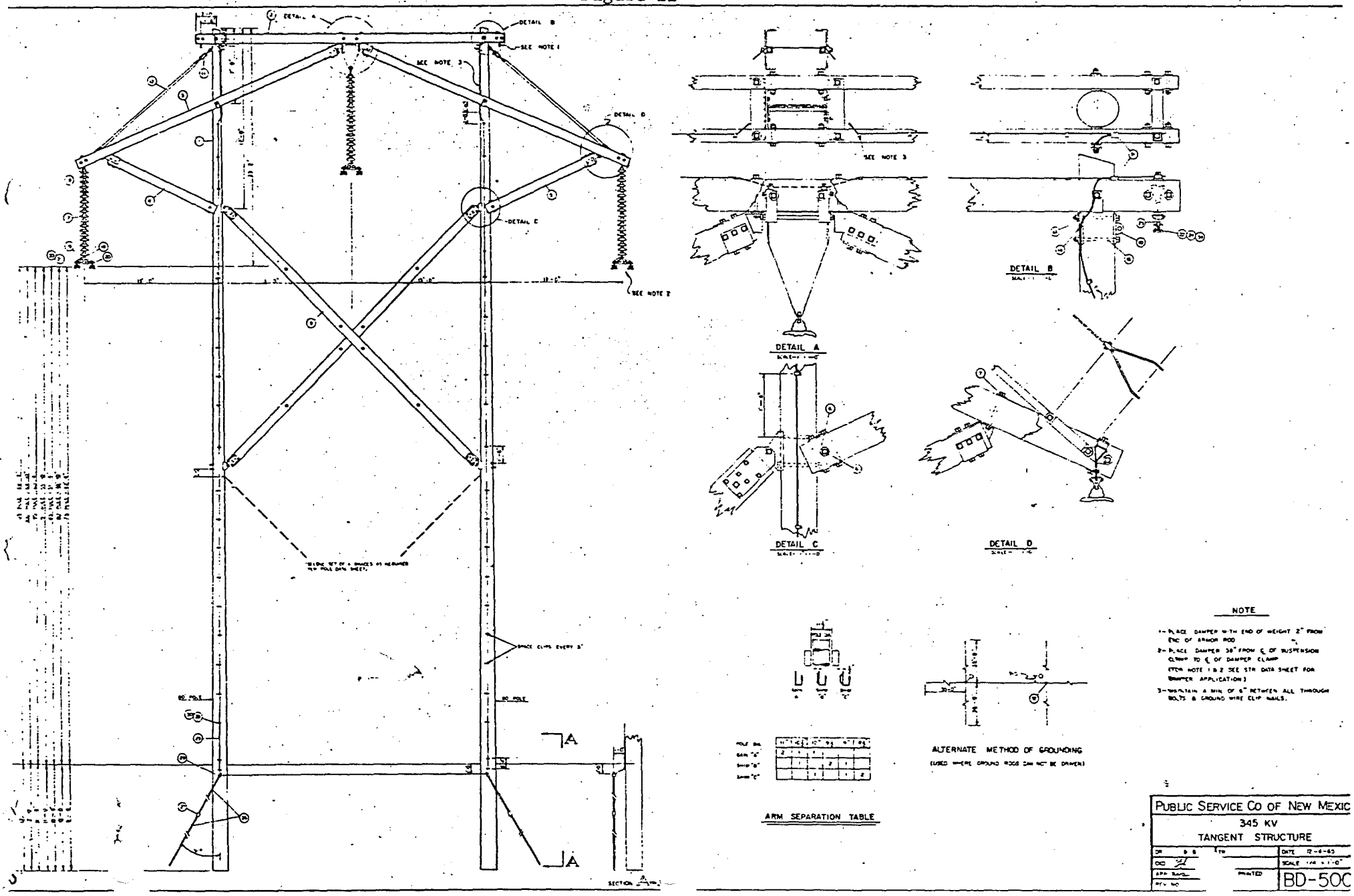
TANGENT DEAD END
BD-507



TRANSPOSITION
BD-508

PUBLIC SERVICE CO OF NEW MEXICO			
345 KV STRUCTURE TYPES			
DR B B	TR	DATE 3-11-66	
CKD	CK	SCALE 1/16" = 1'-0"	
APP		PRINTED	BD-510
REV NO			

Figure II


DETAIL A
DETAIL B
DETAIL C
DETAIL D
SEE NOTE 1
SEE NOTE 2
SEE NOTE 3
SPACE CLIPS EVERY 3'
SECTION A
ARM SEPARATION TABLE
ALTERNATE METHOD OF GROUNDING
(USED WHERE GROUND RODS CAN NOT BE DRIVEN)
NOTE
1- PLACE DAMPER WITH END OF WEIGHT 2" FROM END OF ARMOR ROD
2- PLACE DAMPER 30" FROM ℄ OF SUSPENSION CLAMP TO ℄ OF DAMPER CLAMP
(FOR NOTE 1 & 2 SEE STR DATA SHEET FOR DAMPER APPLICATION)
3- MAINTAIN A MIN OF 6" BETWEEN ALL THROUGH BOLTS & GROUND WIRE CLIP NAILS.
PUBLIC SERVICE CO OF NEW MEXIC
345 KV
TANGENT STRUCTURE
BD-50C