

# FACILITY

## PLAN

Electric Service  
Transmission &  
Subtransmission  
Facilities (1995-2005)

Planning Department

City of Albuquerque/Bernalillo County

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CITY of ALBUQUERQUE  
ELEVENTH COUNCIL

COUNCIL BILL NO. R-341

ENACTMENT NO. 38-1996

SPONSORED BY: Vincent E. Griego

1 RESOLUTION

2 ADOPTING THE FACILITY PLAN: ELECTRIC SERVICE TRANSMISSION AND  
3 SUBTRANSMISSION FACILITIES (1995-2005) AND REPEALING THE FACILITY PLAN:  
4 ELECTRIC SERVICE TRANSMISSION AND SUBTRANSMISSION FACILITIES (1985-  
5 1995).

6 WHEREAS, Section 3-19-9 NMSA 1978 authorizes the City to adopt a plan  
7 which addresses the general location and extent of public utilities and terminals,  
8 whether publicly or privately owned; and

9 WHEREAS, the City adopted the Facility Plan: Electric Service Transmission and  
10 Subtransmission Facilities (1985-1995) in 1985 and adopted an amendment in 1988,  
11 but has not since reviewed the Plan on this important aspect of the development in  
12 the City's planning jurisdiction; and

13 WHEREAS, the staff of the City of Albuquerque, Bernalillo County and of the  
14 area's electrical utilities (Public Service Company of New Mexico, Plains Electric, and  
15 El Paso Electric) have updated and clarified the existing Plan through technical and  
16 writing teams; and

17 WHEREAS, the staff of the City, County, and of the electrical utilities have  
18 expressed their support of and recommendation for the Facility Plan: Electric Service  
19 Transmission and Subtransmission Facilities (1995-2005); and

20 WHEREAS, the Environmental Planning Commission and the County Planning  
21 Commission have held an advertised, joint public hearing on September 28, 1995 on  
22 the Facility Plan and have unanimously recommended adoption of the Plan; and

23 WHEREAS, new concerns and changed specifications have prompted the  
24 drafting of new language addressing Electromagnetic Fields (EMFs), joint uses within  
25 utility rights-of-way and design for corridor maintenance as well as changes in the  
26 visual impact guidelines, undergrounding recommendations, and the definitions of

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1 major and minor changes; and

2 WHEREAS, this amended and updated Facility Plan contains clarified and  
3 strengthened standards which are sensitive to the quality of the environment and  
4 reflect the policies of the Albuquerque/Bernalillo County Comprehensive Plan.

5 BE IT RESOLVED BY THE COUNCIL, THE GOVERNING BODY OF THE CITY OF  
6 ALBUQUERQUE:

7 Section 1. In order to further detail and implement the concepts of the  
8 Albuquerque/Bernalillo Comprehensive Plan, the amended Facility Plan: Electric  
9 Service Transmission and Subtransmission Facilities (1995-2005), attached as part  
10 of this Resolution is adopted for the area within the planning jurisdiction of the City  
11 of Albuquerque.

12 Section 2. The amended Plan attached as a part of this Resolution is  
13 commended to Bernalillo County and to the Village of Los Ranchos de Albuquerque  
14 for their planning jurisdictions.

15 Section 3. The Facility Plan: Electric Service Transmission and Subtransmission  
16 Facilities (1985-1995) adopted in 1985 is hereby repealed and replaced with the  
17 attached Facility Plan: Electric Service Transmission and Subtransmission Facilities  
18 (1995-2005). In the event of conflicting statements between the two Plans, the  
19 newer attached Plan shall govern.

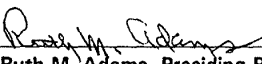
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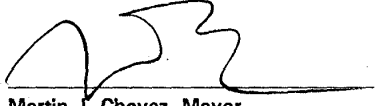
1 PASSED AND ADOPTED THIS 4th DAY OF March, 1996  
2 BY A VOTE OF: 7 FOR 0 AGAINST.

3  
4 Yes: 7

5 Excused: Gallegos, Robbins  
6  
7

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9   
10 Ruth M. Adams, Presiding President  
City Council

11 APPROVED THIS 28th DAY OF March, 1996  
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15 Martin J. Chavez, Mayor  
City of Albuquerque

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18 ATTEST:  
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20 City Clerk  
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**BERNALILLO COUNTY  
BOARD OF COUNTY COMMISSION**

**RESOLUTION NUMBER AR 65-96**

1     **ADOPTING THE FACILITY PLAN: ELECTRIC SERVICE TRANSMISSION AND**  
2     **SUBTRANSMISSION FACILITIES (1995-2005) AND REPEALING THE FACILITY**  
3     **PLAN: ELECTRIC SERVICE TRANSMISSION AND SUBTRANSMISSION FACILITIES**  
4     **(1985-1995).**

5             **WHEREAS, Section 3-19-9 NMSA 1978 authorizes the County to adopt a**  
6     **plan which addresses the general location and extent of public utilities and terminals,**  
7     **whether publicly or privately owned; and**

8             **WHEREAS, the County adopted the Facility Plan: Electric Service**  
9     **Transmission and Subtransmission Facilities (1985-1995) in 1985 and adopted an**  
10    **amendment in 1988, but has not since reviewed the plan on this important aspect of**  
11    **the development in the County's planning jurisdiction; and**

12            **WHEREAS, the staff of the City of Albuquerque, Bernalillo County and of**  
13    **the area's electrical utilities (Public Service Company of New Mexico, Plains Electric,**  
14    **and El Plaso Electric) have updated and clarified the existing plan through technical**  
15    **and writing teams; and**

16            **WHEREAS, the staff of the City, County, and of the electrical utilities have**  
17    **expressed their support of and recommendation for the Facility Plan: Electric Service**  
18    **Transmission and Subtransmission Facilities (1995-2005); and**

19            **WHEREAS, the Environmental Planning Commission and the County**  
20    **Planning Commission have held an advertised, joint public hearing on September 28,**  
21    **1995 on the Facility Plan and have unanimously recommended adoption of the plan; and**

22            **WHEREAS, new concerns and changed specifications have prompted the**  
23    **drafting of new language addressing Electromagnetic Fields (EMFs), joint uses within**

CONTINUATION PAGE 2, RESOLUTION NUMBER AR 65-96  
ADOPTING THE FACILITY PLAN, ELECTRIC SERVICE TRANSMISSION  
& SUBTRANSMISSION FACILITIES (1995-2005) & REPEALING THE FACILITY  
PLAN: ELECTRIC SERVICE TRANSMISSION & SUBTRANSMISSION FACILITIES  
(1985-1995)

1 utility rights-of-way and design for corridor maintenance as well as changes in the visual  
2 impact guidelines, undergrounding recommendations, and the definitions of major and  
3 minor changes; and

4 WHEREAS, this amended and updated Facility Plan contains clarified and  
5 strengthened standards which are sensitive to the quality of the environment and  
6 reflect the policies of the Albuquerque/Bernalillo County Comprehensive Plan.

7 BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSION:

8 Section 1. In order to further detail and implement the concepts of the  
9 Albuquerque/Bernalillo Comprehensive Plan, the amended Facility Plan: Electric  
10 Service Transmission and Subtransmission Facilities (1995-2005), attached as part  
11 of this resolution is adopted for the area within the planning jurisdiction of the  
12 County of Bernalillo.

13 Section 2. The amended plan attached as a part of this resolution is  
14 commended to the Village of Los Ranchos de Albuquerque for their planning  
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16 Section 3. The Facility Plan: Electric Service Transmission and  
17 Subtransmission Facilities (1985-1995) adopted in 1985 is hereby repealed and replaced  
18 with the attached Facility Plan: Electric Service Transmission and Subtransmission  
19 Facilities (1995-2005). In the event of conflicting statements between the two plans,  
20 the newer attached plan shall govern.

21

22

CONTINUATION PAGE 3, RESOLUTION NUMBER AR 65-96  
ADOPTING THE FACILITY PLAN, ELECTRIC SERVICE TRANSMISSION  
& SUBTRANSMISSION FACILITIES (1995-2005) & REPEALING THE FACILITY  
PLAN: ELECTRIC SERVICE TRANSMISSION & SUBTRANSMISSION FACILITIES  
(1985-1995)

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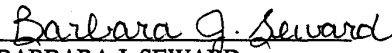
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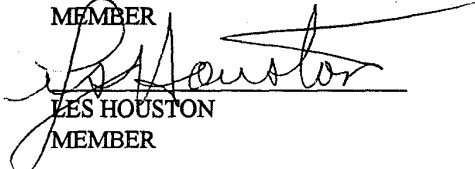
ALBERT "AL" VALDEZ  
CHAIRMAN

  
KEN SANCHEZ  
VICE-CHAIR

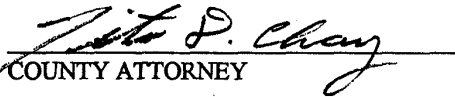
EXCUSED

EUGENE M. GILBERT  
MEMBER

  
BARBARA J. SEWARD  
MEMBER

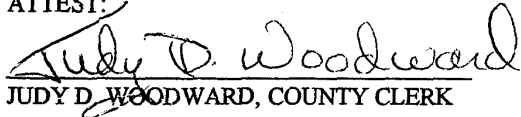
  
LES HOUSTON  
MEMBER

APPROVED:

  
TITO P. CHAY  
COUNTY ATTORNEY

DATE: 6 / 7 / 96

ATTEST:

  
JUDY D. WOODWARD  
COUNTY CLERK

DATE:   /  /



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## SUMMARY

On March 8, 1971, the Plan for Electric Service in Albuquerque was adopted as an element of the City Master Plan by the City Commission. In subsequent action, the Plan was amended by the Albuquerque City Council and the Bernalillo County Board of Commissioners to include additional projects, as well as standards addressing the general location, extent and character of electrical transmission and subtransmission facilities. Furthermore, the Plan has been adopted as a facility plan to detail and implement the concepts of the Albuquerque/Bernalillo County Comprehensive Plan (Enactments 47-1982 and 49-1983).

The 1971 Plan for Electric Service in Albuquerque was amended in 1972 and again in 1981; superseded in 1985 by the Facility Plan: Electric Service Transmission and Subtransmission Facilities (1985-1995). Recognizing that additional changes are appropriate, the Facility Plan for Electric Service in Albuquerque/Bernalillo County has now been further revised to clarify and strengthen the procedures and standards for the location, design, and review of existing and proposed electrical transmission and subtransmission facilities for 1995-2005.

This revision supersedes and replaces the 1985 Facility Plan: Electric Service Transmission and Subtransmission Facilities (1985-1995). It was written and reviewed by a technical team made up of representatives from the City, the County, and electrical utilities with transmission facilities located in Bernalillo County. All facilities under construction and any existing facilities of the electrical utilities are approved as of the date of adoption of this plan.

This plan addresses all investor-owned public utilities located within the City of Albuquerque and Bernalillo County. It provides a mechanism through which the planning and design among the various utilities can be coordinated and based on a consistent set of standards.

## I. INTRODUCTION

Every metropolitan area requires a large, reliable supply of energy in the form of electricity to meet a variety of demands. Electricity produced at generating plants is transmitted in major lines and stepped down several times for ultimate use.

The system serving each metropolitan area is linked to other systems to form regional multi-state grids to balance supply with demand and to assure reliability. The size and complexity of the system serving a particular metropolitan area is directly related to the area's population and economic base, sources of generating fuel, and to the industrial/agricultural/mineral extraction/military activities in surrounding areas.

### A. Scope and Purpose

Bernalillo County, the City of Albuquerque, and the electrical utilities (Public Service Company of New Mexico, Plains Electric Generation and Transmission Cooperative, Inc., and El Paso Electric) recognize the necessity for a Facility Plan. The Plan addresses and states policy for the system of electric transmission and subtransmission facilities in the City of Albuquerque and Bernalillo County.

Transmission and subtransmission line corridors and substation sites are chosen based on the standards contained in this Plan, as well as economic feasibility and other operating requirements. These criteria support the long-range planning goals and policies of the City of Albuquerque, Bernalillo County and the electrical utilities.

### B. Definitions

The Distribution System: includes all lines under 46 kV which transport power from the subtransmission system to a customer.

Electrical Utility(ies): refers to any and all electric utilities that operate and/or maintain electric transmission and subtransmission facilities within the City of Albuquerque and/or Bernalillo County including, but not limited to the Public Service Company of New Mexico (PNM), Plains Electric Generation and Transmission Cooperative, Inc. (Plains Electric), and El Paso Electric.

Insignificant Change: Insignificant changes include: replacing conductor on an existing power line with a similar size conductor; replacing structures of the same height and material; replacing three or less structures in the same locations within the same easement with structures of different size and/or material; government or developer initiated projects that have gone through a public involvement process and approved by DRB, CPC, and/or EPC; routine maintenance.

Major Amendment: Includes: a. Updating proposed projects; b. Amending the Standards for the Location and Design of Transmission/Subtransmission Facilities; c. Amending the procedures relating to Implementation and Administration; d. Approval of a project not described in the Facility Plan.

Minor Change: Minor changes include: upgrading conductor size on an existing power line where structure replacement is required; expansion of an existing substation; replacing a majority of the structures on an existing line with structures of a different type; changing the timing and/or preliminary location of any proposed project described in Section V of the Plan before application is made for project approval.

Protected Corridors: rights-of-way and/or easements containing transmission or subtransmission lines that form a network within Bernalillo County. Major transmission lines feeding bulk power into the network are also a part of this protected corridor. Because of their location and function, preservation of these corridors and protection from encroachment is particularly critical for continued reliable electric service in Albuquerque. The protected corridors are preferred pathways to provide electrical capacity for current and future needs.

Siting Constraints: Resource factors or land use values that determine the suitability or compatibility of an area for transmission and subtransmission facilities siting and construction. The magnitude of an impact is dependent upon the sensitivity of the resources affected. Resource sensitivities are defined as follows:

1. Fatal Flaw: Resource factors or land use values that preclude siting electric facilities due to officially stated or approved restrictions, plans or policies. Fatal flaws are sometimes called exclusion areas, where developing a line is prohibited.
2. Environmental Sensitivity: Resource factors or land use values where the presence of electric facilities would conflict with that resource or land use value. Environmental sensitivities do not preclude development of an overhead transmission line, but because of their conflict potential are given special consideration in designating the alignment, substation location, and facility design and construction.
3. Environmental Concern: Resource factors or land use values considered during planning corridor designation and subsequent routing efforts to minimize environmental impact of the electric facilities and construction difficulty.

Siting Impacts: modifications or changes to the natural and/or built environment such as visual resources or land use patterns, resulting from the introduction of transmission and subtransmission facilities. Siting impacts are of varying types (and degree) and are classified as follows:

1. Visual Impact: A modification or change that could be incompatible with the scale, form, texture or color of the existing natural or built landscape.

2. Ecological Impact: A modification or change in the existing natural environment that could result in the disruption and/or loss of wildlife habitat, vegetation, air quality, soil and water resources and/or an increase in ambient noise levels.
3. Land Use Impact: A modification or change that could be incompatible with existing land use patterns or approved land use plans.

Substation Upgrade: increases the capacity of a substation by installing a higher voltage and/or higher capacity transformer, or by installing an additional transformer, making a multi-unit substation.

Subtransmission System: extends from bulk power stations to distribution substations. The subtransmission system consists of distribution substations and 46 kV to 115 kV lines that transport power from bulk power stations to distribution substations or which transport power between distribution substations.

Transmission System: includes all lines between generating sources and bulk power stations (i.e., switching stations). Transmission voltages range from 115 kV to 500 kV.

## II. GOAL AND OBJECTIVES

The goal of this Plan is to provide the City of Albuquerque and Bernalillo County with an electric transmission and subtransmission system to deliver electric energy in the amount and locations needed by present and future area residents, businesses, and industries. This system must be based upon sound technical design, consider environmental concerns and be within the economic means of the customer, the City of Albuquerque, Bernalillo County and the electrical utilities.

The following four objectives support this goal:

- A. To conduct system planning at least ten years into the future.
- B. To provide a forum for the general public to comment on electric facility plans through public hearings before the Environmental Planning Commission (EPC), the County Planning Commission (CPC), the Albuquerque City Council and the Bernalillo County Commission (BCC).
- C. To formulate standards for the location and design of transmission and subtransmission facilities.
- D. To preserve planned transmission and subtransmission line corridors from encroachments by new development.

### III. STANDARDS FOR THE LOCATION AND DESIGN OF TRANSMISSION AND SUBTRANSMISSION FACILITIES

The applications of the standards contained in this section are intended to be used to mitigate potential adverse siting impacts (see definitions) of transmission and subtransmission facilities within the City of Albuquerque and the County of Bernalillo, and especially on areas and structures having significant historic and cultural value. Examples of these areas and structures include those designated by the City of Albuquerque, State and National Registers, or local landmarks or historic zones; urban centers as defined by the Albuquerque/Bernalillo County Comprehensive Plan; sensitive environmental areas (the Rio Grande State Park); areas having great scenic value (the escarpment, the Rio Grande State Park and the U.S. Forest Service lands). Where overhead lines are necessary in these areas, a corridor route and facility design shall be chosen based on siting constraints (see definitions); maximizing environmental compatibility; electric service reliability; and economic constraints.

Generally, right-of-way corridor widths for transmission and subtransmission lines are as follows: 46 kV (50 feet); 115 kV (50 feet); 230 kV (100 feet); 345 kV (100 feet); 500 kV (200 feet). Widths, however, may vary depending on pole height, the number of lines on a pole, whether or not street right-of-way is used, and a number of other factors.

Because not all transmission or subtransmission corridors are of the same importance to the electrical network, certain "protected corridors" must be carefully protected because of their strategic location, and to safeguard present and future electrical service. Protected corridors are identified on figures 2 and 5. Unobtrusive encroachments within electrical utility "protected corridors" will be considered for approval by a representative of the impacted electrical utility on a case by case basis. Development shall not encroach on transmission and subtransmission rights-of-way, unless written permission for such encroachments is obtained from the impacted electrical utility.

#### A. Standards for the Location of Transmission and Subtransmission Line Corridors

1. Where practical, future transmission and subtransmission lines shall avoid traversing residential land.
2. There are three levels of preference for the location of transmission and subtransmission lines in "metropolitan areas" as defined by the Albuquerque/Bernalillo County Comprehensive Plan. In order of preference they are as follows:
  - a. Interstate highways and arterial streets are particularly appropriate corridors for transmission and subtransmission lines; some major drainage channels may also be appropriate.

- b. Collector streets, especially nonresidential collector streets, are appropriate in some cases for subtransmission lines.
  - c. Other potential corridors will be evaluated where appropriate.
- 3. Existing transmission and subtransmission routes satisfying criteria in this section should be used in preference to establishing new routes.
- 4. Wherever practical, shared rights-of-way for the placement of above-ground utility corridors such as telephone and cable television shall be encouraged.
- 5. In this 1995 Plan, transmission and subtransmission facilities are planned as above ground. However, proposed new facilities within the City of Albuquerque will consider underground options in the planning study for this project. Cost estimates for both the best above ground and below ground alternative will be supplied to the City of Albuquerque and/or Bernalillo County. The City of Albuquerque and/or Bernalillo County will lead a study with assistance from the appropriate electrical utility(ies) to examine the funding mechanisms available to fund underground installation of subtransmission facilities. Installation of underground facilities would be contingent upon the availability of funding for the differential costs associated with underground construction.
- 6. Transmission and subtransmission facilities should be sited on the basis of electrical utility system studies, their electric demand projections, and official City of Albuquerque and Bernalillo County plans and forecasts.
- 7. Existing transmission and subtransmission facilities can be relocated if the impacted electrical utility, the City of Albuquerque and/or Bernalillo County agree to such relocation. Relocation of electric facilities must not adversely affect the electrical utilities' ability to provide reliable service. The Albuquerque City Council or Bernalillo County Board of County Commissioners, following written justification, may request relocation on public rights-of-way where such relocation is critical to the attainment of adopted public policies.
- 8. New lines over 115 kV shall be minimized in the metropolitan area designated as Redeveloping, Established, Developing, Semi-Urban and Major Public Open Space by the Albuquerque/Bernalillo County Comprehensive Plan. But, it is recognized that as the metropolitan area continues to grow additional bulk capacity will have to be added to the transmission system, and future transmission lines at a voltage greater than 115 kV may be needed.



9. In siting new transmission and subtransmission line alignments, siting impacts shall be minimized:
- a. New transmission and subtransmission corridor alignments shall be located to take advantage of existing topographic features to minimize visual impacts of transmission and subtransmission structures. Every reasonable attempt/effort shall be made to avoid lines and structures being the high points in the visual plane.
  - b. Where possible in siting new transmission and subtransmission lines, a route shall be chosen which minimizes the disturbances to and/or alteration of the natural environment. For example, alignments could avoid crossing hills at right angles to the contours and could cross wooded hills and mountains at an oblique angle to minimize the focus of attention on the alignment.
  - c. In siting new transmission and subtransmission line alignments, consideration shall be given to minimizing disruption of existing land use patterns. Corridor alignments can parallel existing roads, fence lines, windbreaks, or other major patterns in the area or can be moved back from the road when land use and visual impacts are reduced by doing so.
10. Electromagnetic Fields (EMFs) shall be considered when locating new transmission corridors. The City of Albuquerque and Bernalillo County land use planning policy is to adopt measures that will minimize EMF exposures to the public when it is reasonable, practical and low cost or no cost. New transmission facilities proposed in this plan will be consistent with the Findings and Recommendations of the Albuquerque Environmental Health Department Task Force on Electromagnetic Fields, which are adopted as part of this plan.

When siting facilities, the utility shall consider the following areas of public concern:

1. Schools
2. Child care centers
3. Residential areas
4. High density employment areas

There has been an increase in public interest, awareness and concerns regarding potential health effects from exposure to electromagnetic fields (EMFs) (see "FINDINGS AND RECOMMENDATIONS OF THE ALBUQUERQUE ENVIRONMENTAL HEALTH DEPARTMENT TASK FORCE ON ELECTROMAGNETIC FIELDS," appendix F). Worldwide studies on the health effects of EMFs are ongoing. Consequently, the electrical utilities and the City of Albuquerque and Bernalillo County shall continue to monitor these studies as well as EMF legislative actions

and evaluate the results. Any substantial changes in the information or substantial new findings relative to the Electric Facility Plan shall be reviewed by all parties. The Albuquerque Environmental Health Department may recommend that the Task Force on Electromagnetic Fields be reconvened to determine if any changes to this section of the plan are warranted.

**B. Standards for the Design of Transmission and Subtransmission Facilities**

The application of the following standards is intended to minimize the impacts when constructing new and/or upgrading overhead transmission and subtransmission facilities:

1. Placement of transmission and subtransmission facilities within public rights-of-way shall conform with the provisions of the City of Albuquerque's Traffic Code, ADA and AASHTO requirements and guidelines, and all other applicable City of Albuquerque and Bernalillo County codes and ordinances (City of Albuquerque Ordinance, Sections 6-5-5-1 et seq., Sidewalk, Drive Pad, Curb and Gutter Ordinance).
2. On a case by case basis new facilities within street right of way should meet clear roadside horizontal clearance: 15 feet from face of the curb (or edge of the through lane if uncurbed), for 40 mph, or 20 feet for 50 mph, or else barrier protection (guard rail or impact attenuation) should be provided. The former is the preferred solution.
3. On a case by case basis new facilities outside of street right of way, but adjacent to right of way, should meet clear roadside clearances as nearly as possible or be protected if substantially under clearance requirements.
4. Intersection and driveway visibility, and existing property lines should be considered in locating individual poles.
5. Angles in lines shall be avoided or minimized wherever possible to avoid installing guys and/or larger diameter poles.
6. Placement of poles directly in front of residentially zoned lots shall be avoided unless no feasible alternatives exist. Application of environmentally compatible concepts and attractive pole design shall be considered in these cases.
7. Placement of poles and guy wires in sidewalks or planned sidewalk locations should be avoided. Pole foundations shall be at the same grade as sidewalks according to City of Albuquerque Traffic Street Light Foundations Detail Drawing 2530.

8. Wherever possible, the height of lines and the size and number of poles shall be considered, to minimize their land use and visual impact.
9. New transmission/subtransmission facilities shall be designed and/or selected to have minimal visual impacts. The material, color, texture and shape of transmission and subtransmission structures should be compatible with the surrounding environment.
10. The noise level of new substation facilities shall not exceed guidelines set by the American National Standards Institute (Appendix D). Electric facilities shall be so located and screened as to minimize sound impacts on the surrounding environment.
11. Transmission and subtransmission lines crossing other transmission and subtransmission lines shall be minimized.
12. When physically and economically feasible, new substations shall be located immediately adjacent to transmission and subtransmission corridors to preclude the extension of new lines.
13. Substations should be located to take advantage of available topography, vegetation, and artificial structures to minimize their visual impact. Screening shall be provided by the appropriate electrical utility according to the standards set out in Appendix C.
14. Substation profile and size should be as unimposing as possible, consistent with the surroundings and present and future electric service needs, as illustrated by the figures in Appendix B.
15. Joint uses and coordination of uses within transmission line easement rights-of-way shall be encouraged where appropriate.
16. All new transmission facilities, and upgrades of existing facilities, shall be, as much as possible, designed and constructed as to minimize maintenance of the corridor grounds. When new development encroaches upon existing facilities, ownership and maintenance of the utility corridor shall be explicitly identified. Where possible, maintenance by the public sector shall be minimized as much as possible except where the corridor is identified for public uses.

#### IV. IMPLEMENTATION AND ADMINISTRATION

##### A. General

The Plan requires that the electrical utilities' system expansion plans be consistent with the Albuquerque/Bernalillo County Comprehensive Plan. Therefore a representative of the electrical utilities will be asked to serve in an advisory capacity or will be given the opportunity to provide verbal and written input on revisions to the Albuquerque/Bernalillo County Comprehensive Plan, on all area plans, sector plans, and facility plans addressing streets and drainage.

To ensure the implementation of the plan, the City of Albuquerque and Bernalillo County shall consider the provisions of sites for electric facilities when reviewing plans and plats submitted for approval. Additionally, all area and sector plans shall show the location of present and future transmission and subtransmission corridors and facilities.

##### B. Planning Jurisdiction

Because Bernalillo County's planning jurisdiction often overlaps the City of Albuquerque's planning jurisdiction, the following procedures relate to whichever governmental unit(s) has/have jurisdiction over geographic area of amendment or approval as regulated by the state legislation.

###### 1. Facility Plan Amendment

The Plan is subject to a review process by the staffs of the electrical utilities, the City of Albuquerque and Bernalillo County when either agency or the utility determines that changes are necessary. Because of this process, amendments to the proposed projects, location and design standards, or other procedures relating to implementation and administration may be proposed and submitted to the appropriate review authorities.

Major amendments to this plan and subsequent updates will be reviewed by the EPC, the CPC, and adopted by the Albuquerque City Council and the Bernalillo County Board of County Commissioners. Amendments to update this Facility Plan will be submitted for approval when either agency or the utility determines that changes are necessary.

The electrical utilities, following proper application and notification procedures, may propose amendments to the proposed projects at any time.

Minor changes to the Plan that are not substantive amendments may be approved by EPC and/or CPC without adoption as amendments by the Albuquerque City Council and the Bernalillo County Board of County Commissioners.

Insignificant changes to the Albuquerque/Bernalillo County electrical system are those that are not substantive amendments to the Plan and do not require utilities to obtain EPC and/or CPC approval.

## 2. Corridor and Facility Planning Process

As the electrical utilities initiate location planning for any subtransmission/ transmission corridor or facility, an initial conference will be held with representatives from City of Albuquerque and/or Bernalillo County planning staff, electrical utility representatives, and any other City of Albuquerque or Bernalillo County agencies which planning staff deems appropriate.

The purpose of this conference is twofold: 1) to notify the City of Albuquerque and/or Bernalillo County of alternate locations and/or alignments being considered by the electrical utilities for transmission/subtransmission corridors and substations consistent with the Facility Plan standards and maps, and 2) to notify the electrical utilities of City of Albuquerque/Bernalillo County staff concerns regarding specific corridor alignments, and/or locations of substations. The discussion is to be held for information purposes only.

During this corridor selection process, electrical utility staff should continue to meet periodically with the planning staff identified in the initial conference as project plans become more specific and the preferred substation location and corridor alignments are identified.

## 3. Project Review Process

Location and site plans for proposed electric transmission or subtransmission facility projects must be submitted for a public hearing in conformance with the process described in the City of Albuquerque Development Process Manual, Volume 1: Procedures, Chapter 9 (Zone Map Amendment Procedure) or the Comprehensive Zoning Ordinance of Bernalillo County, New Mexico, Ordinance No. 213, Section 18, Special Use Permit Regulations depending on the location of the projects. Prior to a formal public hearing the electrical utility should request a pre-application discussion with and submit an application for an in depth review by members of the City of Albuquerque or Bernalillo County planning staff. The electrical utility's application for public hearing will include the following plan information:

- a. A detailed siting study for alternate transmission/subtransmission corridor alignments or substation sites (See Appendix A).
  1. The siting study for the proposed project will describe the area to be served; the purpose and need for the project; the alternate corridors and/or substation sites examined; the facilities to be constructed and preferred alternative. The siting study will identify and address the potential siting impacts as well as the siting constraints and opportunities of each proposed substation site, and transmission or subtransmission corridor alignment will be included as will simulations of alternate sites and alignments and maps showing

proposed facilities' locations. A schematic depicting facility design and a written description of approximate line lengths will be included. The proposed construction schedule, estimated project cost, and a summary of measures taken to accommodate siting concerns will also be identified.

2. A legal description of the proposed substation site(s).
  3. Substation site plan as described in the City of Albuquerque Development Process Manual, Volume 1: Procedures, Chapter 3, Site/Landscaping plan or the Comprehensive Zoning Ordinance of Bernalillo County, New Mexico, Ordinance No. 213, Section 22, Supplementary Height and Area Regulations (see appendix B).
  4. Substation landscaping plan as referenced in item 3 (see appendix B).
  5. After final approval from Bernalillo County and/or the City of Albuquerque and prior to construction of any transmission or subtransmission facility, PNM will apply for the appropriate building permits and follow the appropriate procedures for an approved project, as described in the City of Albuquerque Development Process Manual, Volume 1: Procedures and/or the Comprehensive Zoning Ordinance of Bernalillo County, New Mexico, Ordinance No. 213.
- b. Documentation showing that new electric facilities (transmission and subtransmission lines, substations, etc.) follow adopted EMF policies outlined in section III. A. 10.

#### V. PROPOSED ELECTRIC FACILITIES: 1995 - 2005

The proposed facilities are planned to meet the electrical utilities' forecasted requirements for load growth and system reliability through 2005. Projected requirements are reviewed by the electrical utilities to determine whether current assumptions remain valid. Because of these evaluations, revisions to the present scope of projects may be necessary. These revisions will take the form of amendments and be presented to the City of Albuquerque Environmental Planning Commission, the Bernalillo County Planning Commission, the Bernalillo County Board of Commissioners and the Albuquerque City Council.

Preferred and alternate alignments as outlined on the following pages are provisional and are subject to revision. Proposed alignments and substation locations are based on the electrical utilities' best current knowledge. Changes in land use, inability to obtain right-of-way, a change in the location of load centers, and a variety of other factors may require future changes in proposed alignments. Approval of this plan does not constitute blanket approval by the City of Albuquerque or Bernalillo County of the alignments outlined herein, nor does approval bind the electrical utilities to

these alignments. Preferred alignments and substation sites as identified in this section of the Plan may be changed by the electrical utilities at the time application is made for project approval. These changes will not constitute an amendment of the Plan.

Planned projects are four types: new transmission or subtransmission ties; new substations or switching stations and subtransmission taps; substation upgrades; and line upgrades.

New ties are planned primarily to increase system reliability, allowing substations tapped off the line to be served from two directions. Thus, if there is an outage on part of the line, substations above or below the outage can be fed from another direction, minimizing the extent of the power outage.

New substations and taps are planned to serve anticipated load growth in developing areas. In addition, some existing substations will be upgraded to serve additional load growth within developed areas. Where possible, substations will be upgraded on site by changing out the existing transformer and installing a larger capacity/higher voltage transformer or adding a second transformer. Some sites, however, may not be large enough to accommodate the larger transformer, requiring selection of a new site in the vicinity. When a substation facility is abandoned and not reused, the electric utility shall completely remove the structures and clean and decontaminate the site.

All new and upgraded substations will be standard PNM design, surrounded by a 12-foot wall and landscaped as approved through the site plan approval. If located within the City of Albuquerque, they shall be landscaped as per Section 14-16-3-10 (Landscaping regulations applicable to apartment and nonresidential development) of the City of Albuquerque Zoning Code and the Water Conservation Landscaping and Water Waste Ordinance. If located outside the City of Albuquerque, within Bernalillo County, they shall be landscaped as per the Comprehensive Zoning Ordinance of Bernalillo County, New Mexico, Ordinance No. 213, Section 19, Landscaping and Buffer Landscaping Regulations. Concerns about aesthetics, safety, and landscaping exist regarding existing substations. All existing substations that undergo perimeter and/or land base expansion shall be brought up to the design standards for new substations. All facilities shall be maintained free of graffiti.

Line reconductoring projects involve replacing existing conductors with larger sized conductors of the same voltage, allowing larger loads to be served. In other cases some existing lines are scheduled to be upgraded to a higher voltage, again to allow more loads to be served and also to provide service to upgraded substations. Where possible, existing poles and insulators will be used for the new conductors (larger insulators may be used for the 115 kV lines). In other cases, larger wood or steel poles may be erected and the existing poles removed. Wherever possible, the existing easement will be used for the upgraded or reconducted line. In some cases, due to restrictions written into the existing easement and/or system limitations, new alignments will be developed to accommodate the larger capacity facilities.

The following section includes a description of each project that serves as a key to their graphic representation on figures 3 and 6. Also included in the following section are the ten year capital plans for PNM, Plains Electric and El Paso Electric within Bernalillo County.

**TABLE 1**  
**1995 PROPOSED ELECTRIC FACILITY PROJECT DESCRIPTIONS**

1. Construction of UNM Substation and Tap. (1996)
2. Construction of Sumitomo Substation and Tap. (1996)
3. Construction of Cottonwood Substation and Tap. (1996)
4. Construction of Prager-Reeves 115 kV Line. (1997)
5. Add Second unit to Lomas Substation. (1997)
6. Construction of Second ID Line. (1997)
7. Add second unit to North Substation. (1998)
8. Construction of 115 kV source for KAFB--Phase II. (1999)
9. Construction of Carlisle switching station. (1999)
10. Bulk Transformer addition. (1999)
11. New 345 kV source into southeast area of City. (1999)
12. Construction of West Mesa Substation. (2000)
13. Add second unit to Hamilton Substation. (2002)
14. Upgrade Miles Road Substation. (2002)
15. Upgrade BA to Reeves 115 kV lines (RB and AB). (2002)
16. Construction of Juan Tabo to Princess Jeanne 115 KV line. (2003)
17. Upgrade 115 kV loop lines. (2005)
18. Construction of Lomas to UNM 115 kV line. (2006)
19. BA station to Embudo 115 kV line. (2007)
20. Construction of Downtown Substation. (2008)
21. PL line relocation for Federal Courthouse. (1996)
22. Build Second WP Line. (1998)
- G1. Reeves regeneration. (2003)
- G2. Person regeneration. (1999)



**TABLE 2  
1995 DESCRIPTION OF PROPOSED ELECTRIC FACILITY PROJECTS**

Project Number	Description	Existing Facility			New Facility			Purpose/Function of Facility
		Constr. Year	Volt.	Pole Type Ht.	Volt.	Pole Type Ht.		
1	PROPOSED ACTION: Install new UNM Substation and construct new tap.	1996	115/12.5kV					To provide additional substation capacity for expected growth at UNM. The existing transformers are fully loaded, and an outage one unit would load the remaining transformer to over 100% of rating. This new substation will provide load relief to existing units as well as capacity for future growth on the north campus.
2	PROPOSED ACTION: Install new Sumitomo substation and construct new tap.	1996	115/12.5kV					To serve Sumitomo Wafer Manufacturing Plant with an estimated load of 7.0 MVA, and potential future load of 40 MVA.
3	PROPOSED ACTION: Install new Cottonwood Substation and construct new tap	1996	115/12.5kV					To serve the Cottonwood Shopping Center (estimated load of 9.4 MVA) which will be completed in 1996. This substation will provide the shopping center with two feeders, and the other two feeders would serve the surrounding area. This substation would provide backup to Wayne and Paradise Hills Substations.
4	PROPOSED ACTION: Construct Prager-Reeves 115 KV Line.	1997	115 KV	Steel	80 to 100 ft.			Alleviate overloads during contingent conditions on Albuquerque's 115 kV system. Increase reliability to Prager station and downtown area.
5	PROPOSED ACTION: Install Lomas Substation II.	1997	115/12.5kV					To provide capacity for additional growth in the downtown area. Recent load additions in the downtown area, including the Convention Center expansion and Beta West Hotel have increased the loading on Lomas I and Iron Street to their single contingency capacity. Additional substation capacity is needed to serve other planned growth in the northern downtown area.

**TABLE 2  
1995 DESCRIPTION OF PROPOSED ELECTRIC FACILITY PROJECTS**

Project Number	Description	Existing Facility			New Facility			Purpose/Function of Facility
		Constr. Year	Volt.	Pole Type	Pole Type	Volt.	Pole Ht.	
6	PROPOSED ACTION: Construct second ID line into the East Mountain.	1997	46 kV	Wood	80 to 100 ft.			To provide necessary reliability to East Mountain Division. Reliability will be increased because a second transmission feed into this division will avoid an extended outage to all the East Mountain customers for an ID line problem.
7	PROPOSED ACTION: Install North Unit II Substation.	1998	115/12.5kV					To provide substation capacity to the area served by Signetics, North Reeves, Wyoming and Hawkins Substation. These substations are projected to be loaded to their highest nameplate rating by 1998
8	PROPOSED ACTION: Build a 115 kV source for KAFB -- Phase II	1999	115kV	Steel	80 to 100 ft.			KAFB would like to increase the transmission reliability to sensitive loads and forecasted growth on the west side of the base by upgrading from 46 kV to 115 kV, and provide a geographically isolated service point from Sandia Switching Station.
9	PROPOSED ACTION: Construction of new Carlisle switching station.	1999	115 kV					To increase reliability for the central section of Albuquerque. The station will also increase transmission capacity through the center of Albuquerque by allowing lines to parallel under normal conditions.
10	PROPOSED ACTION: Install new 345/115 kV Bulk Transformer in Albuquerque.	1999	345/115					To increase the bulk transformation capacity for the Albuquerque area.

**TABLE 2  
1995 DESCRIPTION OF PROPOSED ELECTRIC FACILITY PROJECTS**

Project Number	Description	Existing Facility			New Facility			Purpose/Function of Facility
		Constr. Year	Volt.	Pole Type	Pole Ht.	Volt.	Pole Type	
11	PROPOSED ACTION: New 345 kV source into the southeast area of Albuquerque	1999	345 kV	Steel	100 to 120 ft.			To bring a 345 kV source for the new bulk transformer into an existing station (Person or Sandia).
12	PROPOSED ACTION: Install new West Mesa Substation.	2000	115/12.5kV					This substation would provide capacity to Central, Mariposa, and St. Joseph substations. These substations have been experiencing a moderate growth rate and much vacant land exists.
13	PROPOSED ACTION: Install additional unit at Hamilton Substation.	2001	115/12.5kV					This substation would provide capacity to the area surrounding Hamilton, and provide a secure backup to Morris, Tramway and Wyoming Substations. These substations have been experiencing a moderate growth rate and much vacant land exists.
14	PROPOSED ACTION: Upgrade Miles Road Substation.	2002	115/12.5kV					This substation needs to be upgraded to a larger size for additional capacity to accommodate a projected 12.8 MVA for Miles Road Substation in the year 2002. This increase in substation capacity would also provide backup support to it's neighboring substations.
15	PROPOSED ACTION: Upgrade BA to Reeves 115 kV line.	2002	115 kV	Steel	80 to 100 ft.			To increase line capacity from the north into Albuquerque. Creates a stronger and more reliable 115 kV feed from BA station into the Albuquerque area.
16	PROPOSED ACTION: Construction of Juan Tabo to Princess Jeanne 115 kV line.	2003	115 kV	Steel	80 to 100 ft.			To reduce load on the TL line during a Sandia transformer outage. Provide more 115 kV capacity to the Northeast Heights.

**TABLE 2  
1995 DESCRIPTION OF PROPOSED ELECTRIC FACILITY PROJECTS**

Project Number	Description	Existing Facility			New Facility			Purpose/Function of Facility
		Constr. Year	Volt.	Pole Type	Pole Type	Pole Type	Pole Ht.	
17	PROPOSED ACTION: Upgrade 115 KV loop lines.	2005	115 KV	Steel	80 to 100 ft.			Increase the subtransmission capacity to the Albuquerque area.
18	PROPOSED ACTION: Construction of Lomas to UNM 115 KV line.	2006	115 KV	Steel	80 to 100 ft.			To provide more reliability and increase subtransmission capacity to the UNM and Downtown area.
19	PROPOSED ACTION: Construction of BA station to Embudo 115 KV line.	2007	115 KV	Steel	80 to 100 ft.			To increase subtransmission capacity into the eastern Albuquerque area. Creates a stronger and more reliable 115 KV feed from BA station into Albuquerque.
20	PROPOSED ACTION: Install new Downtown Substation.	2008	48/12.5KV					This substation would provide capacity and backup support to other neighboring 12.47 KV substations. It would accommodate
21	PROPOSED ACTION: Relocate PL Line to South Side of Lomas.	1996	115KV	Steel	80 to 100 ft.			This line relocation is to make room for the new Federal Court House that will begin construction in 1996. The alternate route corridor runs from Third Street, east along Marble Avenue to First Street, south along First Street, and then across Lomas to the Lomas Substation. This route removes the transmission line from the vicinity of the Federal Court House site and away from Lomas Boulevard frontage (particularly from in front of the First State Bank Building on Lomas).
22	PROPOSED ACTION: Build Second WP Line.	1998						A second line between West Mesa Station and Prager Station strung on existing structures will allow for more subtransmission into the center of Albuquerque
G1	PROPOSE ACTION: Install three new combustion turbine generators at Reeves station.	2000						The 290 MW of new generation at Reeves would reduce the burden off our transmission system by effectively reducing the Albuquerque load.
G2	PROPOSE ACTION: Build new combustion turbine generator at Person station.	1999						The 88 - 120 MW of new generation at Person will reduce the burden off our transmission system by effectively reducing the Albuquerque load.

**EXISTING AND PLANNED FACILITIES  
IN BERNALILLO COUNTY**

**Plains Electric Generation and  
Transmission Cooperative, Inc.**

**Existing Facilities**

**Planning Lab (505) 889-7234**

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**Plains' existing transmission facilities in Bernalillo County may be summarized as follows:**

**Substations and Switching Stations:**

The West Mesa 115 kV switching station is Plains' only facility of this nature in Bernalillo County. It does not serve any load, but does provide transmission support for Plains' transmission system.

**Transmission Lines:**

Three of Plains' existing transmission lines enter Bernalillo County and terminate at Plains' West Mesa switching station. These transmission lines are:

- Laguna Tap - West Mesa 115 kV
- Belen - West Mesa 115 kV
- Algodones - West Mesa 115 kV

Plains' West Mesa 115 kV switching station is also connected to the Public Service Company of New Mexico (PNM)'s West Mesa 115 kV bus by a short 115 kV line, i.e., a bus-tie, which is owned and operated (switched) by PNM.

**Generating Stations:**

Plains does not own, co-own, or operate any generating stations within Bernalillo County.

**EXISTING AND PLANNED FACILITIES  
IN BERNALILLO COUNTY**

**Plains Electric Generation and  
Transmission Cooperative, Inc.**

**Planned Facilities**

Planning Lab (505) 889-7234

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**Plains' planned transmission system modifications in Bernalillo County, over the 1995 - 2005 time frame, may be summarized as follows:**

**Substations and Switching Stations:**

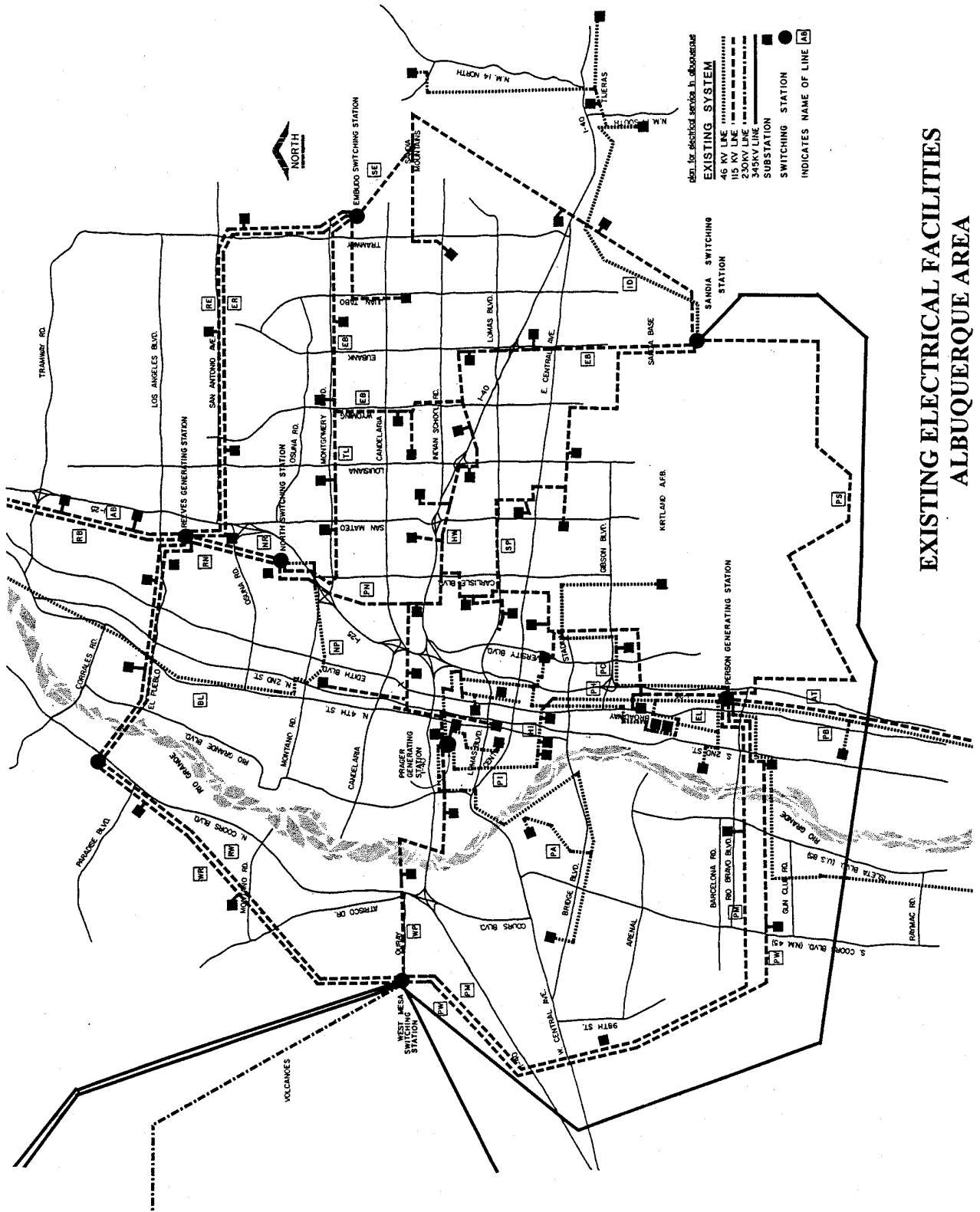
Plains does not currently plan any substation or switching station additions within Bernalillo County over the next decade, nor does Plains intend to make any significant modifications to the existing West Mesa 115 kV switching station.

**Transmission Lines:**

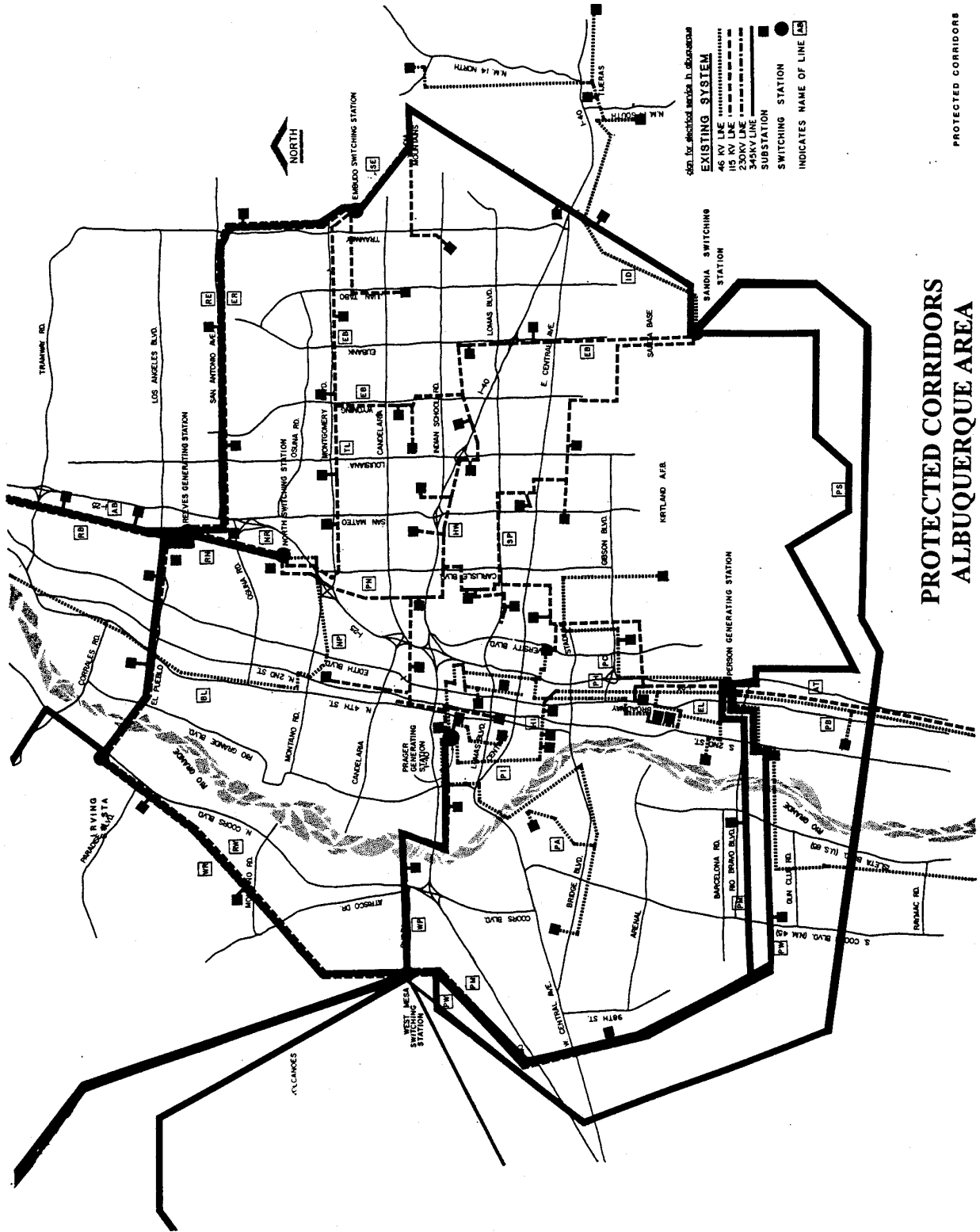
Only one relatively minor modification to Plains existing transmission system within Bernalillo County is currently planned for the 1995 - 2005 time frame. This modification will consist of the rebuilding, but not reconductoring, of Plains' Bluewater - West Mesa 115 kV line. The existing conductors of this line will be uniformly raised, above ground level, to a new height which will boost the normal power transfer rating of this line to approximately 83 MVA. This project is expected to be completed by the latter months of 1995.

**Generating Stations:**

Plains does not currently plan to construct, own, co-own, or operate any generating stations within Bernalillo County over the 1995 - 2005 time frame.



# EXISTING ELECTRICAL FACILITIES ALBUQUERQUE AREA

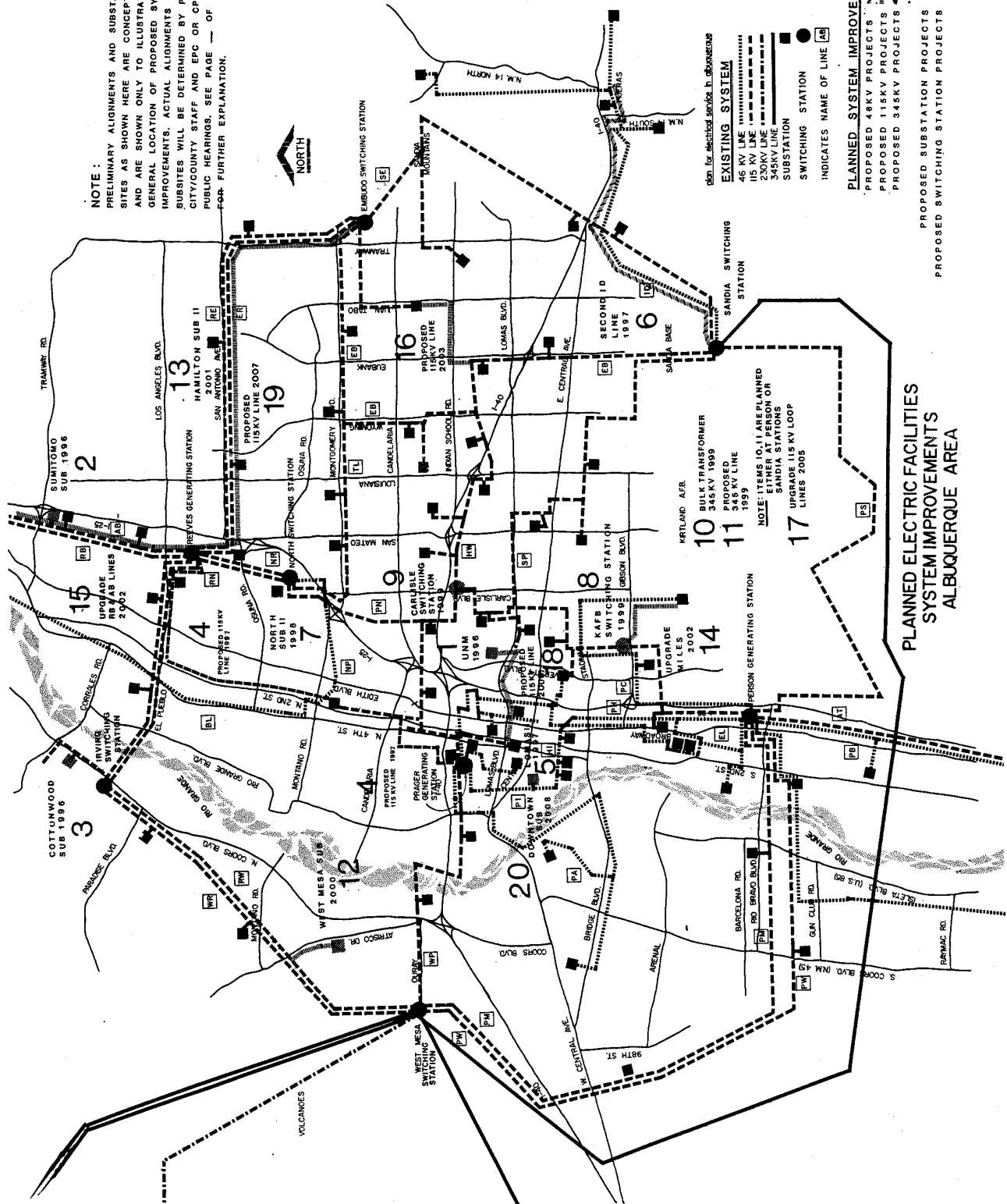


**PROTECTED CORRIDORS  
ALBUQUERQUE AREA**

PROTECTED CORRIDORS



**NOTE:**  
 PRELIMINARY ALIGNMENTS AND SUBSTATION SITES AS SHOWN HERE ARE CONCEPTUAL AND ARE SHOWN ONLY TO ILLUSTRATE GENERAL LOCATION OF PROPOSED SYSTEM IMPROVEMENTS. ACTUAL ALIGNMENTS AND SUBSITES WILL BE DETERMINED BY PNM, CITY/COUNTY STAFF AND EPC OR CPC AT PUBLIC HEARINGS. SEE PAGE — OF PLAN FOR FURTHER EXPLANATION.



SEE PLAN FOR ELECTRICAL SERVICE TO DEVELOPERS

**EXISTING SYSTEM**  
 46 KV LINE  
 115 KV LINE  
 230KV LINE  
 345KV LINE

SUBSTATION  
 SWITCHING STATION

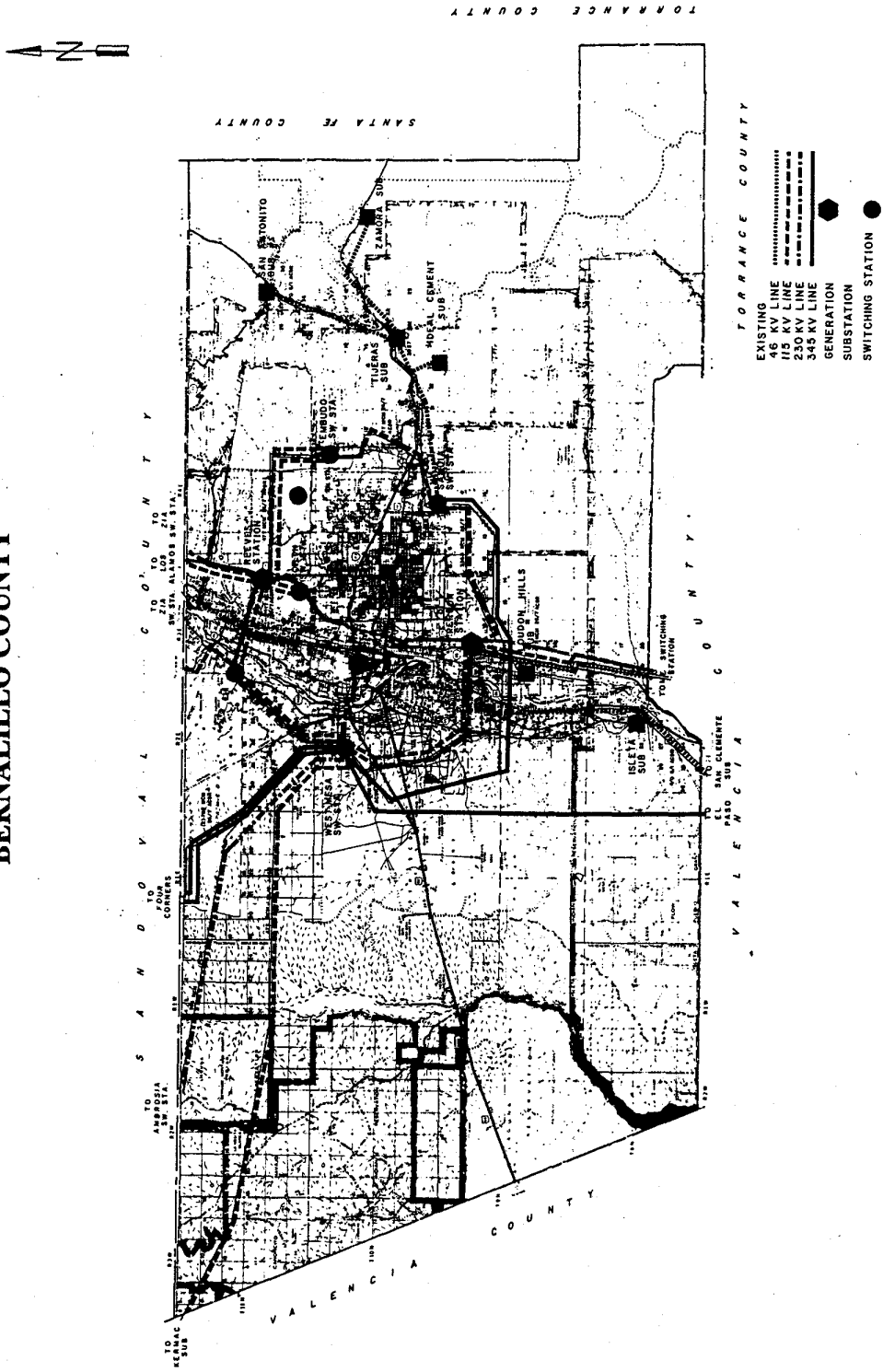
INDICATES NAME OF LINE

**PLANNED SYSTEM IMPROVEMENTS**  
 PROPOSED 48KV PROJECTS  
 PROPOSED 115KV PROJECTS  
 PROPOSED 345KV PROJECTS

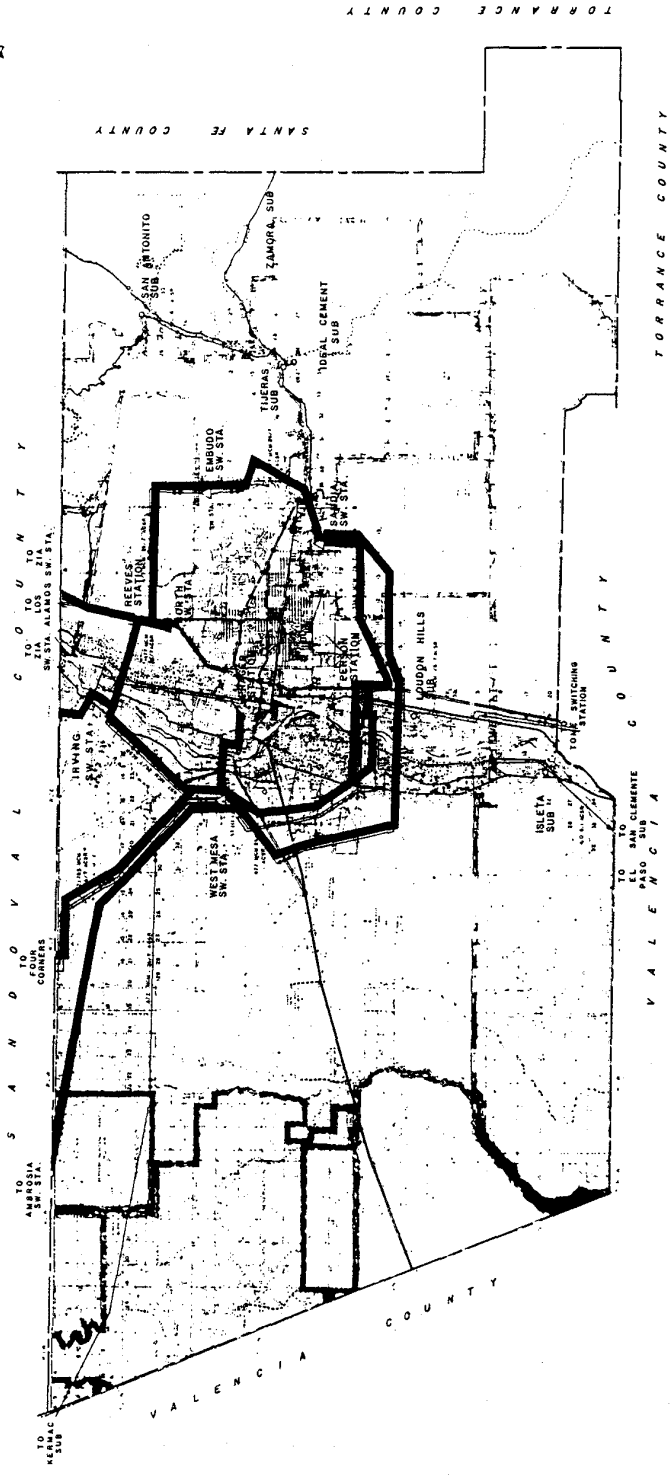
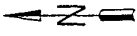
PROPOSED SUBSTATION PROJECTS  
 PROPOSED SWITCHING STATION PROJECTS

**PLANNED ELECTRIC FACILITIES SYSTEM IMPROVEMENTS ALBUQUERQUE AREA**

# EXISTING ELECTRICAL FACILITIES BERNALILLO COUNTY



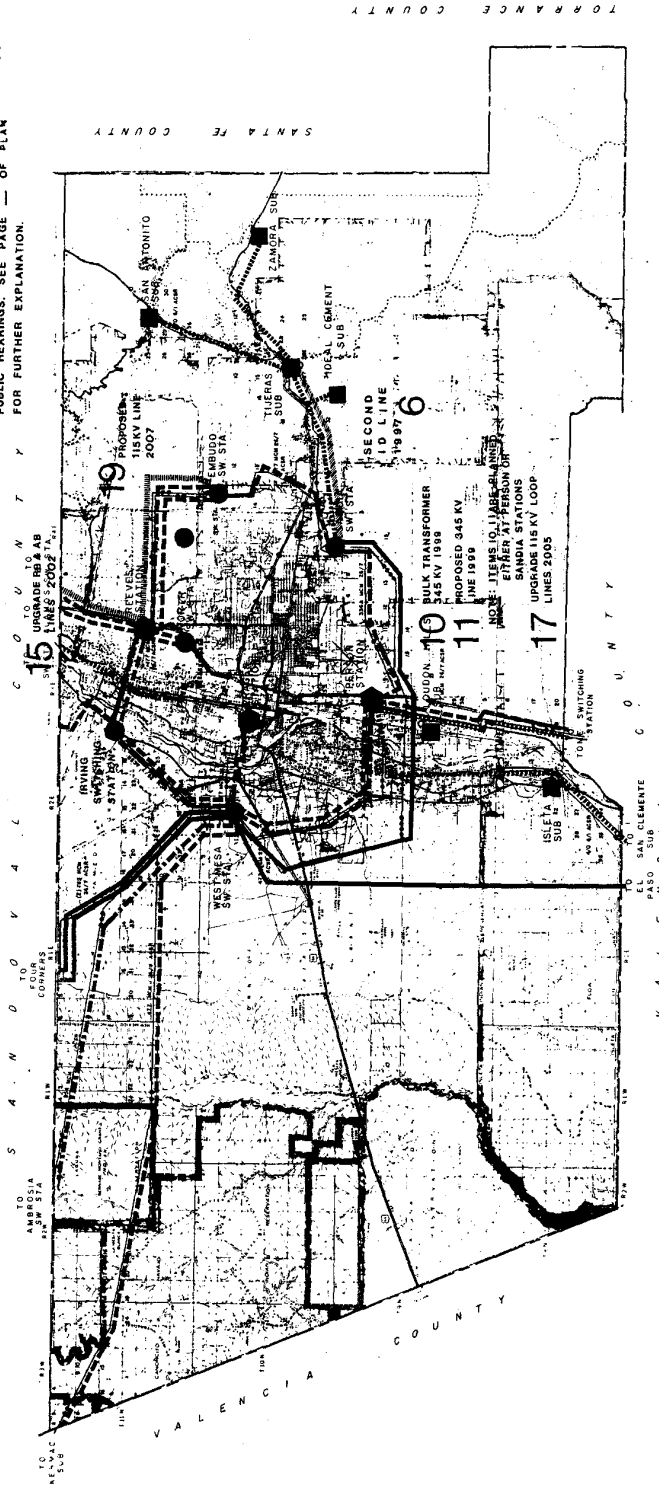
# PROTECTED CORRIDORS BERNALILLO COUNTY



- TORRANCE COUNTY**
- EXISTING
  - 46 KV LINE
  - 115 KV LINE
  - 220 KV LINE
  - 345 KV LINE
  - GENERATION
  - SUBSTATION
  - SWITCHING STATION

PROTECTED CORRIDORS

**NOTE:**  
 PRELIMINARY ALIGNMENTS AND SUBSTATION SITES AS SHOWN HERE ARE CONCEPTUAL AND ARE SHOWN ONLY TO ILLUSTRATE GENERAL LOCATION OF PROPOSED SYSTEM IMPROVEMENTS. ACTUAL ALIGNMENTS AND SUBSITES WILL BE DETERMINED BY P.W. CITY/COUNTY STAFF AND EPC OR CPC AT PUBLIC HEARINGS. SEE PAGE — OF PLAN FOR FURTHER EXPLANATION.



**PLANNED ELECTRIC FACILITIES  
 SYSTEM IMPROVEMENTS  
 BERNALILLO COUNTY**

**LEGEND:**  
 EXISTING  
 46 KV LINE  
 115 KV LINE  
 230 KV LINE  
 345 KV LINE  
 GENERATION  
 SWITCHING STATION

**APPENDICES**

APPENDIX A:  
OUTLINE FOR A  
TYPICAL SITING STUDY

OUTLINE FOR A TYPICAL SITING STUDY

Executive Summary

- A. Project Description
- B. Alternative Corridors and/or Substation Sites Examined
- C. Preferred Alternative

I. Introduction

- A. Project Description
- B. Purpose and Need
- C. Design and Construction Information

II. Identification of Constraints and Opportunities for Siting

A. Study Area Delineation and Description

1. General Characterization of Land Use

- a. Zoning
- b. Existing Uses
- c. Proposed Uses
- d. Existing and Proposed Streets  
- Functional Classifications

2. General Characterization of Visual Resources

- a. General View Quality
- b. General View Orientation
- c. Topography

3. General Characterization of Ecological Resources

B. Identification of Siting Constraints

- 1. Fatal Flaws
- 2. Environmental Sensitivities
- 3. Environmental Concerns

C. Identification of Siting Opportunities

- 1. Feasible Alternative Corridor Locations
- 2. Feasible Substation Sites

III. Evaluation of Alternative Corridors and/or Substation Sites

A. Physical Description

1. Existing Land Use
2. Proposed Land Use
3. Existing Overhead Utilities
4. Functional Street Classification
5. Traffic Counts
6. Characterization of Existing Views
7. Ecological Characterization

B. Options for Construction

1. Approximate Line Length
2. Average Structure Height
3. Approximate Number of Structures
4. Average Span Length
5. Estimated Installed Costs
  - above ground and underground

C. Identification and Description of Potential Siting Impacts

1. Potential Land Use Impacts
2. Potential Visual Impacts
3. Potential Ecological Impacts

IV. Identification/Selection of Preferred Alternative

A. Summary of Impacts

B. Summary of Measures Taken to Accommodate Siting Impacts

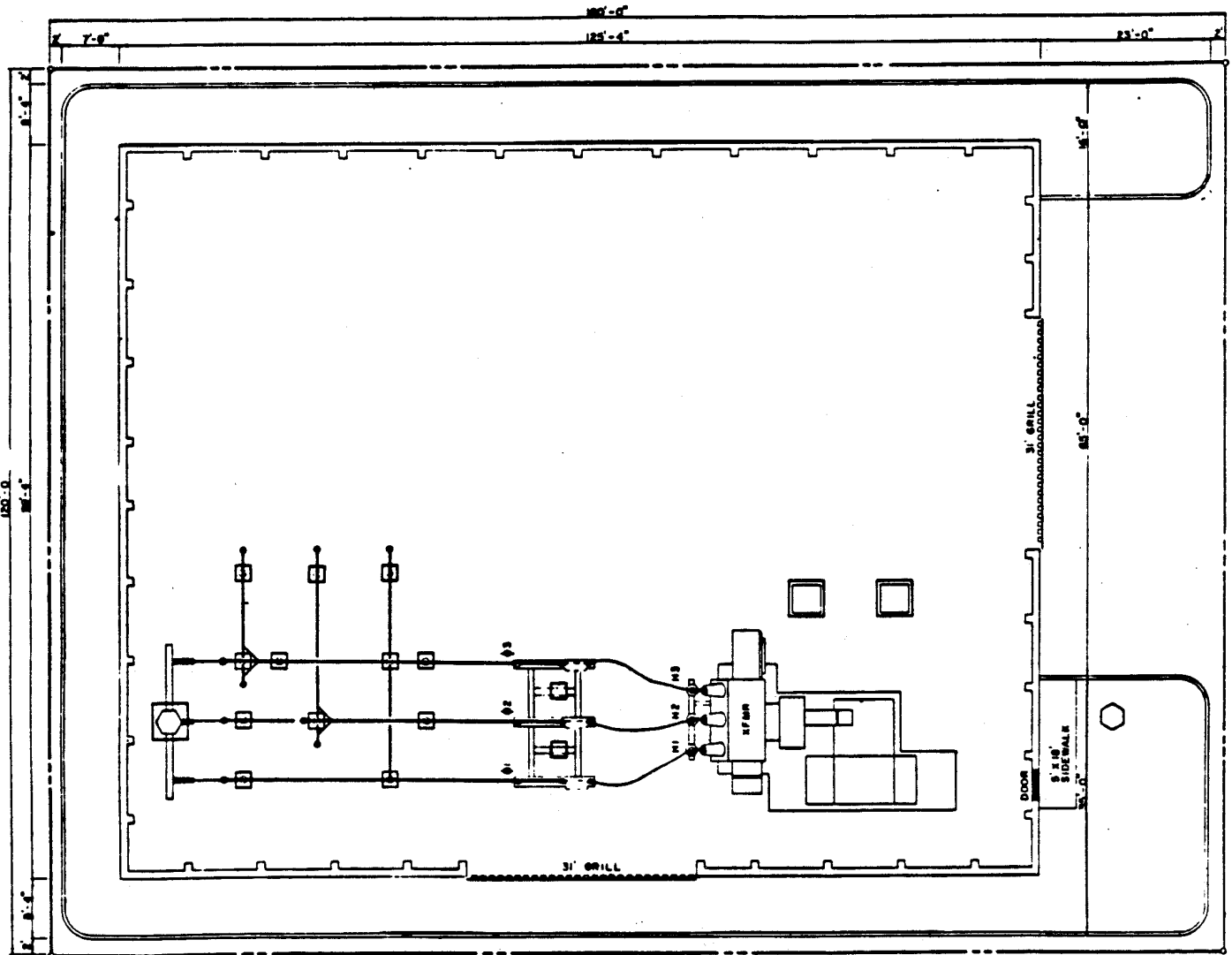
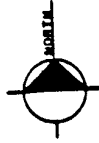
1. Corridor Alignment
2. Substation Location
3. Design and Construction Information

C. Project Costs



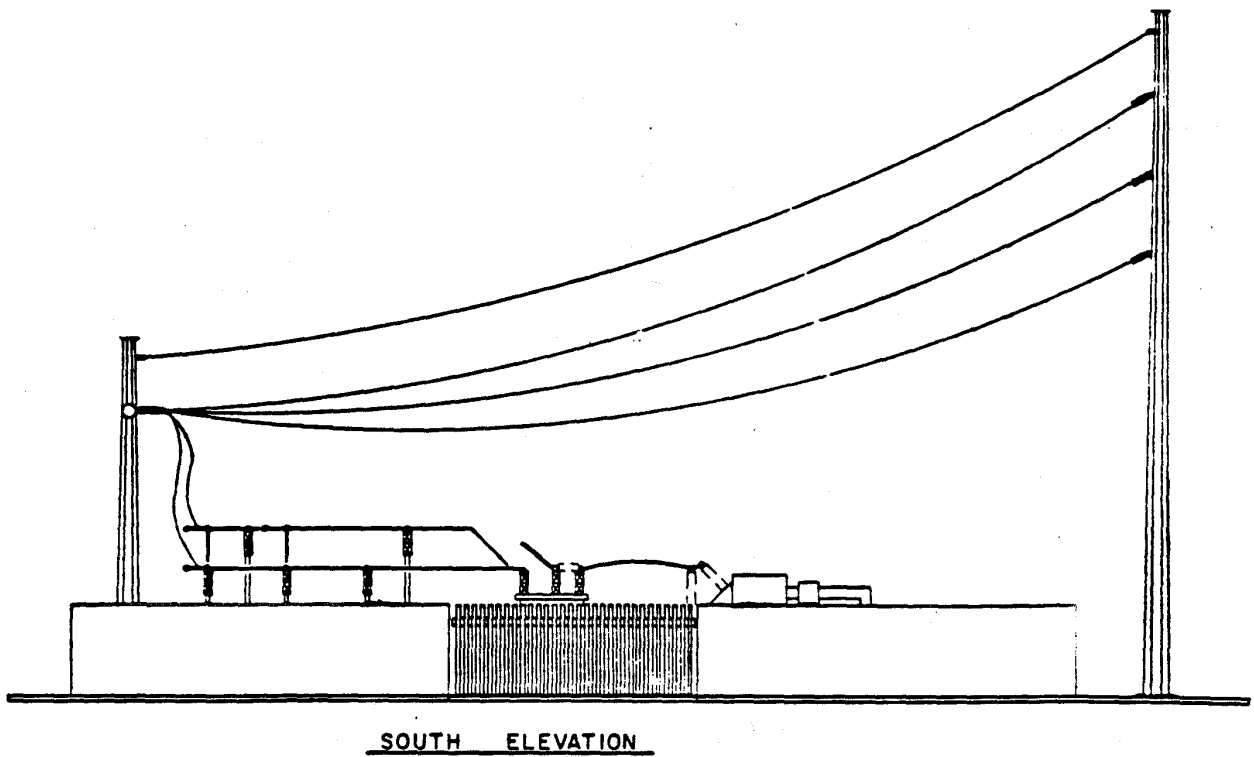
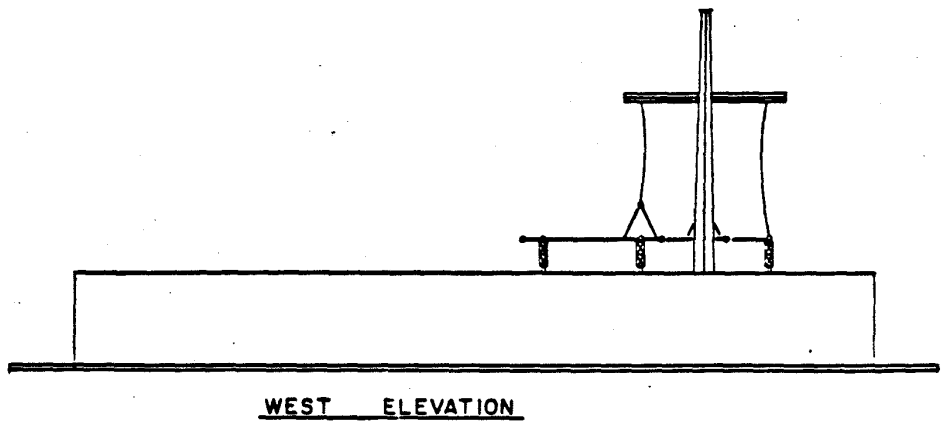
APPENDIX B:  
SAMPLE SUBSTATION PLANS

# SAMPLE SITE PLAN

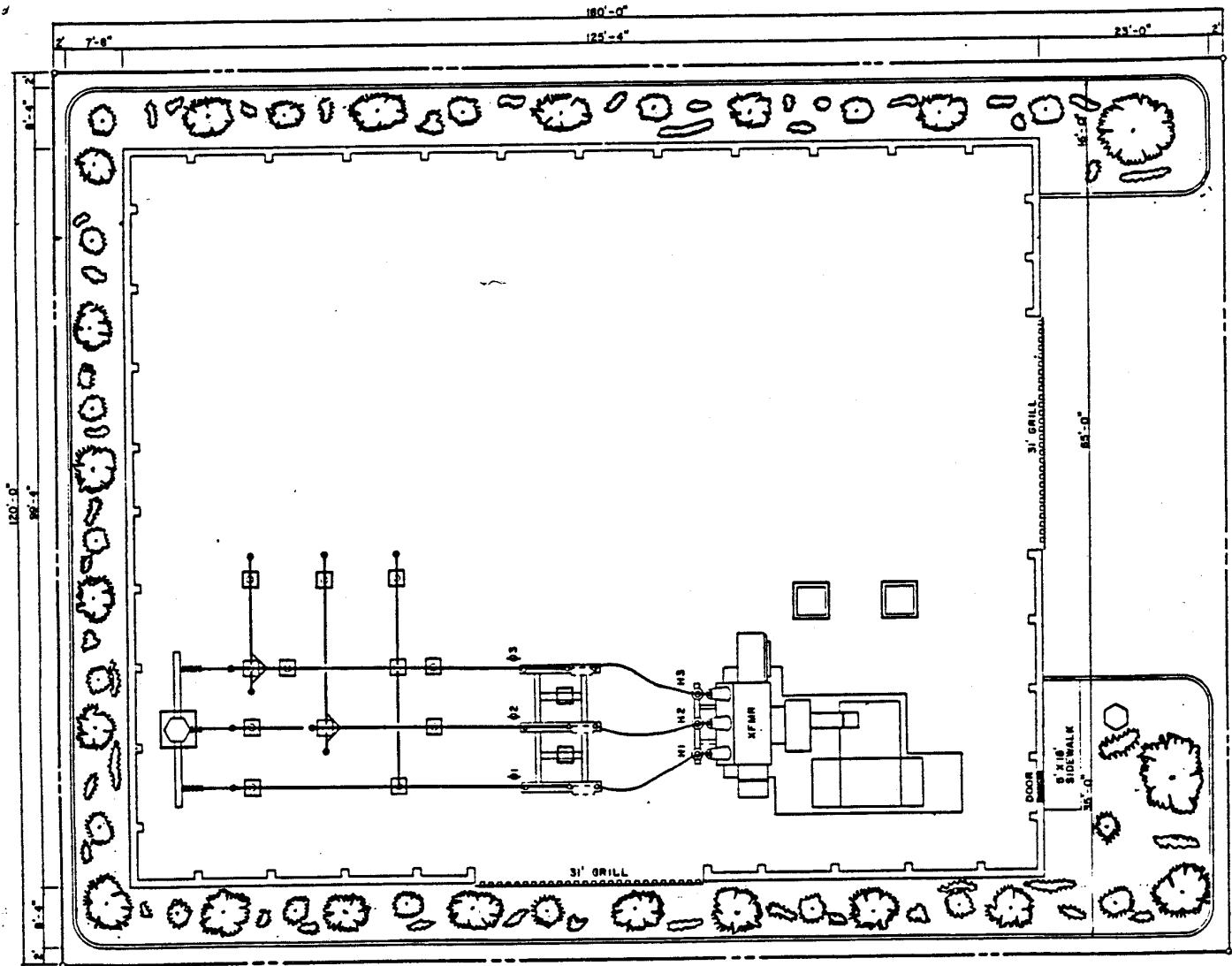
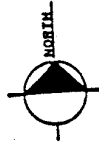


TYPICAL LAYOUT

SAMPLE ELEVATION DRAWINGS

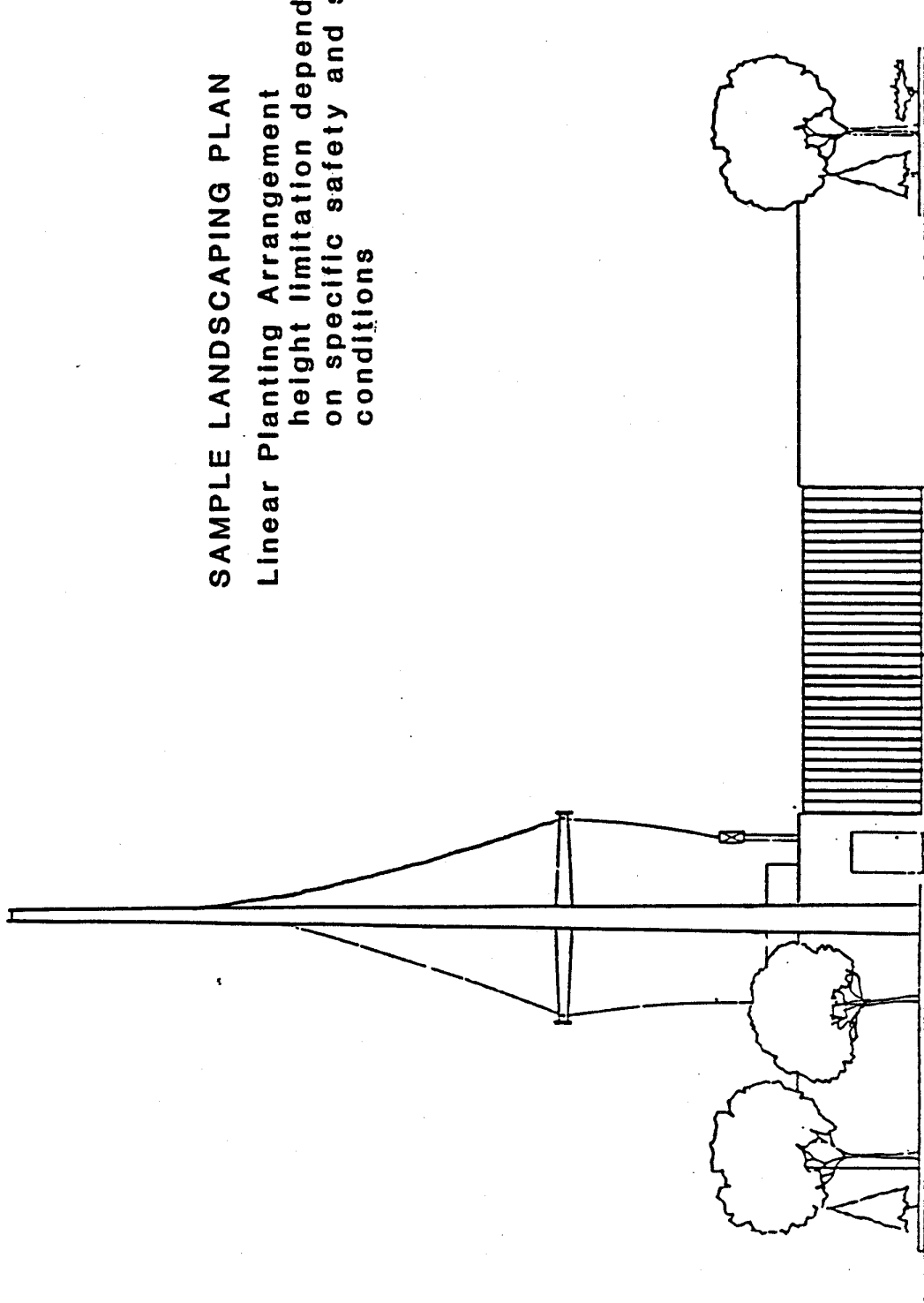


# SAMPLE LANDSCAPING PLAN



Linear Planting Arrangement

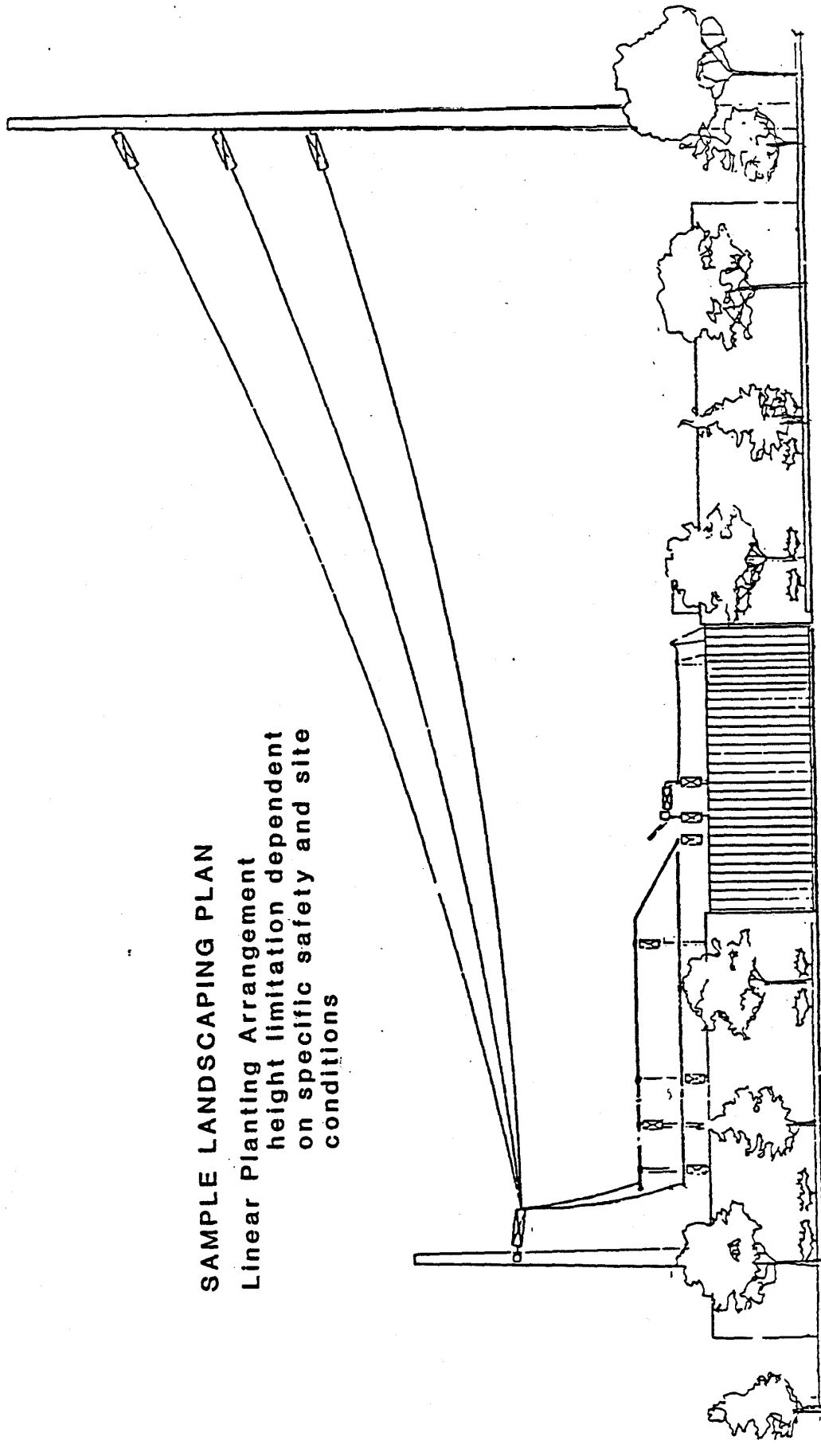
**SAMPLE LANDSCAPING PLAN**  
**Linear Planting Arrangement**  
**height limitation dependent**  
**on specific safety and site**  
**conditions**



**EAST ELEVATION**

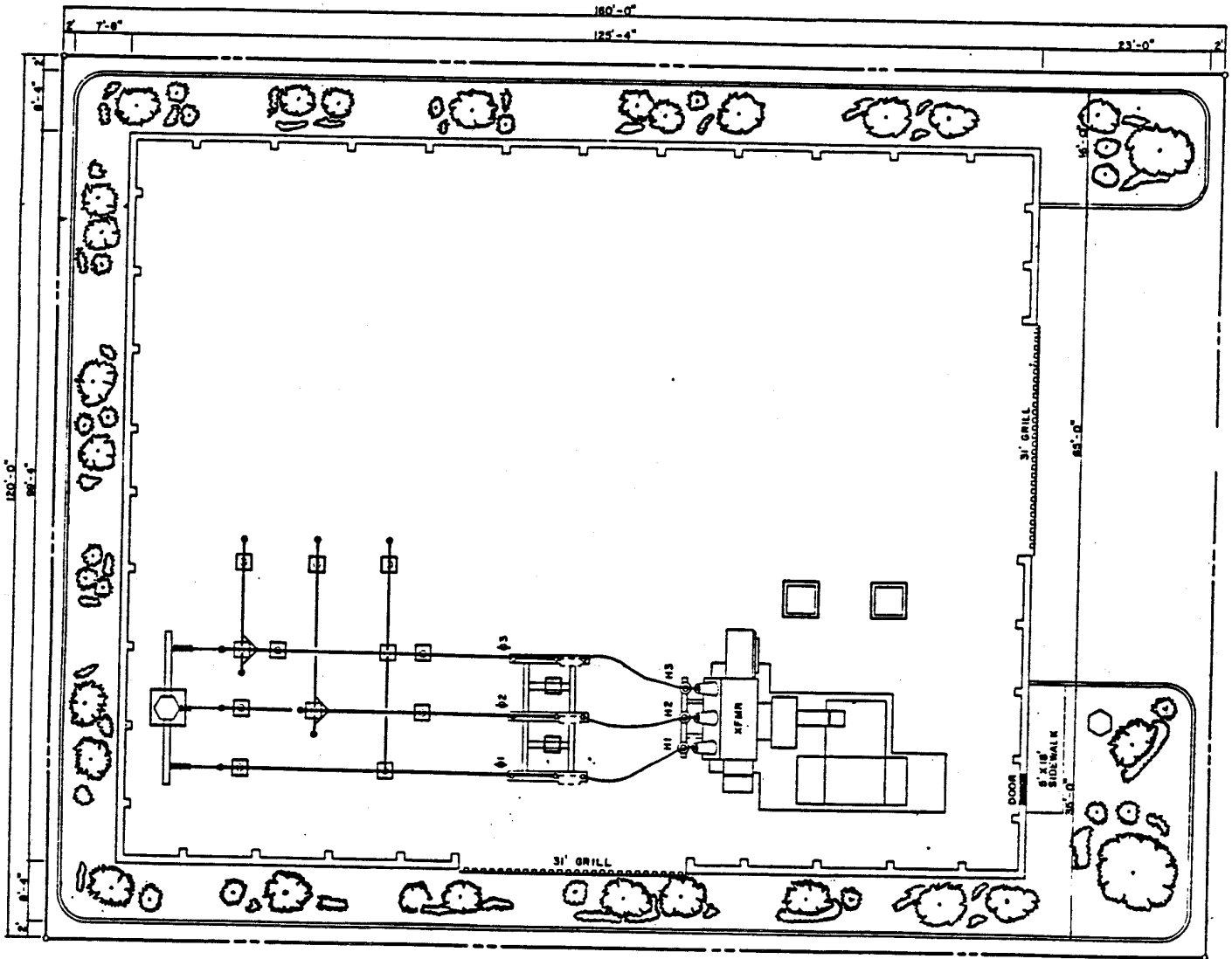
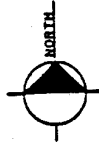
**SAMPLE LANDSCAPING PLAN**

**Linear Planting Arrangement  
height limitation dependent  
on specific safety and site  
conditions**



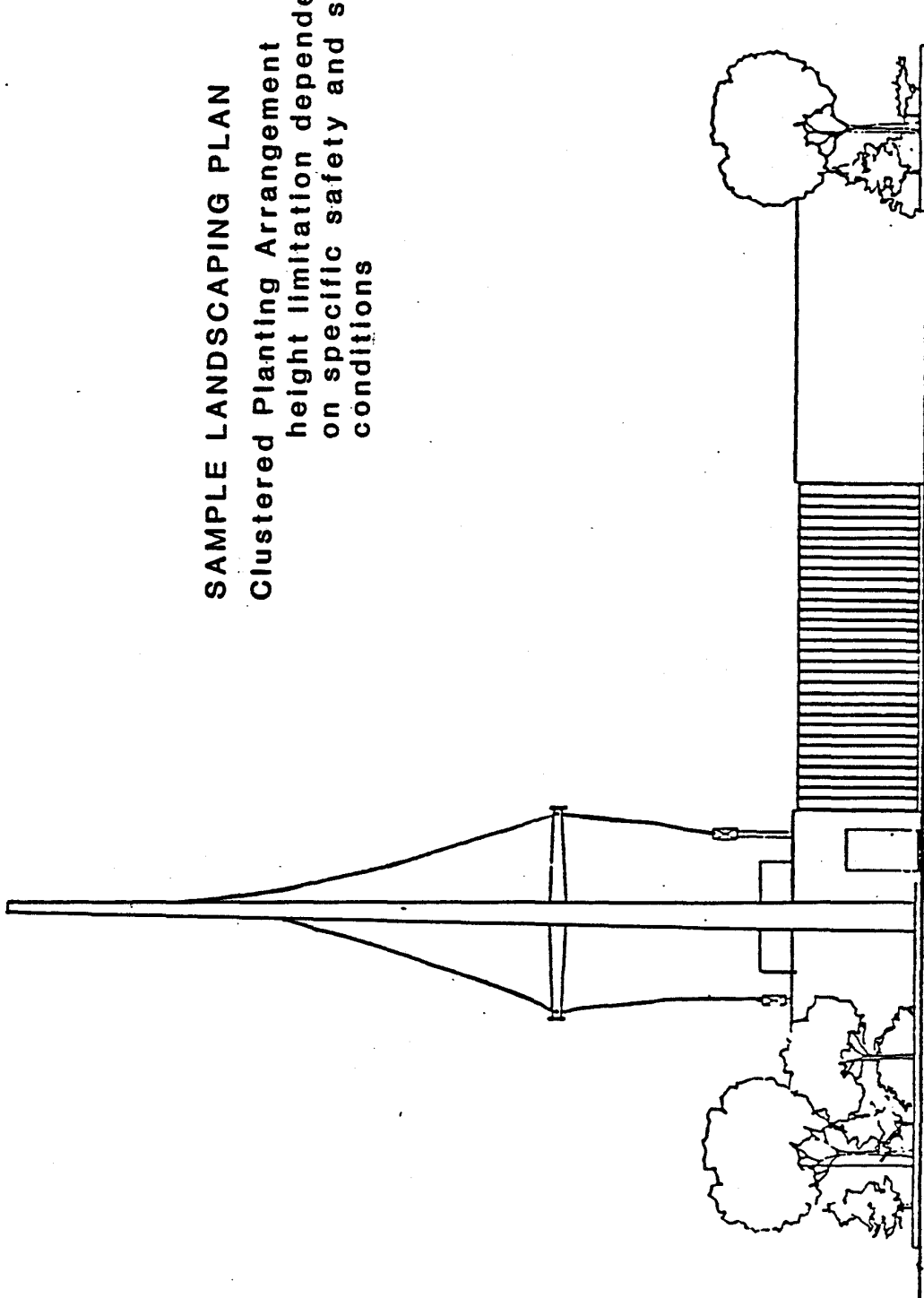
**SOUTH ELEVATION**

# SAMPLE LANDSCAPING PLAN



Clustered Planting Arrangement

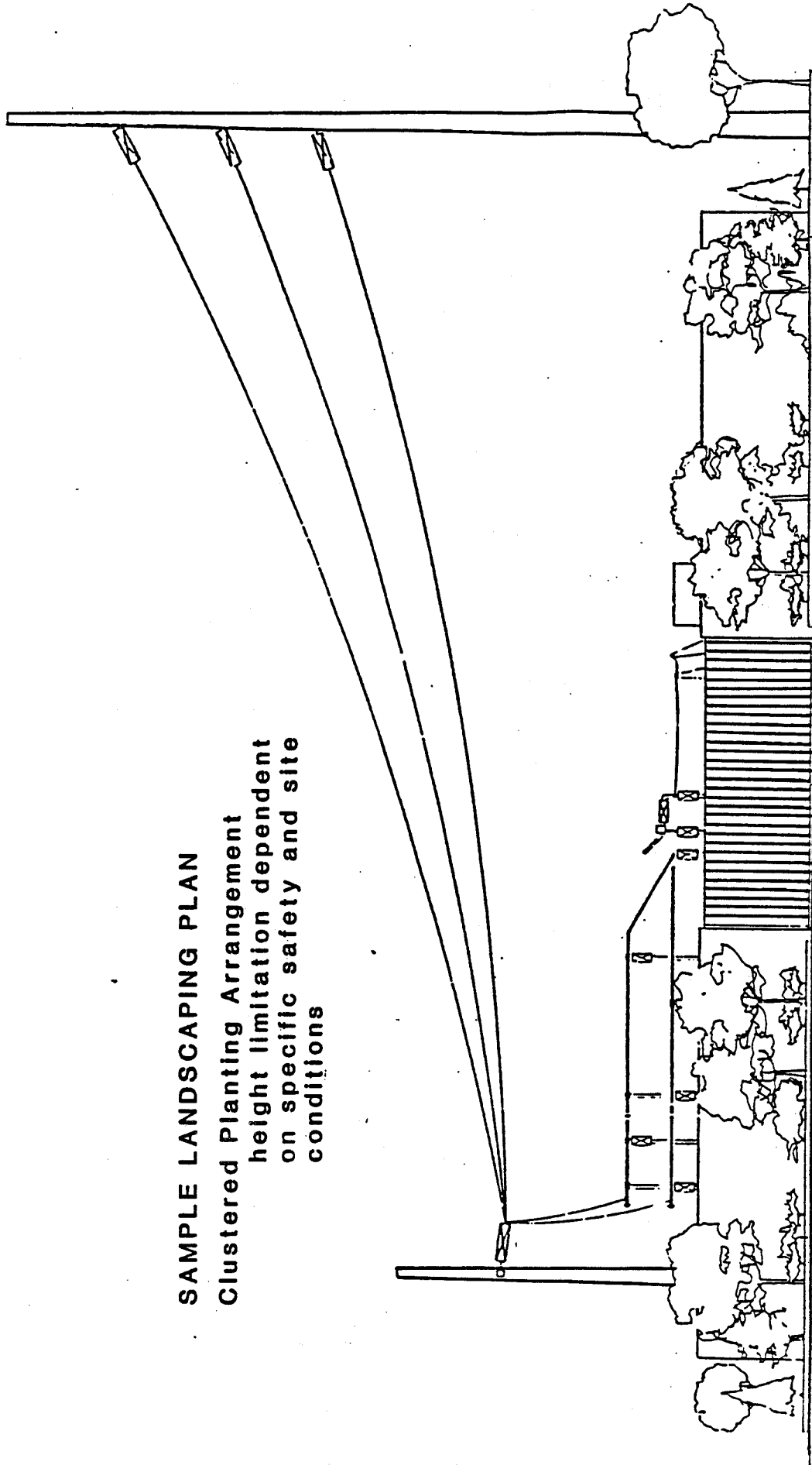
**SAMPLE LANDSCAPING PLAN**  
**Clustered Planting Arrangement**  
**height limitation dependent**  
**on specific safety and site**  
**conditions**



**EAST ELEVATION**



**SAMPLE LANDSCAPING PLAN**  
**Clustered Planting Arrangement**  
**height limitation dependent**  
**on specific safety and site**  
**conditions**



**SOUTH ELEVATION**

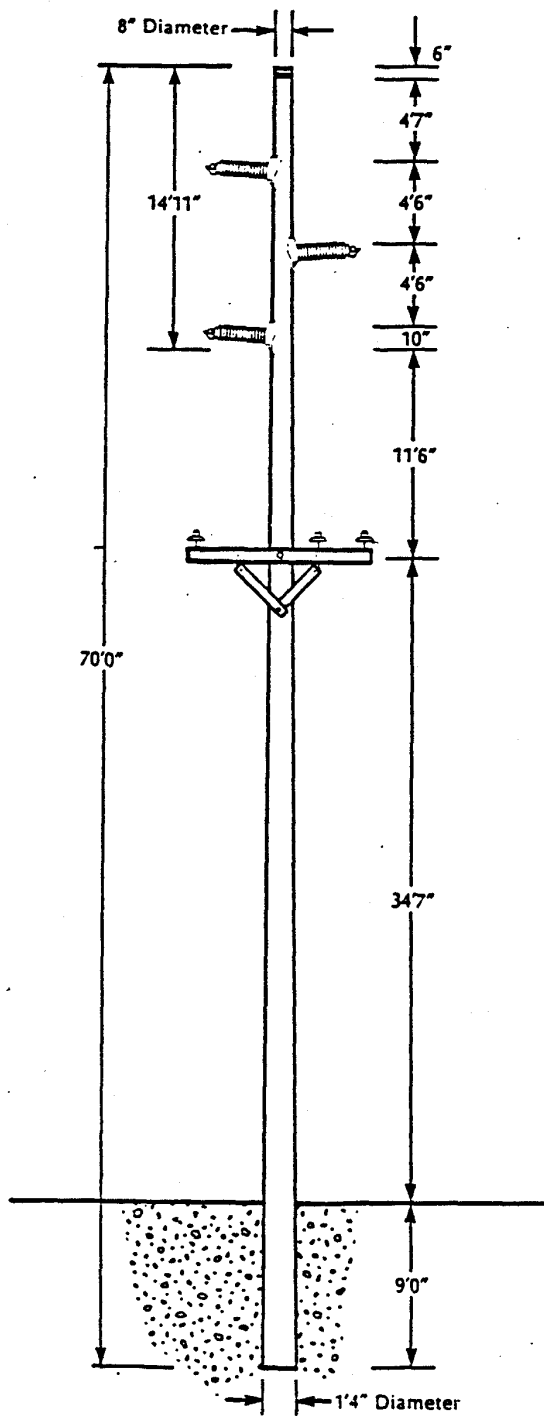
APPENDIX C:  
PNM SUBSTATION  
LANDSCAPE DESIGN STANDARDS

## PNM SUBSTATION LANDSCAPE DESIGN STANDARDS

1. Substation facilities should be surrounded by a minimum 10-foot, landscaped buffer zone as approved through the site plan approval. If located within the City of Albuquerque, they shall be landscaped as per Section 14-16-3-10 (Landscaping regulations applicable to apartment and nonresidential development) of the City of Albuquerque Zoning Code and the Water Conservation Landscaping and Water Waste Ordinance. If located outside of the City of Albuquerque, within Bernalillo County, they shall be landscaped as per the Comprehensive Zoning Ordinance of Bernalillo County, New Mexico, Ordinance No. 213, Section 19, Landscaping and Buffer Landscaping Regulations. This buffer zone should not limit adequate substation access for maintenance vehicles and special equipment.
2. The setback of the substation will be equal to the setback requirements of adjacent properties. Where the site faces or is contiguous to two or more different zones, the more restrictive setback requirements shall apply. If compliance with the more restrictive setback requirements would cause practical difficulties and unnecessary hardship, a variance may be applied for.
3. The buffer zone area should be planted with sufficient vegetation which, when mature, will assist in visually screening the substation walls and structures from all adjacent land uses and from the public right-of-way. The sample landscaping plans (B-3 to B-8), provide examples of this standard.
4. Street trees are required and shall be planted in accordance with existing regulations at new substations and at existing substation sites that are being upgraded. If planting of street trees would result in a safety hazard to the public, a variance from the street tree ordinance shall be applied for.
5. Where possible and appropriate, existing trees, shrubs, fences, walls, and landforms shall be incorporated into landscape plans. The landscape design shall be compatible with the surrounding environment where appropriate. Mature landscapes should shade the gravel below to prevent excessive heat build-up.
6. A limited variety of landscape materials is suggested. The plant materials shall complement those found in the surrounding neighborhood or environment where appropriate.
7. Live plant materials are an important element in all landscaped areas. However, for safety purposes, the buffer zone shall be covered with 3/8 inch pea gravel to a depth of approximately four inches.

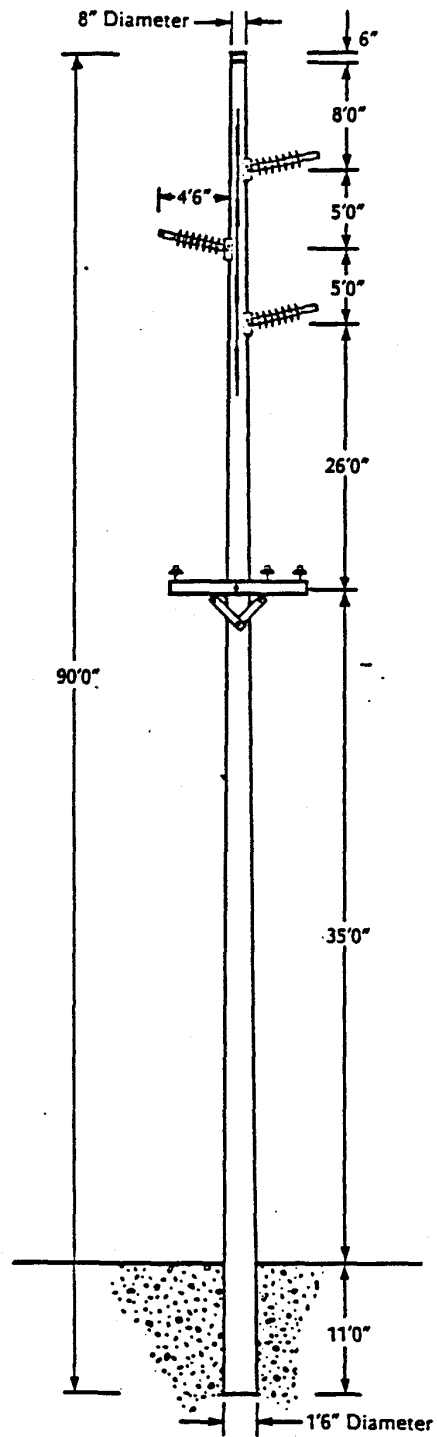
8. The selection and arrangement of plant materials shall provide ample screening for the substation, as discussed in standards 2, 3, and 4, while complying with safety and maintenance requirements (for more information, see sample landscaping plans B-3 to B-8).
9. Irrigation shall be specified for all landscaped areas. Generally, an underground system is encouraged. Irrigation systems should be designed so as to comply with the provisions of the Albuquerque Water Conservation Landscaping and Water Waste Ordinance if located within the City of Albuquerque.
10. Existing substation sites which do not meet the landscaping standards contained in this Plan shall be addressed on an individual basis as warranted.

APPENDIX D:  
POLE DESIGNS



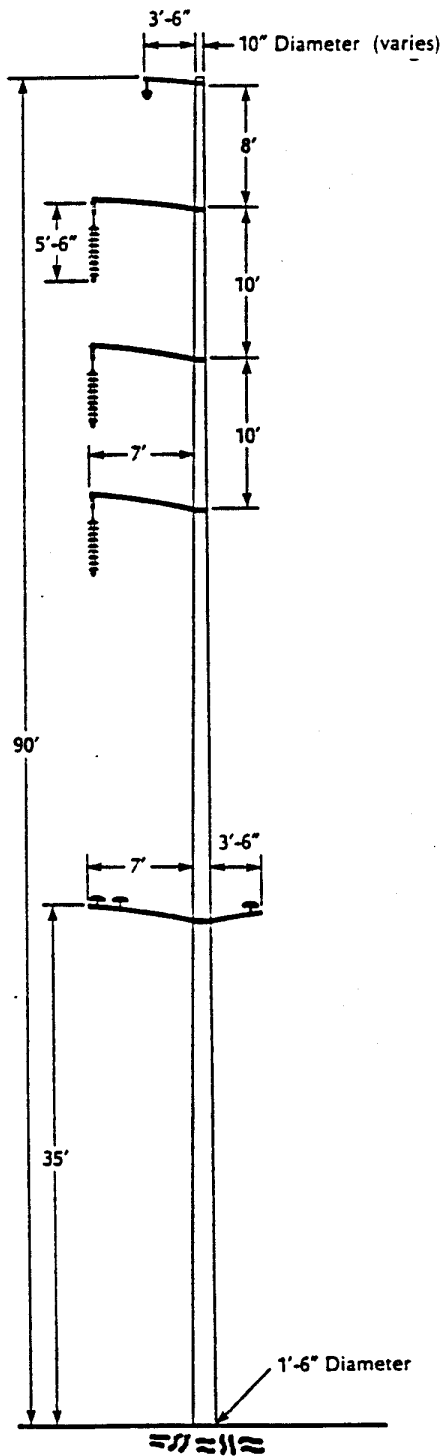
46 kV HORIZONTAL POST WOOD TANGENT STRUCTURE  
WITH DISTRIBUTION UNDERBUILD

FIGURE B-1



115 kV WOOD POLE POLYMER POST TANGENT  
STRUCTURE WITH DISTRIBUTION UNDERBUILD

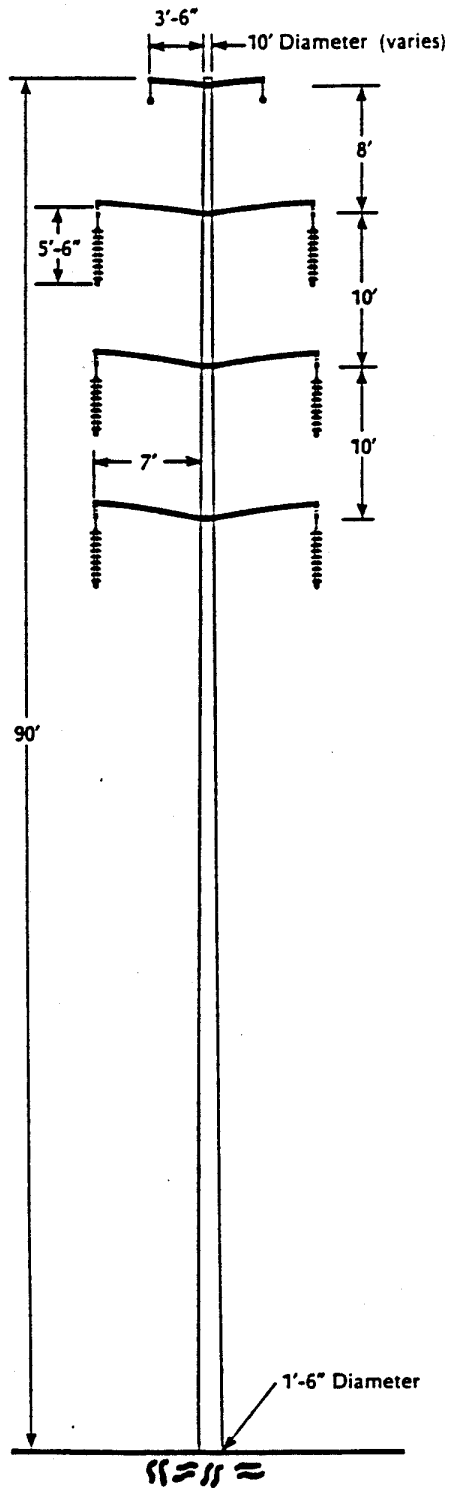
FIGURE D-2



115 kV STEEL TANGENT STRUCTURE  
WITH DISTRIBUTION UNDERBUILD

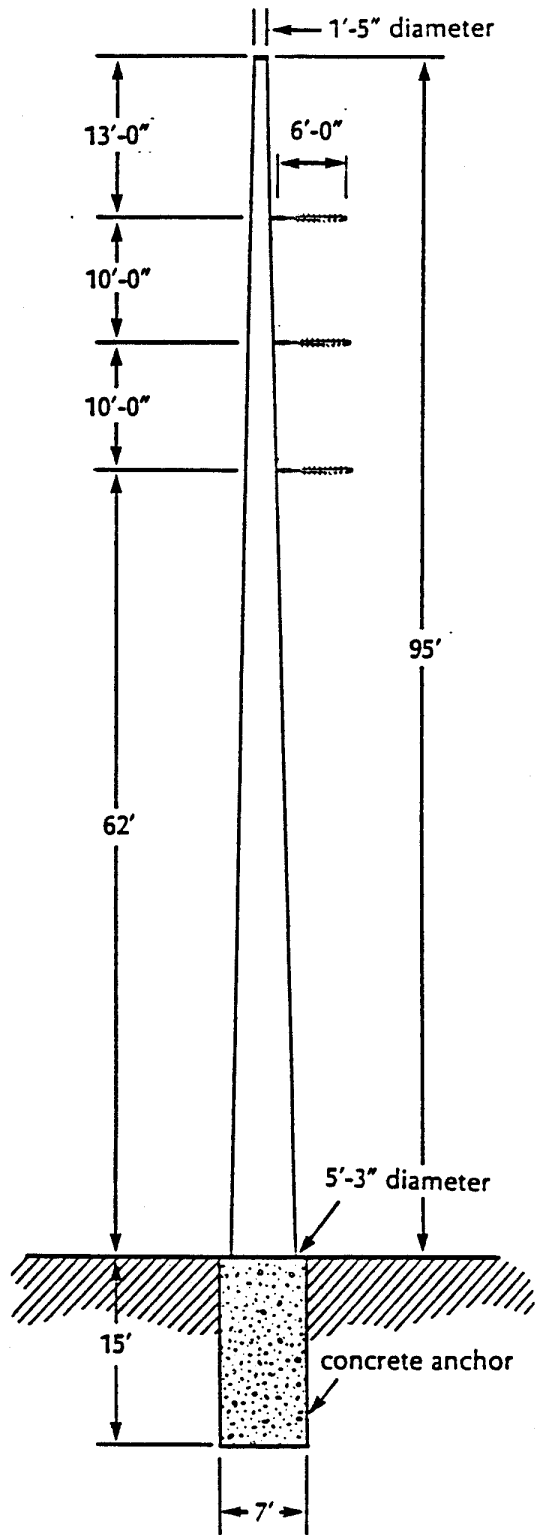
FIGURE D-3





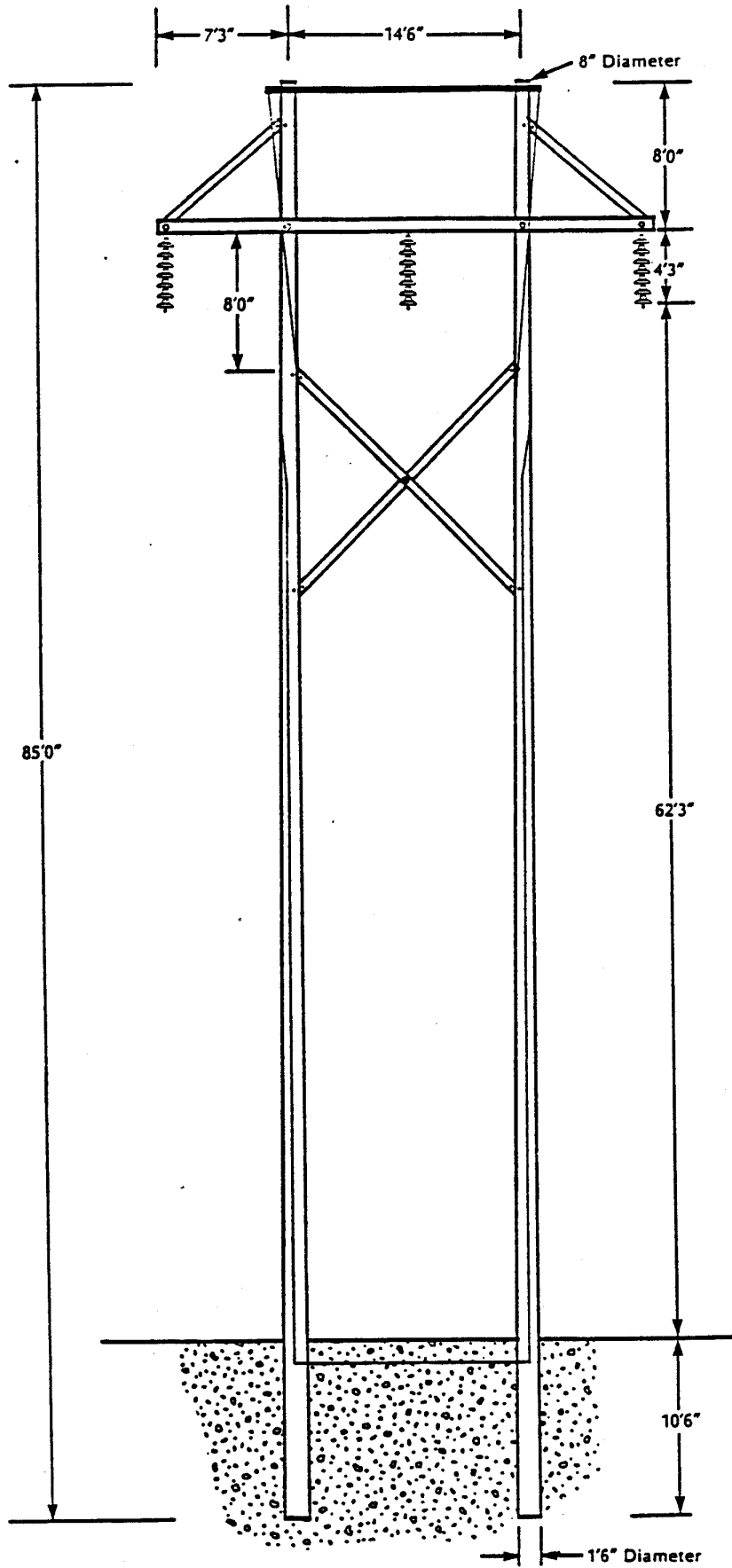
115 kV STEEL TANGENT DOUBLE CIRCUIT STRUCTURE

FIGURE D-4



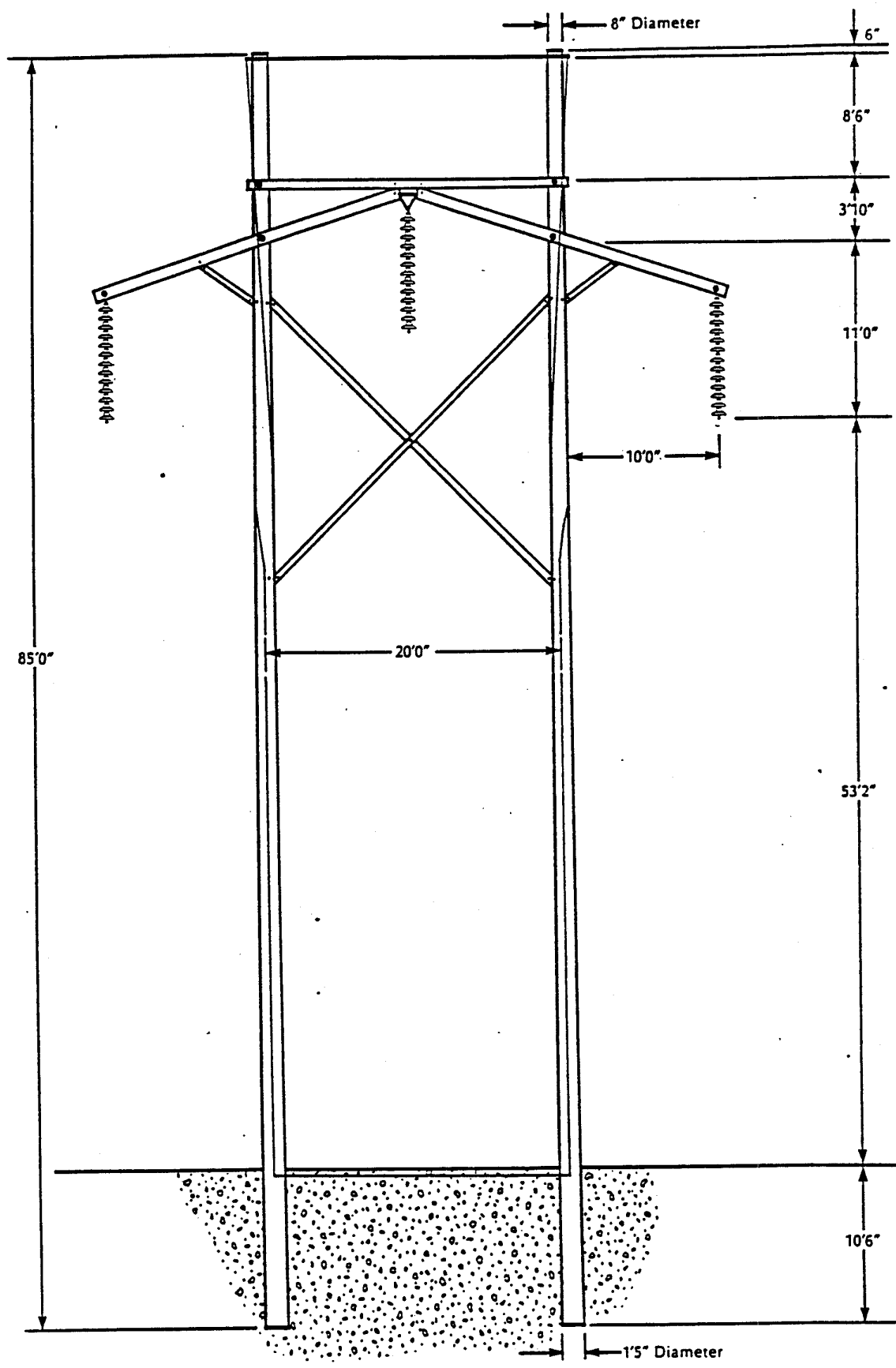
115 kV STEEL DEADEND STRUCTURE

FIGURE D-5



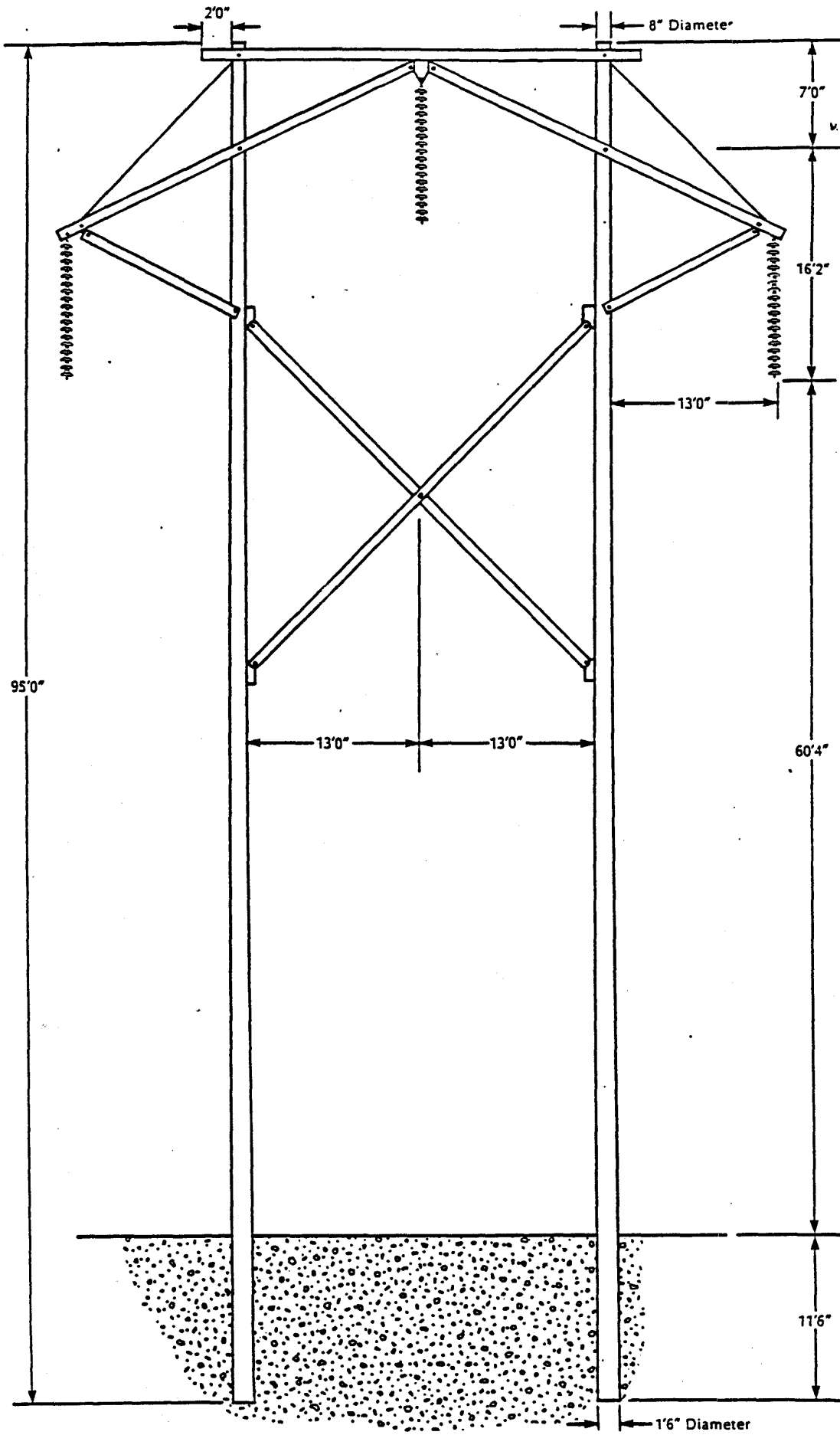
115 kV WOOD TANGENT STRUCTURE

FIGURE D-6

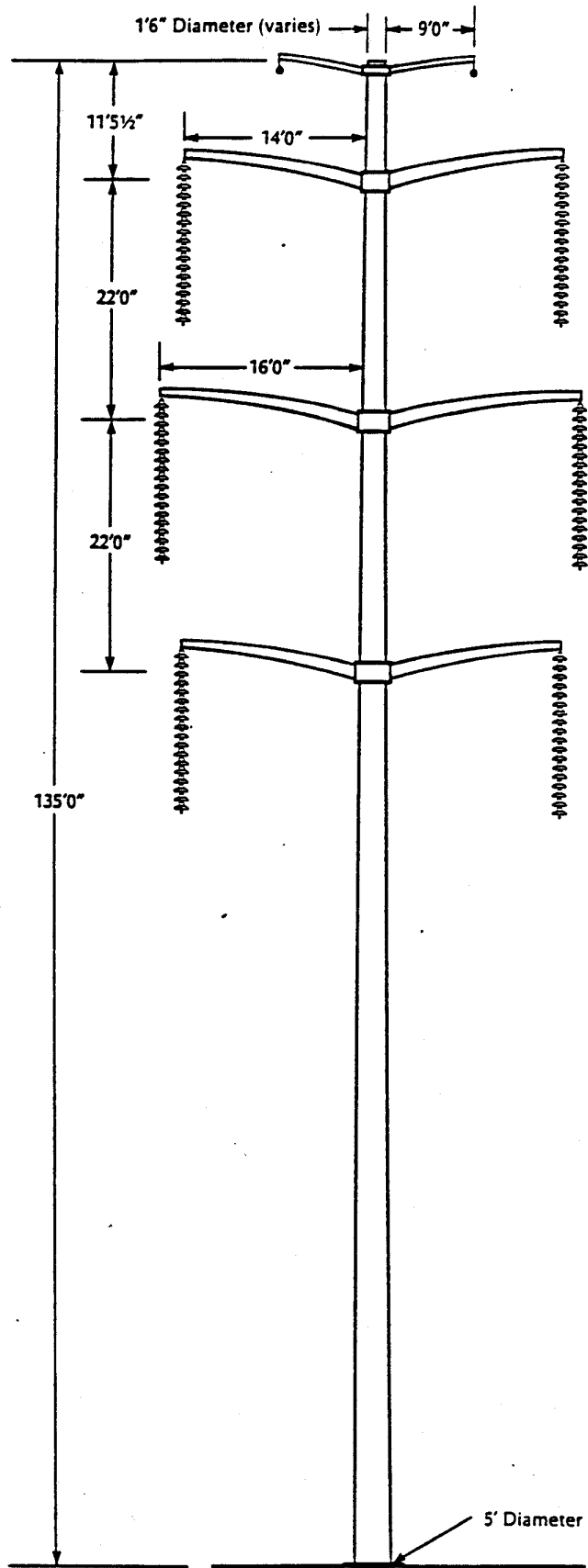


230 kV WOOD TANGENT STRUCTURE

FIGURE D-7



SALVAGE WOOD TANGENT STRUCTURE ETCIDE D-L-R  
 SALVAGE WOOD TANGENT STRUCTURE ETCIDE D-L-R



345 kV STEEL TANGENT DOUBLE CIRCUIT STRUCTURE

FIGURE D-9

APPENDIX E:  
TRANSFORMER NOISE REGULATIONS

E

NEMA STANDARDS PUBLICATION NO. TR1-1980  
TRANSFORMERS, REGULATORS, AND REACTORS

TR 1.0.05 AUDIBLE SOUND LEVELS

Transformers shall be so designed that the average sound level will not exceed the values given in Tables E-1 through E-3 when measured at the factor in accordance with the conditions outlined in ANSI/IEEE C57.12.90-1980. Rectifier, railway, furnace, grounding, mobile and mobile unit substation transformers are not covered by the tables. The tables do not apply during the time that power switches are operating in load-tap-changing transformers and in transformers with integral power switches. NEMA Standard, November 20, 1980.



**AUDIBLE SOUND LEVELS FOR OIL-IMMERSED POWER TRANSFORMERS**

Column 1-Class\* OA, OW and FOW Ratings  
 Column 2-Class\* FA and FOA First-stage Auxiliary Cooling \*\*  
 Column 3-Straight FOA\* Ratings, TA\* FOA\* Second-stage Auxiliary Cooling\*\*

**Equivalent To-winding Rating**

Average Sound Level Decibels **	350 kV BIL and Below			450, 550, 650 kV BIL			750 and 825 kV BIL			900 and 1050 kV BIL			1175 kV BIL			1300 kV BIL & Above		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
57	700																	
58	1000																	
59		700																
60		1000																
61	1500																	
62	2000																	
63	2500																	
64	3000																	
65	4000																	
66	5000																	
67	6000																	
68	7500	6250																
69	10000	7500																
70	12500	9375																
71	15000	12500																
72	20000	16667																
73	25000	20000																
74	30000	26667																
75	40000	33333																
76	50000	40000																
77	60000	53333																
78	80000	66676																
79	100000	80000																
80		106667																
81		133333																
82		166667																
83		200000																
84		250000																
85		300000																
86		400000																
87																		
88																		
89																		
90																		
91																		

\* Classes of cooling (see 2.6.1 of American National Standard C57.12.00 1980).  
 \*\* First and Second stage auxiliary cooling (see TR 1.0.02).  
 † The equivalent two-winding 550C or 650C rating is defined as one-half the sum of the kVA rating of all windings.  
 ‡ Sixty-seven decibels for all kVA ratings equal to this or smaller.  
 †† For intermediate kVA ratings, use the average sound level of the next larger kVA rating.  
 # For column 2 and 3 ratings, the sound levels are with the auxiliary cooling equipment in operation.

AUDIBLE SOUND LEVELS FOR  
LIQUID-IMMERSED DISTRIBUTION TRANSFORMERS  
AND NETWORK TRANSFORMERS

Equivalent Two-winding kVA	Average Sound Level, Decibels
0 - 50	48
51 - 100	51
101 - 300	55
301 - 500	56
750	57
1000	58
1500	60
2000	61
2500	62

AUDIBLE SOUND LEVELS FOR  
DRY-TYPE TRANSFORMERS 15000-VOLT  
NOMINAL SYSTEM VOLTAGE AND BELOW

Equivalent Two-winding kVA	Average Sound Level, Decibels		Equivalent Two-winding kVA	Average Sound Level, Decibels
	Self-cooled Ventilated (1)	Self-cooled Sealed (2)		Ventilated Forced Air Cooled* (3)
0 - 50	50	50	---	---
51 - 150	55	55	---	---
151 - 300	58	57	3 - 300	67
301 - 500	60	59	301 - 500	67
501 - 700	62	61	501 - 833	67
701 - 1000	64	63	834 - 1167	67
1001 - 1500	65	64	1168 - 1667	68
1501 - 2000	66	65	1668 - 2000	69
2001 - 3000	68	66	2001 - 3333	71
3001 - 4000	70	68	3334 - 5000	73
4001 - 5000	71	69	5001 - 6667	74
5001 - 6000	72	70	6668 - 8333	75
6001 - 7500	73	71	8334 - 10000	76

Columns 1 and 2 - Class AA rating

Column 3 - Class FA and AFA ratings

\*Does not apply to sealed-type transformers

APPENDIX F:  
FINDINGS AND RECOMMENDATIONS  
OF THE ALBUQUERQUE ENVIRONMENTAL HEALTH DEPARTMENT  
TASK FORCE ON ELECTROMAGNETIC FIELDS

May 25, 1994

FINDINGS AND RECOMMENDATIONS OF THE ALBUQUERQUE ENVIRONMENTAL  
HEALTH DEPARTMENT TASK FORCE ON ELECTROMAGNETIC FIELDS

INTRODUCTION

There has been an increase in public interest, awareness and concerns regarding potential health effects from exposure to electromagnetic fields (EMFs). The ability of government, health professionals, and electric utility providers to adequately address these concerns has been challenged by the lack of conclusive EMF research to date. Until research yields more definitive results, interim measures to address potential harmful effects from exposure to EMFs should be considered.

In December 1993, an EMF Task Force was formed by the City of Albuquerque Environmental Health Department (AEHD) to obtain Task Force recommendations for the AEHD policy regarding the relationship between EMFs and health in the context of land use and also how the AEHD should educate the public about EMFs. The group consisted of planners, developers, Realtors, epidemiologists, physicians, electric utilities representatives, environmental scientists, and a representative from the Environmental Planning Commission. Thirteen meetings were held which covered the following areas:

- Introduction to the issue and setting of goals and a scope of work.
- Presentation of technical information on electric power transmission and distribution.
- Presentation of scientific research on health effects and a summary of the results from these studies.
- Ongoing and future research.
- A review of previous local land use requests involving EMF issues.
- What other communities are doing.
- Deliberation on proposed findings and recommendations.

The following findings and recommendations have been developed to assist the AEHD in responding to land use matters and requests for public information concerning EMFs.

#### FINDINGS

1. The focus of the health studies reviewed by the task force in regard to cancer risk was on the magnetic field component of EMFs, not the electric fields. Thus, the following findings and recommendations pertain to magnetic fields only.
  2. Although a conclusive link between adverse health effects and exposure to EMFs has not been established, studies over the last fifteen years have indicated that there is reason to view human exposure to EMFs with concern.
  3. In the studies considered by the EMF Task Force, stronger associations were found between exposure of children to EMFs and possible adverse effects than were exhibited for adults.
  4. Ongoing research should provide a better understanding of the possible health effects of EMFs; however, the specific mechanisms of carcinogenesis for EMFs, if any, are unknown at this time (frequency, duration, magnitude, etc.). Resolution of this issue is not expected for at least several more years.
  5. Technological, behavioral, and site planning methods exist which can be used to reduce exposure to EMFs. Different methods can range from no or minimal cost to very expensive. Examples of methods that can help reduce EMF exposure levels include the following:
    - Increasing distances between EMF sources and locations of human activity.
    - Decreasing length of exposure to EMFs.
    - Modifying power lines (e.g., reconfiguration using a "delta arrangement", use of higher poles, burying lines in some instances\*, etc.).
    - Arranging land use patterns so that locations where children are most likely to spend the most time are also the locations with lower EMF levels.
    - Assessing individual home exposure conditions and take actions to reduce exposure.
- \* Buried lines are considered one of the most expensive options, both in terms of the initial cost and from a long-term maintenance standpoint. Buried lines also produce relatively

high magnetic fields directly above them, however, they often tend to have lower magnetic fields than overhead lines as distances from the lines increase.

6. EMF levels can also be kept at, or close to, their present levels by maintaining currently existing conditions. However, if no significant changes are made, it is still possible that increased electrical demand will cause a corresponding increase in power and associated EMFs.

#### RECOMMENDATIONS

1. The City of Albuquerque and the AEHD should pursue efforts to help reduce exposure of community members to EMFs. Emphasis should be focused where the greatest practical benefits may be yielded. Areas of focus should include:
  - Existing land uses.
  - Proposed (or changed) land uses.
  - Children.
  - Enhanced educational efforts concerning EMFs.
2. AEHD should continue efforts to help educate the public about the issue of human exposure to EMFs. Education should include:
  - Preparing an informational brochure to help answer questions and provide information in an easily understandable manner.
  - Monitoring research and continually updating staff knowledge in order to provide the best information possible.
  - Assisting individuals wishing to determine personal exposure levels. Upon request, information on known measured levels should be provided along with available reference materials. With available resources, the City may create a database of community EMFs.
  - Preparing an informational package specifically intended to address questions in the real estate industry and development community which would include a range of options available to reduce EMF exposure.

Additionally, it is recommended that any educational material assembled for release to the public be reviewed by members of the Task Force and other appropriate entities prior to finalization.

3. The City may request the real property owner or the developer to perform a technical evaluation of the anticipated exposure of community members where proposed land uses are likely to result in exposure of a segment of the population to magnetic fields which are substantially above normal ambient levels over an extended time period. Land use where children are present for extended time periods, including but not limited to residences, day care facilities, and schools, should be given greater weight. Such an evaluation by the real property owner or the developer might include the following elements:
  - Field measurements taken at varying distances from the magnetic field source to establish the magnetic field gradient as a function of distance. An EMF measurement protocol should be developed by the City to provide for consistency.
  - Computer generated milligauss contours developed to represent existing and future levels of exposure under various conditions or scenarios, for situations where land use proposals are adjacent to utility lines.
  - Comparisons of the effectiveness of various mitigation options.
  - Cost comparisons of various alternatives.
  - Characterization of the number, type, and siting of buildings, individuals, or potentially sensitive land uses.
4. Developers, government, and utilities should be encouraged to work together to make reasonable efforts to reduce electromagnetic field exposure to members of the community.
5. Current scientific findings are not definitive and, therefore, no cost or low cost alternatives by government, public utilities, and developers are recommended at this time.
6. Where an action will result in a substantial increase in electromagnetic field exposure levels to existing sites of prolonged human activity, adequate justification should be given for the proposed action.
7. The City of Albuquerque, in cooperation with local electric utilities, should make an effort to discuss and incorporate appropriate measures pertinent to electromagnetic fields within the Electrical Facilities Plan for the metropolitan area.

APPENDIX G:

ELECTRICAL TERMINOLOGY AND  
TYPICAL ELECTRIC POWER SYSTEM



## ELECTRICAL TERMINOLOGY

**Voltage** is the force (pressure) that moves electrons. It is measured in volts. The voltage supplied to most residences is 120 and 240 volts. Commercial buildings are usually supplied with 120/208 or 277/480 volts. Most of PNM's distribution lines operate at 12,470 volts. Transmission lines are typically 115,000 or 345,000 volts. The voltage a line operates at determines how much insulation is needed.

**Current** is the flow of electrons, and is measured in amperes (amps). The current in a line varies as determined by the devices connected to it. The current is zero if all devices are off, and is at its maximum value when all devices are at maximum output.

**Power** is the rate at which work is produced or energy is transferred. It is the product of voltage and current, and is measured in watts.

One watt = one volt \* one amp. and one kilowatt = 1000 watts.

One horsepower = 746 watts

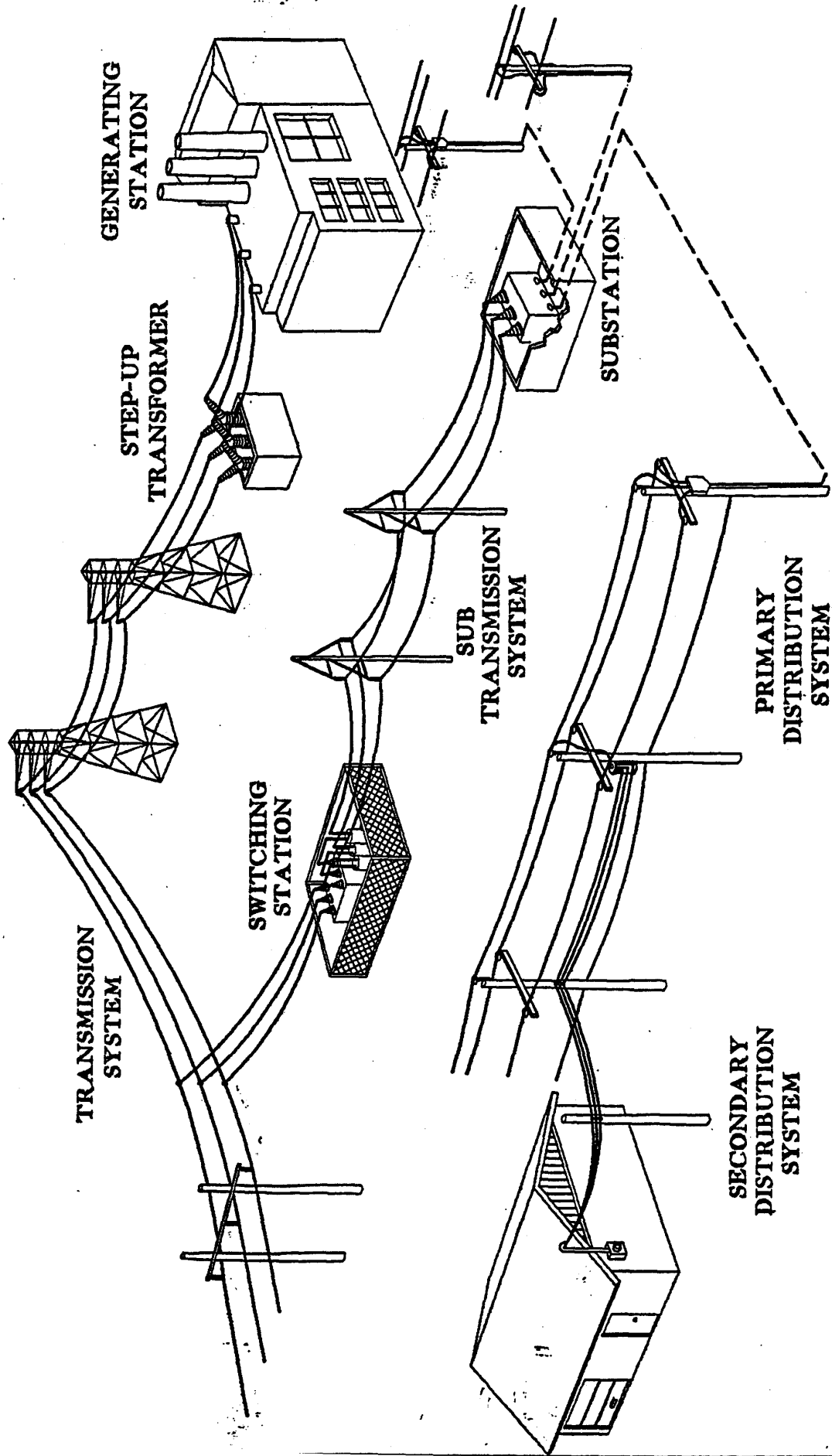
**Energy** is the electrical work produced. It is measured in kilowatt-hours. PNM's rate for a kilowatt-hour is approximately 9 cents.

**Transformer** is a device which changes the voltage level, while keeping the power output nearly the same as the power input. A substation transformer changes the voltage from a transmission level to a distribution level (usually 115,000 volts to 12,470 volts). A distribution transformer changes the voltage from the distribution level to a service voltage (usually 12,470 to 120/240 volts).

**Conductor** is material which allows easy flow of current. Aluminum and copper are good conductors. The wires in a power line are made of a material which is a good conductor.

**Insulator** is material which stops the flow of current. Air provides the insulation on an overhead line. Polyethylene or rubber provides the insulation on an underground line.

	Service	Distribution	Transmission
Voltage	120/240, 120/208, or 277/480	7200 single phase 12,470 three phase	115,000 short dist 345,000 bulk power
Used for	Service to homes and businesses	Medium distance power transfer	Longer distance and higher power transfer
Pole Height	25-30 feet	35-40 feet	70-90 feet (115 kV) 110 feet (345 kV)



TYPICAL ELECTRIC POWER SYSTEM

**TECHNICAL TEAM**

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