San Juan Basin Action Plan

WILDLIFE AND AQUATIC BIOLOGY TECHNICAL REPORT

for the
Environmental Impact Statement on Public Service Company of New Mexico's Proposed New Mexico Generating Station and Possible New Town

United States
Department
of the Interior

Bureau of Land Management
New Mexico State Office
Santa Fe, New Mexico

October 1982

Report 14 of 22

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
NEW MEXICO STATE OFFICE
P.O. BOX 1449
SANTA FE, NEW MEXICO 87501

IN REPLY REFER TO
NM30840EIS
1792.73(934A)

October 1982

Dear Interested Citizen:

Attached is one of twenty-two technical reports developed as a basis for writing the Environmental Impact Statement on Public Service Company of New Mexico's Proposed New Mexico Generating Station and Possible New Town (NMGS EIS). (A list of the technical reports is attached.)

These technical reports provide detailed information on the existing environment, methods used for the impact analysis, and related data supportive of the analysis and conclusions presented in the EIS. These reports should be retained for use with the Draft and Final EIS and other documents related to BLM's San Juan Basin Action Plan (SJBAP).

The Draft NMGS EIS will be filed with the Environmental Protection Agency and released for public review on November 30, 1982. Comments on the Draft EIS will be due by close of business February 7, 1983, at the BLM New Mexico State Office. Because of the large volume of material presented in the technical reports, the BLM is distributing these reports in advance of the Draft EIS to provide sufficient time for public review. The technical reports will be available for public review at the places indicated on the attached list. Copies will also be available from the BLM New Mexico State Office, U.S. Post Office and Federal Building, Santa Fe, for a copy fee.

Informational public meetings are scheduled for December 1982 to provide a public forum to clarify questions and concerns about the SJBAP proposals and the related environmental documents, which will all have been issued by that time. The meetings are scheduled as follows:

- December 14, Civic Center, Farmington, 3 to 9 PM
- December 14, Convention Center, Albuquerque, 3 to 9 PM
- December 15, Chapter House, Crownpoint, 3 to 9 PM
- December 16, Holiday Inn, Gallup, 3 to 9 PM
- December 16, Kachina Lodge, Taos, 3 to 9 PM

In addition, formal public hearings will be held in January 1983 to solicit public comments on the SJBAP Proposals. These meetings are scheduled as follows:

- January 10, Chapter House, Crownpoint, beginning at 1:00 PM
- January 12, Civic Center, Farmington, beginning at 9:00 AM
- January 14 (and 15th if necessary because of the number of registrants), Four Seasons Motor Lodge, Albuquerque, I-40 and Carlisle Blvd., beginning at 9:00 AM (each day)

Questions on the public meetings, hearings, and the technical reports themselves should be directed to:

Leslie M. Cone
NMGS Project Manager
BLM, New Mexico State Office
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6184 FTS 476-6184

Sincerely yours,

Charles W. Luscher

Charles W. Luscher
State Director, New Mexico

List of Technical Reports

1. Purpose and Need
2. Project Description
3. Alternatives to the Project
4. Site Alternatives
5. Permit Reconnaissance
6. Air Quality
7. Geologic Setting
8. Mineral Resources
9. Paleontology
10. Soils, Prime and Unique Farmlands
11. Hydrology
12. Water Quality
13. Vegetation
14. Wildlife and Aquatic Biology
15. Threatened and Endangered Species
16. Cultural Resources
17. Visual Resources
18. Recreation Resources
19. Wilderness Values
20. Transportation
21. Social and Economic Conditions
22. Land Use Controls and Constraints

Availability of Technical Reports for Public Review

Individual copies of the technical reports can be obtained for a copy fee. Inquiries should be directed to:

Bureau of Land Management, New Mexico State Office
Title Records and Public Assistance Section (943B)
U.S. Post Office and Federal Building
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6107 FTS 476-6107

Copies of the reports are available for public review at the locations listed below. [Formal and informal cooperating agencies are denoted by an asterisk (*).]

BUREAU OF LAND MANAGEMENT OFFICES

New Mexico State Office

NMGS Project Staff (934A)
Room 122, Federal Building
Cathedral Place
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6184 FTS 476-6184

San Juan Energy Projects Staff (911)
Room 129, Federal Building
Cathedral Place
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6226 FTS 476-6226

Public Affairs Staff (912)
Room 2016
U.S. Post Office and Federal Building
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6316 FTS 476-6316

Division of Resources(930)
509 Camino de los Marquez, Suite 3
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6212 FTS 476-6212

Albuquerque District Office
3550 Pan American Freeway NE
P.O. Box 6770
Albuquerque, NM 87107
(505) 766-2455 FTS 474-2455

Farmington Resource Area Headquarters
900 La Plata Road
P.O. Box 568
Farmington, NM 87401
(505) 325-3581

Taos Resource Area Office
Montevideo Plaza
P.O. Box 1045
Taos, NM 87571
(505) 758-8851

Socorro District Office
198 Neel Avenue
P.O. Box 1219
Socorro, NM 87801
(505) 835-0412 FTS 476-6280

Las Cruces District Office
1705 N. Valley Drive
P.O. Box 1420
Las Cruces, NM 88001
(505) 524-8551 FTS 571-8312

Roswell District Office
1717 W. Second Street
P.O. Box 1397
Roswell, NM 88201
(505) 622-7670 FTS 476-9251

Carlsbad Resource Area Headquarters
114 S. Halagueno Street
P.O. Box 506
Carlsbad, NM 88220
(505) 887-6544

USDI, Bureau of Land Management
Division of Rights-of-Way (330)
18th and C Streets, NW
Washington, D.C. 20240
(202) 343-5441 FTS 343-5441

USDI, Bureau of Land Management
Denver Service Center (D-460)
Technical Publications Library
Denver Federal Center, Bldg. 50
Denver, CO 80225
(303) 234-2368 FTS 234-2368

NEW MEXICO STATE AGENCIES

New Mexico State Environmental Improvement Division*
725 St. Michaels Drive
P.O. Box 968
Santa Fe, NM 87503
(505) 827-5217, ext. 2416

New Mexico Energy and Minerals Department*
525 Camino de los Marquez
P.O. Box 2770
Santa Fe, NM 87503
(505) 827-3326

New Mexico Historic Preservation Bureau*
State Historic Preservation Officer
505 Don Gasper Avenue
Santa Fe, NM 87503
(505) 827-2108

New Mexico Natural Resource Department*
Villagra Building
Santa Fe, NM 87503
(505) 827-5531

New Mexico Public Service Commission*
Bataan Memorial Building
Santa Fe, NM 827-3361
(505) 827-3361

New Mexico State Engineer's Office*
Bataan Memorial Building
Santa Fe, NM 87503
(505) 827-2423

New Mexico State Planning Office*
505 Don Gasper Avenue
Santa Fe, NM 87503
(505) 827-5191

OTHER ORGANIZATIONS

Public Service Company of New Mexico
Alvarado Square
P.O. Box 2268
Albuquerque, NM 87158
(505) 848-2700

Woodward-Clyde Consultants, Inc.
3 Embarcadero Center, Suite 700
San Francisco, California 94111
(415) 956-7070

PUBLIC AND UNIVERSITY LIBRARIES

Reading copies of the NMGS EIS and associated technical reports will be available at the following public and university libraries:

State and Public Libraries

Albuquerque Public Library
501 Copper Avenue NW
Albuquerque, NM 87102

Aztec Public Library
201 W. Chaco
Aztec, NM 87401

Crownpoint Community Library
c/o Lioness Club, P.O. Box 731
Crownpoint, NM 87313

Cuba Public Library
Box 5, La Jara
Cuba, NM 87027

Farmington Public Library
302 N. Orchard
Farmington, NM 87401

Gallup Public Library
115 W. Hill Avenue
Gallup, NM 87301

Mother Whiteside Memorial Library (Public)
525 W. High Street
P.O. Box 96
Grants, NM 87020

New Mexico State Library
325 Don Gaspar Avenue
Santa Fe, NM 87503

OTHER DEPARTMENT OF THE INTERIOR AGENCIES

Bureau of Indian Affairs*
Albuquerque Area Office
123 4th Street
P.O. Box 2088
Albuquerque, NM 87198
(505) 766-3374 FTS 474-3374

Bureau of Indian Affairs*
Eastern Navajo Agency
P.O. Box 328
Crownpoint, NM 87313
(505) 786-5228

Bureau of Indian Affairs*
Navajo Area Office
Box M - Mail Code 305
Window Rock, AZ 86515
(602) 871-5151 FTS 479-5314

Bureau of Reclamation*
Upper Colorado Regional Office
125 S. State Street
P.O. Box 11568
Salt Lake City, UT 84147
(801) 524-5463 FTS 588-5463

Minerals Management Service*
South Central Region
505 Marquette Avenue NW, Suite 815
Albuquerque, NM 87102
(505) 766-1173 FTS 474-1173

Minerals Management Service*
Resource Evaluation Office
411 N. Auburn
Farmington, NM 87401
(505) 327-7397 FTS 572-6254

National Park Service*
Southwest Regional Office
1100 Old Santa Fe Trail
Santa Fe, NM 87501
(505) 988-6375 FTS 476-6375

National Park Service*
Environmental Coordination Office
Pinon Building, 1220 St. Francis Drive
P.O. Box 728
Santa Fe, NM 87501
(505) 988-6681 FTS 476-6681

U.S. Fish and Wildlife Service*
Field Supervisor, Ecological Services
3530 Pan American Highway, Suite C
Albuquerque, NM 87107
(505) 766-3966 FTS 479-3966

U.S. Geological Survey (WRD)*
505 Marquette Avenue, Room 720
Albuquerque, NM 87101
(505) 766-2810 FTS 474-2817

OTHER FEDERAL AGENCIES AND ORGANIZATIONS

Environmental Protection Agency*
Region VI
1201 Elm Street
Dallas, TX 75270
(214) 767-2716 FTS 729-2716

Navajo Tribe*
c/o Division of Resources
P.O. Box 308
Window Rock, AZ 86515
(602) 871-6592

Pueblo of Zia*
General Delivery
San Ysidro, NM 87053
(505) 867-3304

Soil Conservation Service*
424 N. Mesa Verde
Aztec, NM 87410
(505) 334-9437

U.S. Corps of Engineers*
P.O. Box 1580
Albuquerque, NM 87103
(505) 766-2657 FTS 474-2657

USDA, Forest Service*
717 Gold Avenue
Albuquerque, NM 87102
(505) 474-1676 FTS 474-1676

USDA, Forest Service*
District Ranger
Mt. Taylor Ranger District
201 Roosevelt Avenue
Grants, NM 87020
(505) 287-8833

Harwood Foundation Library
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Taos, NM 87571

University/College Libraries

University of New Mexico
General Library
Albuquerque, NM 87131

Navajo Community College Library
Shiprock Branch
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Shiprock, AZ 87420

Northern New Mexico Community College
P.O. Box 250
Espanola, NM 87532

New Mexico State University
San Juan Campus
4601 College Blvd.
Farmington, NM 87401

University of New Mexico, Gallup Campus
Learning Resources Center
200 College Road
Gallup, NM 87301

New Mexico State University/Grants
1500 Third Street
Grants, NM 87020

New Mexico Highlands University
Donnelly Library
National Avenue
Las Vegas, NM 87701

College of Santa Fe
Fogelson Memorial Library
St. Michaels Drive
Santa Fe, NM 87501

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Bureau of Indian Affairs*
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Bureau of Reclamation*
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Southwest Regional Office
1100 Old Santa Fe Trail
Santa Fe, NM 87501
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WILDLIFE AND AQUATIC BIOLOGY TECHNICAL REPORT

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Environmental Impact Statement on Public Service Company of New Mexico's Proposed New Mexico Generating Station and Possible New Town

Prepared by

Woodward-Clyde Consultants

for the

U.S. Department of the Interior Bureau of Land Management

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MAPS AND FIGURE

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NEW MEXICO GENERATING STATION

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1.0
INTRODUCTION

BACKGROUND

Included in the recent Council on Environmental Quality Regulations (1979) are several important objectives to reduce excessive paperwork in the preparation of environmental impact statements (EISs):

- Discuss only briefly issues other than significant ones.
- Emphasize the portions of the EIS that are useful to decision makers and the public and reduce emphasis on background material.
- Prepare analytic rather than encyclopedic EISs.

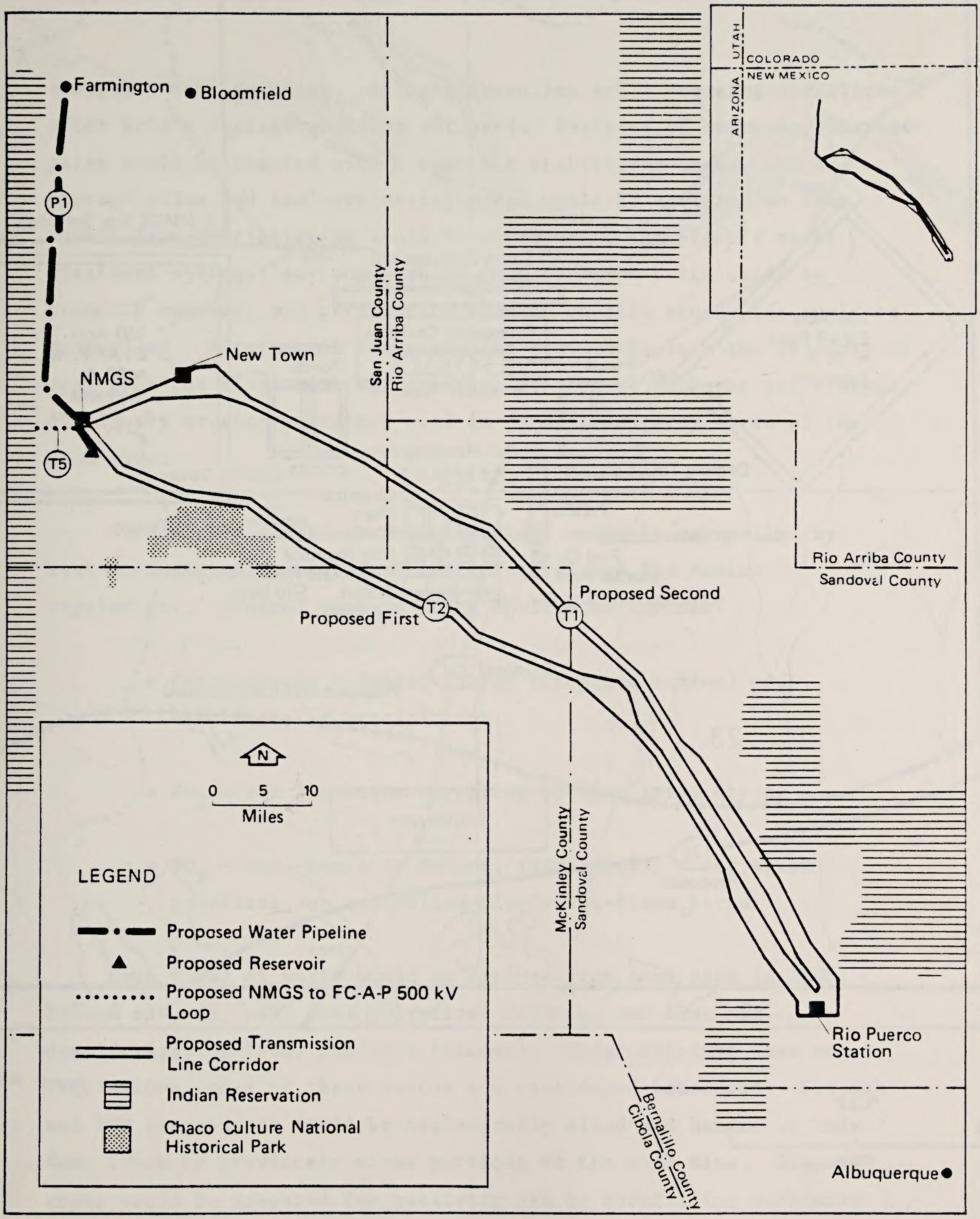
In order to accomplish these objectives and still provide the depth and background required for an analytic impact statement, this technical report has been prepared for the New Mexico Generating Station (NMGS) project. In this report, impacts that were not identified as significant but which are still considered important by the public or technical specialists are analyzed. Background material is provided for those issues and impacts that were considered necessary for the comparison of alternatives. Impacts that were not identified as significant or important by the public and by technical preparers are summarized, and reasons for their elimination from detailed analysis are discussed.

SUMMARY DESCRIPTION OF PROJECT COMPONENTS

Public Service Company of New Mexico (PNM) proposes to construct a 2000-megawatt (MW) coal-fired electric generation plant approximately 35 miles south of Farmington, New Mexico, in San Juan County (Map 1-1). The proposed NMGS, at ultimate development, would have four 500-MW generating units. Each generating unit would include a turbine generator area, coal pulverizer area, boiler area, particulate removal system, SO_2 removal system, and chimney stack. The proposed arrangement of these and other power plant components is shown in Figure 1-1. For the environmental analysis, it was assumed that commercial operation of the first 500-MW unit would begin in 1990 and that other units would start operating during the 1990s.

Coal for NMGS would be acquired through long-term contracts with Sunbelt Mining and Arch Minerals (Proposed Action) or other producers in the San Juan Basin (alternative coal supply). Coal acquired from a joint venture of Sunbelt and Arch Minerals would be supplied from surface mines (referred to as the Bisti mine in this analysis) in the immediate vicinity of the proposed plant site. Coal acquired from other producers in the San Juan Basin would be hauled from mines located as much as 30 miles from the proposed plant site. Coal required for NMGS would average 7.5 million tons per year, or a total of 300 million tons over the 40-year project life.

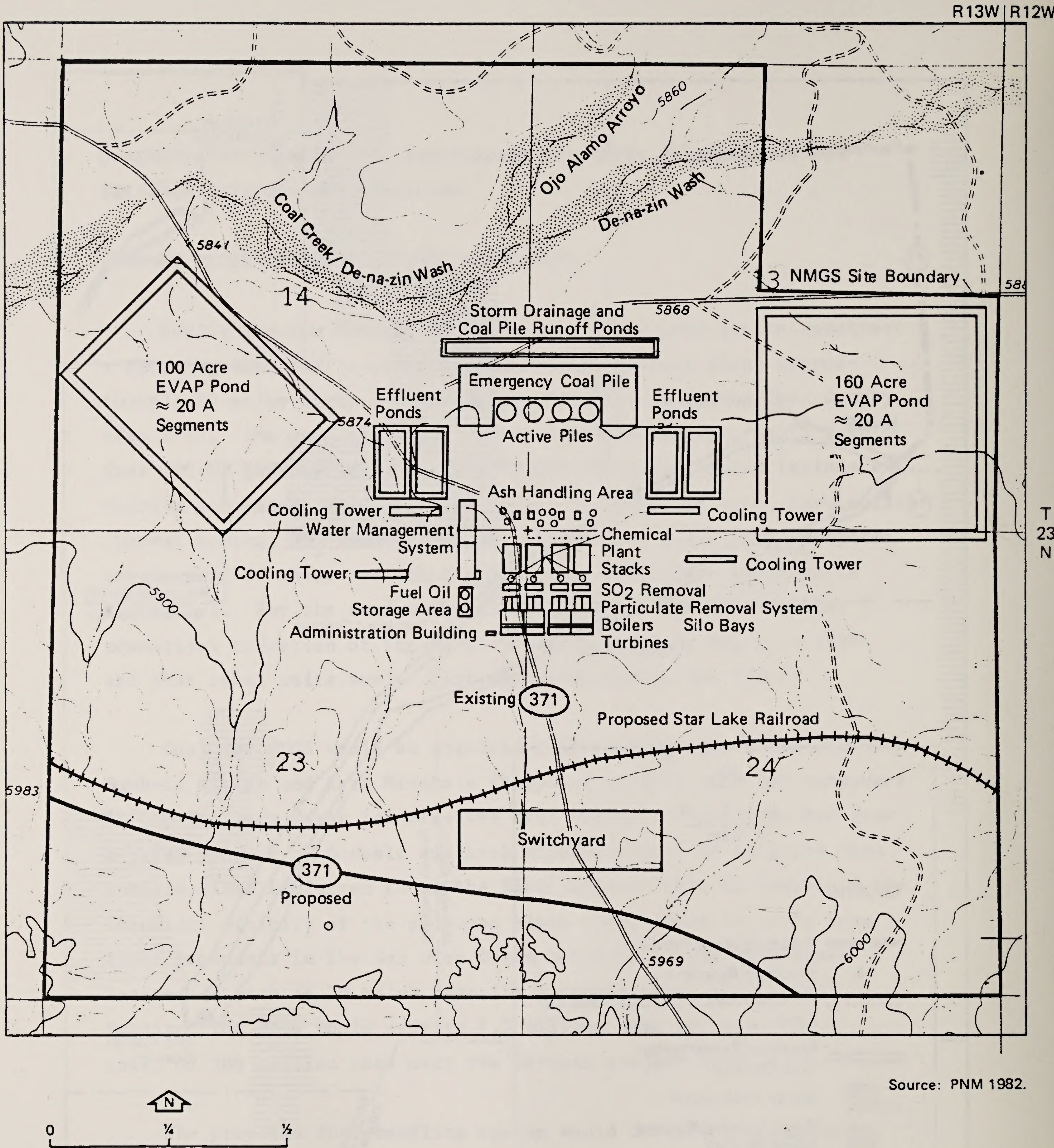
The proposed fuel-handling system would involve hauling coal from the Bisti mine (or other mine locations) by truck to a receiving facility located adjacent to the NMGS site. Coal would then be transferred via conveyor belt from the receiving station to active or



Note: For more information, see the location maps in Appendix G of the EIS.

Source: BLM 1982.

Map 1-1. GENERAL LOCATION OF PROPOSED ACTION



Source: PNM 1982.

Figure 1-1. STATION LAYOUT

emergency storage piles. All coal-handling and processing operations after active storage would be enclosed. Surfaces of emergency storage piles would be treated with a nontoxic stabilizing agent, and all storage piles and coal-processing areas would be designed so that runoff from precipitation would be diverted to the plant's water treatment system. Any coal spills from conveyor belts would be promptly removed, and percolation beneath on-site stockpiles would be controlled. Alternative fuel-handling systems include the delivery of coal from the Bisti mine to receiving station by conveyor and storage of primary crushed emergency coal on Sunbelt property north of the NMGS site.

Atmospheric emissions from the plant would be controlled by systems designed to meet applicable federal and New Mexico regulations. Control systems being considered include:

- Particulates - fabric filter (Proposed Action) and electrostatic precipitator
- SO_2 - wet limestone scrubbing or lime spray drying
- NO_x - dual-register burner, tangentially fired steam generator, or controlled-flow/split-flame burner

Four types of waste would be derived from coal used in NMGS: bottom ash, fly ash, coal pulverizer rejects, and flue gas desulfurization (FGD) products (sludge). Under existing laws and regulations, none of these wastes are considered hazardous. Fly ash and FGD by-products would be mechanically mixed and hauled by end-dump truck to previously mined portions of the coal mine. Disposal areas would be prepared for receiving ash by backfilling with mine overburden. Ash would then be dumped and spread in layers over the mine overburden. After the ash was placed and spread, it would be covered with layers of overburden and surface soil or topsoil and then a vegetative cover would be established. Bottom ash and pulverizer rejects would be collected for disposal in dewatering bins and then hauled by end-dump trucks for disposal into previously mined portions of the coal mine. Procedures for disposal would be the same as for fly ash.

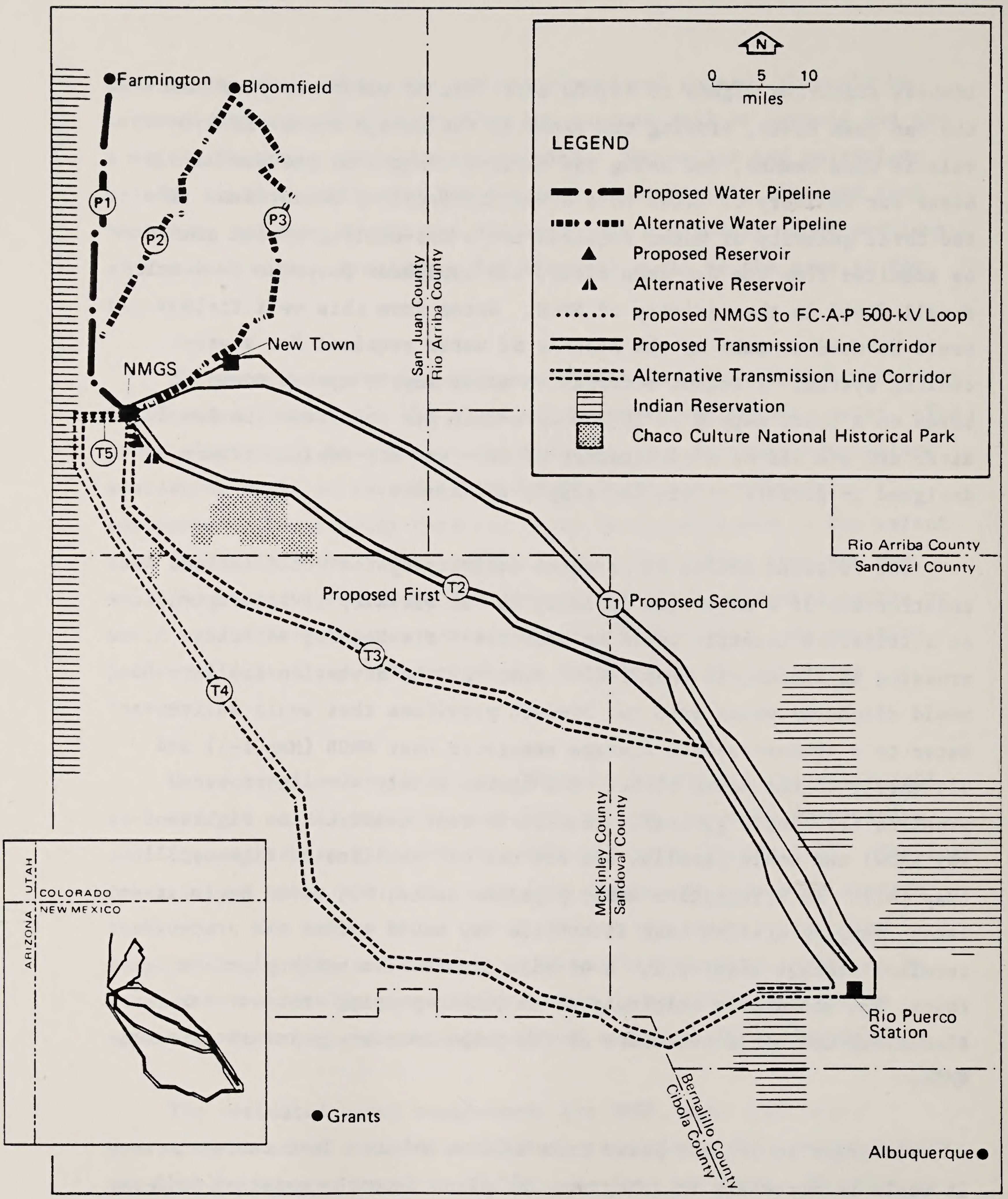
The water management system would contain all equipment necessary to treat and supply all the plant makeup water and potable water. The power plant would be designed and operated as a zero-discharge plant; wastewater would be reused by cascading it to uses requiring successively lower water quality. Used water, degraded to the extent that it could not be economically treated for further in-plant use, would be used for transport and disposal of plant-generated wastes or would be discharged to evaporation ponds (Figure 1-1). Evaporation ponds would be lined with impervious material to limit seepage losses.

Water supplies available for NMGS are believed to be sufficient to construct an all-wet heat-rejection system, based on evaporative cooling, and to use forced-draft cooling towers (Figure 1-1). Cooling-tower makeup water would be drawn from the nearby raw-water storage reservoir. The makeup water would replace the tower losses from evaporation, drift, and blowdown. If sufficient water could not be secured for a totally evaporative system, a water-cooling system employing both dry and conventional wet towers might be required.

The estimated water requirement for NMGS, with four units operating at rated capacity and a heat-rejection system equipped with wet-cooling towers, would be 35,000 acre-feet per year. In order to supply this quantity of water to NMGS, the Proposed Action would involve acquiring rights to 35,000 acre-feet of water per year from the San Juan River, storing the water in the Navajo Reservoir for release upon demand, and using the natural channel of the San Juan River for delivery of water to a diversion facility downstream. If the total quantity of water required for a wet-cooling system cannot be acquired from the San Juan River, the applicant proposes to develop a well field in the vicinity of NMGS. Water from this well field would be used to make up the balance of water required for a wet-cooling system. A second alternative water supply system would be based on a total supply of 20,000 acre-feet per year from the San Juan River and the use of a combination of wet- and dry-cooling towers designed to perform within the supply constraint.

The Proposed Action for a water delivery system would include the construction of a diversion facility in the vicinity of Farmington; an alternative location would be near the State Highway 44 bridge crossing at Bloomfield (Map 1-2). Pumps at the diversion facility would discharge water into two 36-inch pipelines that would deliver water to a 4000-acre-foot storage reservoir near NMGS (Map 1-1) and ultimately to the power plant. The approximately 40-mile proposed pipeline (P1) would generally require 90-foot construction rights-of-way (ROW) and would parallel the new and old portions of Highway 371 (Map 1-1). An alternative water pipeline route, P2, would begin at an intake pumping station near Bloomfield and would end at the proposed terminal storage reservoir. A 49-mile alternative water pipeline route, P3, would also originate at an intake pumping station near Bloomfield and would terminate at the proposed storage reservoir near NMGS.

In order to deliver power from NMGS to various load centers, it would be necessary to integrate the plant into the existing bulk



Note: For more information, see the location maps in Appendix G of the EIS.

Source: BLM 1982.

Map 1-2. GENERAL LOCATION OF ALTERNATIVES INCLUDING THE PROPOSED ACTION transmission systems of PNM and neighboring utilities. Thus the proposed transmission system would consist of a 500-kilovolt (kV) loop linking NMGS with PNM's approved 500-kV Four Corners-Ambrosia-Pajarito (FC-A-P) line, located approximately 5 miles west of NMGS, and two 500-kV lines linking NMGS with the Albuquerque distribution and load center at the proposed Rio Puerco Station (Map 1-1). The NMGS-Albuquerque system would be installed in phases: the 500-kV loop in 1990 with commencement of commercial operation of Unit 1, the first 500-kV line with Unit 2 in 1993, and the second 500-kV line with Unit 4 in 1998.

Four routes are considered technically and economically feasible for construction of the 500-kV transmission system. Route T2 is proposed for the first 500-kV line and route T1 is proposed for the second 500-kV line; routes T3 and T4 are alternatives to the Proposed Action. The total distance traversed would be similar for the two proposed and two alternative corridors: 101 miles (T2), 107 miles (T1), 105 miles (T3), and 126 miles (T4). With the exception of tower sites, the proposed 200-foot ROW could support other compatible land uses, such as grazing. PNM would keep the transmission line ROW closed and would patrol the line by helicopter each month. Lands disturbed by heavy equipment and temporary access roads would be restored to their original condition.

Table 1-1 displays construction work force estimates over time. Construction employment for station facilities would reach peaks of 1515 employees in 1987 and 1530 employees in 1992. Operations employment at station facilities would increase steadily, from 30 employees in 1989 to 900 employees in 1999 when all four units are expected to be on-line.

Table 1-1. NMGS CONSTRUCTION AND OPERATION EMPLOYMENT

			NMGS											
	Intake Pipeline and	500-kV Trans-mission	Construction					Operation					Total	Annual
Year	Reservoir	Line	Unit 1	Unit 2	Unit 3	Unit 4	Total	Unit 1	Unit 2	Unit 3	Unit 4	Total	Employment	Change
1985	—	—	85	—	—	—	85	—	—	—	—	—	85	+85
1986	—	—	800	—	—	—	800	—	—	—	—	—	800	+715
1987	115	—	1515	—	—	—	1630	—	—	—	—	—	1630	+830
1988	295	104	1180	30	—	—	1505	—	—	—	—	—	1505	-125
1989	—	—	360	450	—	—	914	30	—	—	—	30	944	-560
1990	—	—	100	940	40	—	1080	200	—	—	—	200	1280	+336
1991	—	—	—	750	570	—	1320	250	—	—	—	250	1570	+290
1992	—	—	—	270	1260	—	1530	250	24	—	—	274	1804	+234
1993	—	—	—	105	955	30	1090	250	160	—	—	410	1500	-304
1994	—	78	—	—	325	435	838	250	200	30	—	480	1318	-182
1995	—	—	—	—	90	940	1030	250	200	200	—	650	1680	+362
1996	—	—	—	—	—	775	775	250	200	250	—	700	1475	-205
1997	—	—	—	—	—	255	255	250	200	250	24	724	979	-496
1998	—	—	—	—	—	95	95	250	200	250	160	860	955	-24
1999	—	—	—	—	—	—	0	250	200	250	200	900	900	-55

Source: PNM 1980, unpublished data.

According to PNM (unpublished data, 1980), estimated construction employment skill requirements would be as follows:

Skill	Percent of Total Construction Work Force
Boilermakers	9.4
Pipefitters	14.2
Electricians	14.4
Carpenters	5.6
Ironworkers	10.0
Operators	10.0
Laborers	9.0
Teamsters	4.1
Cement masons	0.8
Millwrights	3.3
Insulators	4.0
Sheetmetal workers	1.1
Painters	1.2
Others	0.5
Supervision	12.4

The above estimates are averaged for construction of all four units.

SAN JUAN BASIN ACTION PLAN OVERVIEW AND RELATIONSHIP OF THE NMGS EIS TO ACTIONS INCLUDED IN THE PLAN

The proposed site for the NMGS is located in the San Juan Basin of northwestern New Mexico. The Bureau of Land Management (BLM) is responsible for the management of much of the land and mineral resources in this area, and currently has six separate but interrelated proposals under consideration within the basin. In order to respond to these, the BLM has developed a San Juan Basin Action Plan (SJBAP). This plan provides for the organizational arrangements whereby the environmental analyses and decision making can be implemented in a timely and efficient manner. The plan describes the process for preparation of three site-specific EISs (including the NMGS EIS) and three Environmental Assessments (EAs):

- Coal Preference Right Lease Applications (EA)
- San Juan River Regional Coal Leasing (EIS)
- Wilderness Study Areas (WSAs) (EIS)
- New Mexico Generating Station (EIS)
- Ute Mountain Land Exchange (EA)
- Bisti Coal Lease Exchange (EA)

In addition to these documents, the action plan provides for the preparation of a Cumulative Overview (CO). The CO is intended to focus on the cumulative impacts that would result from the proposed actions analyzed in the EISs and EAs listed above and therefore to facilitate public review and decision making. As a result of this organization, the impact analysis in the NMGS EIS and technical background reports concentrates on the impacts expected to result from the specific NMGS components proposed. The cumulative impacts expected to result from the proposed NMGS, in addition to the cumulative impacts of other proposals to be developed in the same time period, are described in the CO.

BASELINE CONDITIONS ASSUMED FOR THE NMGS TECHNICAL REPORT IMPACT ANALYSES

The site-specific impact analysis for this technical report was based on the affected environment and available resources that would be existing at the time of construction and operation of the NMGS facility. Since construction at the NMGS facility would not begin until 1985, certain assumptions regarding project development in the San Juan Basin were necessary. Two levels of project development were considered, along with criteria for each, in developing a status for the various non-SJBAP actions proposed for the San Juan Basin area.

- Baseline 1 - The projects considered in this level of development are those that have approval and are to be built or under construction in 1985. This level represents the projected existing environment without the proposals included in the SJBAP.

- Baseline 2 - The projects considered in this level are in some phase of the application stage. In this level, Baseline 1 projects are added to any projects in Baseline 2 along with any revision in resource production or uses (e.g., coal).

Where differences in Baselines 1 and 2 affect the results of impact analyses, discussion is provided. If no differences are identified, it should be assumed that consideration of the two different baselines did not alter the impact analyses.

A complete list of projects and comprehensive location maps for Baselines 1 and 2 are provided in Appendix C of the NMGS EIS.

ORGANIZATION OF THE REPORT

Section 2.0 of this technical report describes the assumptions and methodological approach used in the assessment of potential impacts of the Proposed Action on the affected environment. In addition, Section 2.0 contains a definition of the study area and identification of data sources.

Section 3.0, Affected Environment, contains baseline data on existing conditions in the study area, as well as projections of future conditions without the Proposed Action. Information on historical trends is presented where it is useful in providing a basis for predicting most likely future trends. The description of projected future trends takes into consideration the changes in the environment that are expected to occur as a result of the projects identified in Baseline 1. This provides a reasonable estimate of the future existing environment against which the potential impacts of the Proposed Action and alternatives can be assessed.

Section 4.0 describes the potential effects of implementing the Proposed Action and alternatives. Impacts identified are measured against indicators of significance in order to estimate the importance of the impact to the affected human environment. (Potential impacts associated with alternatives to the Proposed Action are compared in Section 9.0.)

In Section 5.0, mitigation measures are suggested. These measures would help to alleviate the potentially significant adverse impacts or enhance the beneficial impacts identified in the Section 4.0 analysis. Those potentially adverse impacts for which no appropriate mitigation measures have been suggested are discussed in Section 6.0 as "unavoidable adverse impacts."

2.0 FRAMEWORK FOR ANALYSIS

2.1 GEOGRAPHIC AREA OF INFLUENCE AND REGIONAL STUDY AREA

2.1.1 Geographic Area of Influence

Direct impacts to wildlife (e.g., direct mortalities, displacement, and loss of carrying capacity) were assessed for specific areas, as follows:

- 3.75 square miles at the proposed plant site
- 90-foot-wide ROW, including related access roads, for water pipelines P1, P2, and P3
- 200-foot-wide ROW, including related access roads, for transmission lines T1, T2, T3, T4, and T5
- Miscellaneous ancillary facilities, such as the Rio Puerco Station, the intake structure and pumping plant on the San Juan River, pumping stations for the proposed and alternative water pipelines, and the water storage reservoir

In addition to the areas that would be directly disturbed, a larger "area of influence" would be indirectly affected (taking into account the home range concept and increases in human population). This geographic area is defined for the NMGS project by: (1) a 5-mile radius from the project site and (2) a 10-mile corridor centered on proposed ROWs. (Direct and indirect effects are defined in Section 4.1.)

All living organisms to some degree exhibit a home range or territory, and daily or seasonal migration. Therefore, if part of an organism's home range or territory is affected, the remaining part of that home range or territory is also affected to a certain degree. This area of indirect loss or adversely affected fish and wildlife habitat may range in size from an area equal to the direct habitat loss, for relatively immobile species, to four or five times the area directly affected, for such species as the golden eagle (BLM 1978a). There would also be indirect effects upon fish and wildlife resources due to increases in human population. More people would spend their leisure time in the country, both on and off the roads. Motorcycles and four-wheel drive vehicles would contribute to fish and wildlife disturbance.

Two adjustments to these estimates became necessary in the impact analysis. Hunting and fishing pressure increases would be likely to occur in areas outside the above definitions. Also, acid rain is a long-distance transport phenomenon and it was analyzed accordingly.

2.1.2. Regional Base for Comparison

The quantity of wildlife and habitat destroyed or disturbed by project activities (direct and indirect) was compared with the total in the regional area, defined by a 10-mile radius from the plant site and a 20-mile corridor centered on ROWs and associated access. Total wildlife habitat present in the defined regional area was calculated for two baselines:

- Total wildlife habitat available assuming Baseline 1 (see Chapter 1.0)
- Total wildlife habitat available assuming Baseline 1 and Baseline 2 (see Chapter 1.0)

2.2 INDICATORS OF SIGNIFICANCE

Impacts to crucial wildlife habitat were analyzed for several important categories of wildlife: (1) recreationally or commercially important species (generally, game species); (2) species characterized by uncertain or declining population status; (3) rare species; and (4) species expected to be sensitive to project activities and which, as a result, may not be capable of sustaining current populations. (Threatened or endangered species are addressed in the Threatened and Endangered Species Technical Report.) Crucial habitat is defined as areas that are important for the maintenance and perpetuation of wildlife populations. Generally, these areas are characterized by population concentrations during critical periods (e.g., winter range, breeding or brooding grounds). Within these areas, populations are very susceptible to human disturbance, and effects on individuals may result in the loss of several generations. Species not included in categories designated as "important" include those such as songbirds, small mammals, and insects. These species are not generally considered recreationally or commercially important, since they are usually capable of rapid recovery and repopulation of disturbed areas due to their large populations, rapid turnover rates, and mobility.

In order to evaluate the significance of impacts to crucial areas as a result of habitat removal (i.e., residual impacts such as loss of carrying capacity), two criteria were considered.

1. Each crucial wildlife area identified through data compilation and personal communication with knowledgeable persons was analyzed to determine the relative extent of habitat disturbance that would be expected to result from the Proposed Action or alternatives. If less than 1 percent of the total available crucial habitat within the geographic area of influence is expected to be disturbed by the project activities, then the significance of that impact was considered to be low. If it was determined that more than 1 percent of the total would be disturbed, then analysis was conducted in further depth to identify possible significant impacts (see criterion 2).

2. This criterion would be applied if a finding of significance was made from criterion 1 (greater than 1 percent disturbance). If the amount of disturbance was found to be greater than 1 percent, further analysis determined whether the nature of disturbance would create beneficial or adverse impacts as well as short-term or long-term impacts to the wildlife resources. For purposes of this determination, the following definitions were employed:

   - Short-term - The impact is not expected to last more than 5 years.

- Long-term - The impact is expected to last for more than 5 years.

2.3 DATA COLLECTION METHODS

2.3.1 Sources of Information

A thorough literature search, agency contact program, and review of special publications was conducted to identify crucial habitats, distribution patterns, relative abundance of populations, and seasonal use patterns. Special attention was focused on those wildlife resources which were identified as important or highly valued. Sources of data included PNM and WCC files and bibliographies, New Mexico Department of Game and Fish, Heritage Program, BLM, U.S. Fish and Wildlife Service (USFWS), and researchers from the University of New Mexico, Eastern New Mexico University, and New Mexico State University. Recent issues of Southwestern Naturalist and publications by the Arizona-Nevada Academy of Science were also examined for any data useful in the preparation of this document. Some of the general documents used for data collection include:

- Description of the Environment - New Mexico Generating Station (PNM 1980)
- Environmental Analysis of the Proposed New Mexico Generating Station to Rio Puerco Station 500 kV Transmission Project (PNM 1980)
- Star Lake - Bisti Regional Coal (BLM 1978b)
- An Investigation of Vegetation and Wildlife of the San Juan River, New Mexico, Colorado, and Utah (SAI 1980)
- WESCO Coal Gasification Project and Expansion of Navajo Mine by Utah International, Inc. (Bureau of Reclamation 1976)
- San Juan Basin Regional Uranium Development (DOI et al. 1980)
- Gallup-Navajo Indian Water Supply Project (USFWS 1981)
- Fish, Wildlife, and Habitat Assessment of the San Juan River, New Mexico and Utah (VTN and Museum of Northern Arizona 1978)

- Wildlife Resource Inventory of the Chaco Strippable Coal Area, New Mexico (Bio/West, Inc. 1982)
- San Juan Grazing Management EIS (BLM 1981)
- Impacts of Uranium Mining and Milling upon the Fish and Wildlife Resources of the New Mexico San Juan Basin Region (Meneely et al. 1979)

Some of the literature examined was specific to certain components:

- Mammals (Findley et al. 1975, Durrant and Dean 1961, Harris 1963)
- Birds (Anderson et al. 1977, Behle 1960, Hubbard 1970 and 1978, Phillips et al. 1964, Schmitt 1976, White and Behle 1961)
- Amphibians and reptiles (Dean and Stock 1961, Jones 1970, Stebbins 1966)
- Aquatics (Holden et al. 1980, Koster 1957, Minckley 1973, Olson 1962)
- Rare and endangered species (Gates 1973, Graul and Webster 1976, Henderson et al. 1974, Hubbard et al. 1978, Johnsgard 1981, Kidd 1977, Martin and Schroeder 1978, McAda and Seethaler 1975, Seethaler 1978, Snow 1972 and 1973, Sprunt 1972, Tolle 1976, Toney 1974, USFWS 1977, Vanicek and Kramer 1969). Other data sources were examined.

2.3.2 Data Verification

For those project components where more than one data source was available, all sources were analyzed. In those situations the data source that was considered the most accurate and detailed was used. The accuracy and adequacy of the existing data base was determined based upon professional judgment and mutual agreement between project supervisors and BLM staff reviewers. The data base was also reviewed to verify that data were recent enough to reflect current conditions. If the information was not considered current and representative of current conditions, field checks and/or field surveys were conducted.

2.3.3 Identification and Quantification of Data

Crucial wildlife habitat that would be intersected by NMGS project components was mapped using New Mexico Game and Fish data. Then the areas of crucial habitat that would be affected by construction activities were determined by digitizing. The total available crucial habitat, assuming Baselines 1 and 2, within the region used for comparison was also calculated with an electronic digitizer.

Baseline 1 was calculated as the total available resource minus the area that would be affected in Baseline 1. The percentage of crucial habitat that would be affected by NMGS compared with the total available resource in Baseline 1 was calculated by dividing the area affected by NMGS by the Baseline 1 acreage. Baseline 2 was calculated as Baseline 1 minus any Baseline 2 located within the crucial wildlife habitat. The acreage that would be affected by NMGS was then divided by the total resource that would remain, assuming Baseline 2, to determine the percentage that would be affected by the NMGS project.

Example: P1 crucial mule deer habitat

- Baseline 1

Total available resource	15,155	acres
Minus Baseline 1	- 420	acres
	14,735	acres
NMGS	30	acres

Baseline 1 percentage = $\frac{30}{14,735} = <1\%$

- Baseline 2

Baseline 1	14,735	acres
Minus Baseline 2*	- 0	
	14,735	acres
NMGS	30	acres

Baseline 2 percentage = $\frac{30}{14,735} = <1\%$

*(Since no Baseline 2 projects were located within the crucial wildlife habitat, Baseline 2 = Baseline 1.)

The amount of noncrucial wildlife habitat that would be disturbed or removed by project activities was estimated based on the project description. For example, lands that would be disturbed within a transmission line ROW were calculated by using a factor of 24.24 acres per linear mile; lands that would be disturbed within water pipeline corridors were calculated by using a factor of 10.91 acres per linear mile. Habitat that would be removed at the plant site was calculated at 2400 acres.

Locations of raptor nests and roosts were mapped using data from the BLM Farmington Area Office files (Ramakka 1981a) and a study on the Chaco Strippable Coal Area (Bio/West, Inc. 1982). Along the linear components, the locations of the known raptor nests, within 5 miles, were presented in tabular form by 10-mile increments. Raptor nests located within 5 miles of NMGS were also presented in a table. No precise locations were presented to preclude unauthorized use of the data.

2.3.4 Data Gaps

In general, the quality and quantity of existing wildlife data were sufficient to predict impacts for the NMGS project. However, two areas where data gaps were apparent are noted below:

- No site-specific aquatic data were available at the proposed water supply intake locations for substrate characteristics, depth, and habitat types. As a result, WCC conducted a field reconnaissance in the proposed intake areas on September 10-11, 1981. Substrate characteristics, depth, and habitat types (i.e., runs, rapids, riffles, pools) were determined at 5-meter intervals along across-river transects. Several transects were conducted at each station.

- Documentation of raptor nest locations was best in the geographic area of influence surrounding the plant site and transmission line route T2 due to recent surveys in these areas (Ramakka 1981a; Bio/West, Inc. 1982). Raptor nest locations are not as well documented for other components (e.g., T1, T3, and T4) due to a lack of comparable intensive ground and aerial surveys. Because raptor use of an area may change, surveys should be performed at times closer to construction.

- A potential for reduced flow in Chuska Mountain springs as the result of ground-water pumping has been identified (Hydrology Technical Report). The potential magnitude of flow reduction has not been determined. As a result, the impacts to wildlife habitat and wildlife use in habitats associated with these springs have not been determined because (1) site-specific data are limited in these areas and (2) potential effects on wildlife habitat or species cannot be quantified without estimates for the reduction in flow.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

Wildlife and aquatic resources in the NMGS geographic area of influence and the regional area for comparison are discussed below for the general environment and also by specific project component. For the general environment, habitat associations are described for the most common wildlife species. In addition, general information regarding distributions, relative abundance, and habitat requirements is presented for various wildlife species defined as unique and/or highly valued. More specific discussions of wildlife species are also presented for each project component. In these project component discussions, emphasis is given to wildlife species defined as unique and/or highly valued.

In Section 3.2.2, wildlife and aquatic resources for each project component are discussed in the following categories:

- Wildlife species that are unique and/or highly valued in the region
    - Big game: elk, pronghorn antelope, mule deer
    - Small and medium-sized mammals: coyote, prairie dog
    - Birds: upland game birds (scaled quail and mourning dove), waterfowl, raptors
- Other wildlife
    - Small and medium-sized mammals (e.g., mice, voles, woodrats, rabbits, muskrats, beavers)
    - Nongame birds
    - Amphibians and reptiles
- Aquatic species

3.2 GENERAL ENVIRONMENT

3.2.1 Communities

The terrestrial ecosystem in the geographic area of influence defined for NMGS project components consists of several arbitrarily defined communities, each of which is made up of more or less distinct groups of plants and animals. For practical purposes these communities are usually defined on the basis of dominant vegetation.

Six vegetative communities are present in the geographic area of influence and regional base for comparison defined for NMGS project components. These six communities have been described in the Vegetation Technical Report and include:

- Ponderosa pine, oak, and pinyon pine woodlands
- Sand wash and saline lowland
- Badland and steep slope
- Shrubland-grassland
- Juniper savannas and pinyon-juniper woodlands
- Irrigated cropland and true riparian

The distribution of vegetation types associated with each project component is presented in Appendix 1. Vegetation type maps for all project components are included in technical files. The vegetation type map for the proposed NMGS site is included in the Vegetation Technical Report.

Ponderosa Pine, Oak, and Pinyon Pine Woodlands

The ponderosa pine, oak, and pinyon pine woodlands are generally found at elevations above the pinyon-juniper zone. Common species include ponderosa pine, pinyon pine, oaks, junipers, skunkbush, sagebrush, mountain mahogany, blue grama, western wheatgrass, and junegrass. This vegetation type is found only on transmission corridor T4 where it crosses Mesa Chivato (see the Vegetation Technical Report). Mammals whose preferred habitat includes ponderosa habitat (BLM 1978b) include long-legged myotis, small-footed myotis, silver-haired bat, big brown bat, eastern cottontail, Colorado chipmunk, Mexican woodrat, bushy-tailed woodrat, montane vole, Mexican vole, porcupine, and black bear. Common birds associated with this habitat type include goshawk, red-tailed hawk, American kestrel, turkey, band-tailed pigeon, screech owl, flammulated owl, great horned owl, pygmy owl, spotted owl, poor-will, common nighthawk, white-throated swift, broad-tailed hummingbird, rufous hummingbird, calliope hummingbird, common flicker, acorn woodpecker, Lewis's woodpecker, yellow-bellied sapsucker, Williamson's sapsucker, hairy woodpecker, and downy wood-pecker, among others. A more complete list can be found in BLM (1978b) and Hubbard (1970).

Amphibians and reptiles are not abundant in this vegetation type. The smooth green snake, striped whiptail, gopher snake, and milk snake are reported from most habitats and would probably be encountered in the woodlands. If there are damp grasslands or pools in these areas, chorus frogs and bullfrogs may be seen. A more complete list can be found in Dean and Stock (1961) and Harris (1963).

Sand Wash and Saline Lowlands

The sand wash and saline lowland habitat type includes sand washes re-worked by intermittent stream flow, nearby sand dunes, and saline lowland sites. Common vegetation includes cocklebur, ragweed, tamarisk, Indian rice-grass, and spiny muhly. Vegetation associated with heavy saline/alkaline soils include alkali sacaton-galleta grassland, black greasewood, and four-wing salt-bush. Mammals commonly associated with the greasewood/alkali sacaton drain-age habitat type in the Chaco Coal study area (Bio/West, Inc. 1982) include desert cottontail, black-tailed jackrabbit, white-tailed antelope squirrel, silky pocket mouse, western harvest mouse, and deer mouse. Birds commonly found in this area include northern harrier, scaled quail, mourning dove, Say's phoebe, horned lark, common raven, rock wren, loggerhead shrike, western meadowlark, northern oriole, house finch, green-tailed towhee, lark sparrow, black-throated sparrow, sage sparrow, dark-eyed junco, chipping sparrow, and Brewer's sparrow.

Reptiles reported from sandy terrain include the collared lizard, leopard lizard, lesser earless lizard, side-blotched lizard, and little striped whiptail. Several snakes commonly reported from most other vegetation types would also be found in this habitat. Few amphibians would be expected unless there is a permanent water source. A more complete list can be found in Dean and Stock (1961) and Harris (1963).

Badland and Steep Slope

The badland and steep-slope vegetation type is characterized as very erosive, low-productivity land and steep scarps not covered by pinyon-juniper. Common species include blue grama, junegrass, galleta, alkali sacaton, red-threeawn, sandhill muhly, Indian ricegrass, sand dropseed, big sagebrush, four-wing saltbush, shadscale, broom snakeweed, Russian thistle, buckwheats, and an occasional one-seed juniper. The only common mammal found is the deer mouse (Bio/West, Inc. 1982). The silky pocket mouse, western harvest mouse, white-throated woodrat, porcupine, coyote, and kit fox are uncommon. Avian fauna in these areas are sparse. The northern harrier, ferruginous hawk, and horned lark are common.

Some reptiles are reported in this habitat, including lizards, whiptails, and snakes (Dean and Stock 1961; Harris 1963). Few amphibians use this habitat because of the paucity of water.

Shrubland-Grassland

The shrub-grass vegetation type included shortgrass, degraded shortgrass, and sagebrush-grass subtypes. Mammals reported from grassland and sagebrush-greasewood habitat types include elk, mule deer, pronghorn antelope, and white-tailed prairie dog (BLM 1978). Various small mammals are also common inhabitants (Bio/West, Inc. 1982). Birds found in these habitat types include ring-necked pheasant, scaled quail, Gambel's quail, rock dove, mourning dove, red-headed woodpecker, and Baird's sparrow.

Some of the amphibians found in semiarid to arid regions (near damp areas, stock ponds, etc.) include the tiger salamander, plains spadefoot, and bullfrog (Dean and Stock 1961; Harris 1963). Where moisture is available in the vegetation type, these amphibians would be encountered. Several lizards, whiptails, and snakes also inhabit these regions.

Juniper Savannas and Pinyon-Juniper Woodlands

The juniper and pinyon-juniper type includes the drier, sparse juniper savannas and the higher-elevation, wetter pinyon-juniper woodlands. The pinyon-juniper habitat type is the preferred habitat for the cliff chipmunk, pinyon mouse, gray fox, goshawk, red-tailed hawk, ferruginous hawk, golden eagle, peregrine falcon, merlin, American kestrel, Gambel's quail, turkey, band-tailed pigeon, mourning dove, roadrunner, screech owl, great horned owl, pygmy owl, spotted owl, long-eared owl, poor-will, common nighthawk, white-throated swift, broad-tailed hummingbird, black-chinned hummingbird, Lewis' woodpecker, yellow-bellied sapsucker, hairy woodpecker, downy woodpecker, kingbirds, flycatchers, western wood pewee, swallows, jays, black-billed magpie, common raven, crow, and others (BLM 1978b).

Unless sufficient water were available, no amphibians would be able to complete their reproductive cycle in this dry, sparse vegetation type. Some reptiles utilize this habitat, including lizards, whiptails, and snakes.

Irrigated Cropland and True Riparian

Irrigated croplands and true riparian zones are the most productive vegetation types in the project area. The vegetation associated with the riparian zone includes saltcedar (invaded disturbed lands and sandbars), willows, cottonwoods, and Russian olive. Numerous herbaceous plants and grasses exist along with the shrubs and trees (USFWS 1981). The agricultural portion includes crop fields, pastures, and orchards.

Riparian habitat supports bats, rabbits, squirrel, prairie dog, gophers, beaver, mice, voles, muskrat, porcupine, coyote, foxes, bear, raccoon, weasel, badger, skunk, mountain lion, bobcat, and mule deer (BLM 1978b). This zone is very important for the breeding success for many birds. Water birds and some raptors extensively use the riparian zone.

This habitat type would provide the most conducive habitat for amphibians. Water would be available for amphibians to complete their reproductive cycle. Some of the amphibians that may inhabit this area include the tiger salamander, plains spadefoot, Woodhouse's toad, chorus frog, bullfrog, and northern leopard frog (Dean and Stock 1961; Harris 1963). Lizards, whiptails, and snakes may also be encountered in these areas.

3.2.2 Wildlife Species

Unique and/or Highly Valued Wildlife Species

Elk. The elk was once found throughout all the major montane areas in New Mexico (Findley et al. 1975), but elk populations in the northern regions of New Mexico were essentially gone by 1909. Reintroduction was started in 1910, and by 1967 the state herd was estimated at 11,000. Generally, elk gather in large herds and may move from place to place in search of browse, forbs, and grasses (Lechleitner 1969). Grass comprises 85 percent of their diet (Findley et al. 1975). Winter forage limits elk populations. In winter, heavy snow may force the elk to leave the higher mountain areas and to migrate to lower valleys. Transmission line T4 is the only NMGS component where elk habitat is present; elk are discussed further in that section.

Pronghorn Antelope. Approximately 80 pronghorn were transplanted to the northeastern corner of McKinley County between 1937 and 1955 (Russell 1964). The pronghorn in the Chaco Coal study area are assumed to be progeny of these original transplants.

Ideal pronghorn antelope habitat conditions include a vegetation composition of 40 to 60 percent grass, 10 to 30 percent forbs, and 5 to 20 percent browse (Yoakum 1978). Bio/West (1982) reports that habitat conditions in the Chaco Coal study area are similar to the habitat conditions described by Yoakum (1978). Bio/West (1982) also states that distribution of water sources appears to be adequate; however, some sources retain water only during a few months and not consistently every year. This lack of a permanent and consistent supply of water is an important limiting factor. Another limiting factor appears to be severe food competition from domestic sheep (Bio/West, Inc. 1982). Other mortality factors are predation by coyotes and domestic dogs, and poaching. Bio/West (1982) concludes that the "expansion of the herd is doubtful and eventual extinction of the population is likely."

Mule Deer. Mule deer are the most abundant big game species in the area of the proposed NMGS project components and occupy a great variety of habitat types. Mule deer are found in forest and park areas at high altitudes, in riparian zones, juniper- ponderosa pine breaks and ridges, brushy foothill areas, and occasionally above the timberline. Their food habits vary according to season. Mule deer are primarily browsers; their food may include oak, juniper, mountain mahogany, pinyon, ceanothus, bitter brush, Douglas fir, white fir, and ponderosa (Stewart 1967, as cited in Findley et al. 1975). In some areas, farm crops may be utilized by mule deer.

PNM (1978) reports that mule deer center their activity in pinyon-juniper and higher-elevation habitat types, including the woodland areas around and on Mt. Taylor, on the wooded mesas east of Farmington, in the Chuska Mountains, and the wooded mesas around Interstate-40. Areas subjected to disturbance resulting in increased browse species (i.e., mountain mahogany, oak, etc.) are also areas of increased use by mule deer.

Coyote. Coyotes are found throughout all habitats in New Mexico, although they are most common in the grasslands (Findley et al. 1975). Coyotes have been subjected to extensive predator campaigns and are presently being harvested by trappers (USFWS 1981). During 1977-78, approximately 875 coyotes were harvested in San Juan County, with the trappers reaping nearly $31,000.

Cottontails, woodrats, cricetid mice, ground squirrels, voles, pocket mice, and water owls are important in the coyote diet (Johnson and Hansen 1977; MacCracken 1981). Deer (Crompton 1980; MacCracken 1981) and cattle (MacCracken 1981) are also potential food sources. A small portion of their diet consists of plant material (Johnson and Hansen 1977).

Prairie Dog. The prairie dog is considered an important wildlife species because of its association with the black-footed ferret (federally listed endangered species), which is almost totally dependent on prairie dogs for food and burrows (Snow 1972). White-tailed prairie dogs (Cyonomys gunnisoni) live in grasslands in the northern and western part of New Mexico (Findley et al. 1975). They may occur in low valleys, parks, and meadows in the montane forests up to at least 10,000 feet. They are not reported to be abundant, but they are fairly common periodically. They have been the object of control practices, since the animals are seen as competitors with grazing stock. Behaviorally, white-tailed prairie dogs differ from black-tailed prairie dogs in that they form smaller, more loosely organized towns. Often two or three animals form a colony.

Scaled Quail. The scaled quail is the more common of the two species of quail in New Mexico (Meneeley et al. 1979). The less common Gambel's quail is an introduced species (Hubbard 1978). The scaled quail is distributed throughout the grassland/desert shrub habitat type (Campbell et al. 1973; Johnsgard 1975) but prefers shrub communities with relatively open ground beneath. Although they use a wide variety of shrubs for cover, they strictly avoid heavy woodlands (Bio/West, Inc. 1982). In the Chaco Coal study area, greasewood provides the best overall cover structure. The primary food utilized by scaled quail includes seeds of annual and perennial forbs. Common species include pigweed (Amaranthus sp.), aster, and Russian thistle (Salsola kali).

Mourning Dove. The mourning dove is a ubiquitous species. Grain-producing agricultural areas provide favored feeding grounds, and nesting sites are reported from grassland/desert shrub to ponderosa pine communities (Meneely et al. 1979). Mourning doves have been reported from the lowest elevation in New Mexico to its highest peaks (Ligion 1961). This species provides the largest annual harvest of any game bird in New Mexico (Sand 1972) and in the United States (Peters 1961).

Raptors. Several species of raptors nest in the general vicinity of NMGS project components. One of the more common raptors in the study area is the golden eagle (Aquila chrysaetos), which is a resident almost statewide. According to Hubbard (1978), the golden eagle is rare to locally fairly common. It nests on cliffs, and most of the desirable cliff sites overlook pinyon-juniper or desert shrub. Typically, the golden eagle prefers an interspersion of habitat types in foraging areas. Golden eagles may mate for life; the number of nesting sites per pair may vary from 1 to 14. In New Mexico, eggs are laid in March, and adults are particularly sensitive to disturbances during incubation. Rabbits and rodents are the principal prey, but golden eagles also occasionally eat carrion.

The ferruginous hawk (Buteo regalis) is a year-round New Mexico resident occurring almost statewide (Hubbard 1978). Ferruginous hawks prefer fringes of pinyon-juniper and adjacent grassland associations as well as desert shrub areas. Prey usually consists almost entirely (90 percent) of rabbits, jackrabbits, and rodents; productivity in any one region may be related to the number of jackrabbits available as prey. Ferruginous hawks have been reported dominant over other raptor species, displacing red-tailed and Swainson's hawks. Ferruginous hawks build nests in March and lay eggs in April. Incubation requires 28 to 35 days, and fledging occurs 38 to 50 days later. Throughout North America, ferruginous hawks prefer trees as nesting sites. However, in the West, where tree nesting sites are scarce, ferruginous hawks may nest in bushes or on the ground on a cliff ledge, riverbank, hillside, or badlands such as those present in the Bisti badlands.

The prairie falcon (Falco mexicanus) is a year-long resident in New Mexico, but surveys have suggested that their numbers may be highest during winter. Hubbard (1978) reports that the prairie falcon is a rare to fairly common resident almost statewide. Prairie falcons prefer cliff areas overlooking open country but also utilize clay banks. These falcons typically choose sheltered ledges as nesting sites. Pairs, which are typically not associated during winter, move to the eyrie sites in March. Clutches usually consist of three to six eggs and incubation normally requires 29 to 33 days (Bent 1961).

The marsh hawk (Circus cyaneus) is mainly a winter resident in New Mexico (Hubbard 1978). A marsh hawk was observed just south of the NMGS site during an October 1981 site reconnaissance. Marsh hawks prefer level to rolling topography and are typically noted in grasslands and meadows in the study area. Prey items include rodents, small mammals, frogs, small snakes, small birds, and insects. A large number of marsh hawks winter in the study area, usually leaving the area in the spring.

Another migratory and winter resident is the rough-legged hawk (Buteo lagopus). According to Hubbard (1978), the rough-legged hawk is rare to locally fairly common in grasslands and other open habitats. These hawks prefer lone trees (with branches close to the ground) as hunting perches. Rough-legged hawks usually migrate into New Mexico in late October and leave for their arctic breeding areas in late March. Rough-legged hawks concentrate where there are high rodent densities; microtine rodents and other small mammals are the major prey items (Bent 1961).

Swainson's hawk (Buteo swainsoni) is a summer resident in New Mexico (Hubbard 1978). Swainson's hawks migrate in large flocks to South America during late September and early October and return to New Mexico in late March and early April (Bent 1961). They usually nest in April or May. In the study area, scattered trees provide nest sites, which are renovated yearly.

Eggs hatch in June, and the young typically fledge in about 35 days. Their food consists of small mammals, small birds, and insects.

The burrowing owl (Athene cunicularia) summers and occasionally winters throughout New Mexico (Hubbard 1978). It is rare to common in grassland, open shrubland, and woodland at lower and middle elevations. Clutch size varies from 6 to 11, and incubation lasts about 3-weeks (Bent 1961). Their diet includes insects, "injurious rodents," and a few small birds. Indicative of its name, the burrowing owl nests in burrows.

The long-eared owl (Asio otus) occurs in New Mexico somewhat irregularly in the summer (Hubbard 1978). It is rare to uncommon. Breeding is reported from evergreen woodland down into shrubby lowland habitats. It migrates and winters statewide and is rare to locally common in shrubland and woodland, mainly at lower elevations.

The American kestrel (Falco sparverius) is rare to fairly common throughout most of new Mexico (Hubbard 1978). It is more numerous and widespread during migration, but generally less common in winter. The kestrel feeds largely on small mammals, especially rodents (Bent 1961). Breeding is reported from pine forests down into lowlands. Strictly speaking, the kestrel makes no nests and often lays its eggs in a recess or on a ledge.

Other Wildlife Species

Discussion of general habitat associations for small and medium-sized mammals, nongame birds, and amphibians and reptiles are presented in Section 3.2.1, above. Further information on these species, such as relative abundance, distribution, and habitat requirements, is contained in the general references noted in Section 2.3.1.

Aquatic Species

Aquatic species are discussed separately for each project component.

3.3 SITE-SPECIFIC WILDLIFE AND AQUATIC RESOURCES ASSOCIATED WITH EACH PROJECT COMPONENT

3.3.1 NMGS Plant Site

Unique and/or Highly Valued Wildlife Species

Big Game. No elk, pronghorn antelope, or mule deer are reported in the geographic area of influence defined for the proposed NMGS plant site (NMDG&F 1978; PNM 1980).

Small Mammals.

Coyote. The coyote occurs occasionally in the geographic area of influence defined for the proposed plant site. Improvements in range condition have occurred over the last 5 years (Scott Berger, pers. comm.). As a result, it is probable that the relative abundance of coyotes has increased in response to increased small-mammal populations.

Prairie Dog. There are no prairie dog towns in the geographic area of influence defined for the proposed plant site.

Birds.

Scaled Quail. Scaled quail populations in the area are low and do not support any appreciable level of hunting (Ramakka 1981a). In the geographic area of influence, the scaled quail is found primarily along washes.

Mourning Doves. Because of a preference for trees interspersed with open lands, the mourning dove is not present in appreciable numbers at the proposed plant site. Stock tanks in the geographic area of influence for NMGS serve as a primary water source.

Waterfowl. Waterfowl reported in the NMGS geographic area of influence include mallards, pintail, gadwall, American widgeon, shovelers, blue-winged teal, cinnamon teal, green-winged teal, redhead, American coot, and Canada goose. Waterfowl occurrence in the area is limited to relatively few individuals that use earthen stock tanks during migration.

Raptors. Raptor nests or roosts in the area of the proposed NMGS site are presented in Table 3-1.

Other Wildlife Species

A general description of the relative abundance, species composition, and occurrence of small mammals that would be expected in the shrub-grass habitat on the NMGS plant site is documented in several recent references (PNM 1980; Bio/West 1982; DOI et al. 1980).

Current range conditions, erosion factors, and edaphic factors are responsible for actual population levels and species occurrence. There are indications that current range conditions are significantly improved over that observed when recent studies (PNM 1980) documented a depauperate mammalian fauna. As a result, small nongame populations have probably improved somewhat. Small mammal species present on the NMGS plant site include Ord's kangaroo rat, bannertail kangaroo rat, northern grasshopper mouse, plain pocket mouse, silky pocket mouse, white-footed mouse, and deer mouse.

Nongame birds associated with the NMGS site are similar to species documented in the regional studies referenced above. Stock tanks, broken terrain, and shrub areas appear to be of major importance to nongame and game birds in the vicinity of the proposed plant site.

Table 3-1. NUMBER OF RAPTOR NESTS AND ROOSTS WITHIN 5 MILES OF NMGS

Species	Nest	Roost
Ferruginous hawk	6	—
Burrowing owl	2	—
Long-eared owl	—	1

Source: Ramakka (1981a), Bio/West, Inc. (1982).

Note: At BLM's request, specific locations are not given.

Studies by Jones (1970) and PNM (1980) are the most site-specific for reptiles and amphibians in the region of the NMGS site.

Aquatic Species

Permanent aquatic habitat on the plant site consists of two gully-plug stock ponds in Sections 23 and 24, R13W, T23N. Each pond is less than 0.5 acre in surface area and is heavily used by cattle. Vascular aquatic vegetation is lacking in both ponds and the water was very turbid (indicative of heavy livestock use) during site visits in August and September 1981. Streambank vegetation consists of grasses and forbs, with some saltcedar.

Damselflies (Odonata) and water fleas (Diptera: Dixidae) were the only aquatic insects observed during site visits, and since these ponds most likely experience low dissolved-oxygen levels for long periods, it is unlikely that a permanent fish fauna is present.

The plant site is drained by De-na-zin Wash and several unnamed tributaries. All stream channels on the plant site are ephemeral and flow only in response to heavy precipitation. The sometimes heavy amounts of rainfall cause instantaneous floods in these otherwise dry streambeds. These streams lack a permanent fish fauna, although some aquatic invertebrates may be present for short periods of time.

3.3.2 Water Supply System

Proposed Action--Intake and Water Pipeline P1

Unique and/or Highly Valued Species.

Elk. Elk have been observed wintering along the San Juan River (USFWS 1981); however, the New Mexico Department of Game and Fish has not designated any crucial habitat for elk in the vicinity of the proposed intake or pipeline P1 (NMDG&F 1978).

Pronghorn Antelope. There are no pronghorn antelope reported in the area of the proposed P1 intake location and pipeline at Farmington.

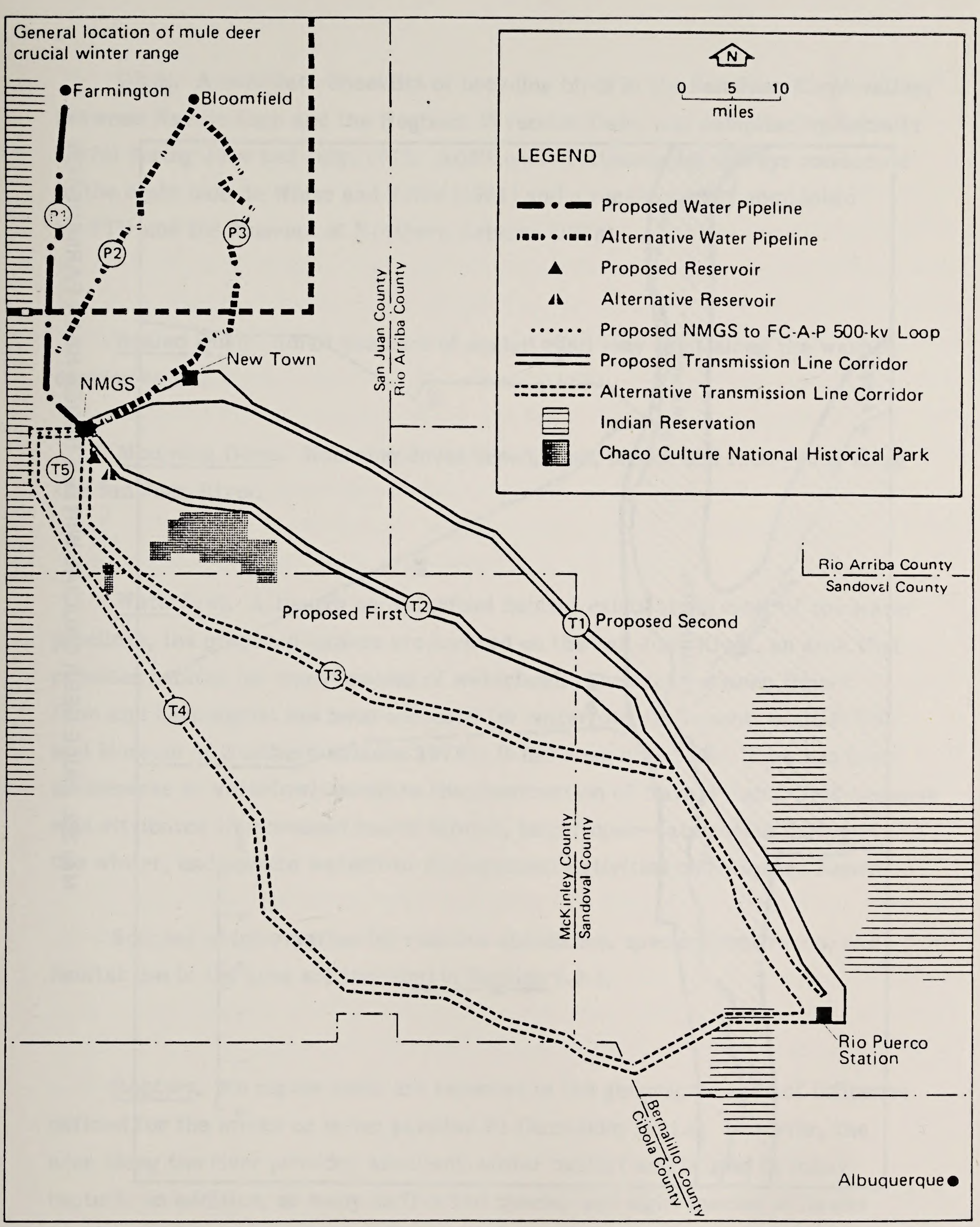
Mule Deer. A resident mule deer herd, located in the riparian zone along the San Juan River, is reported to have about 300 deer; densities average about 1 deer per square mile (Kelly 1982). During severe winters, migrations of deer from Colorado may increase the population in the area. In habitat outside the riparian zone in the river valley, mule deer densities are low and are reported at less than 0.1 deer per square mile (Kelly 1982).

Mule deer crucial winter range has been designated along the San Juan River (NMGF 1978). The proposed Farmington intake and pipeline P1 would traverse approximately 2.75 miles (MP 0-2.75) of this range (Maps 3-1 and 3-2).

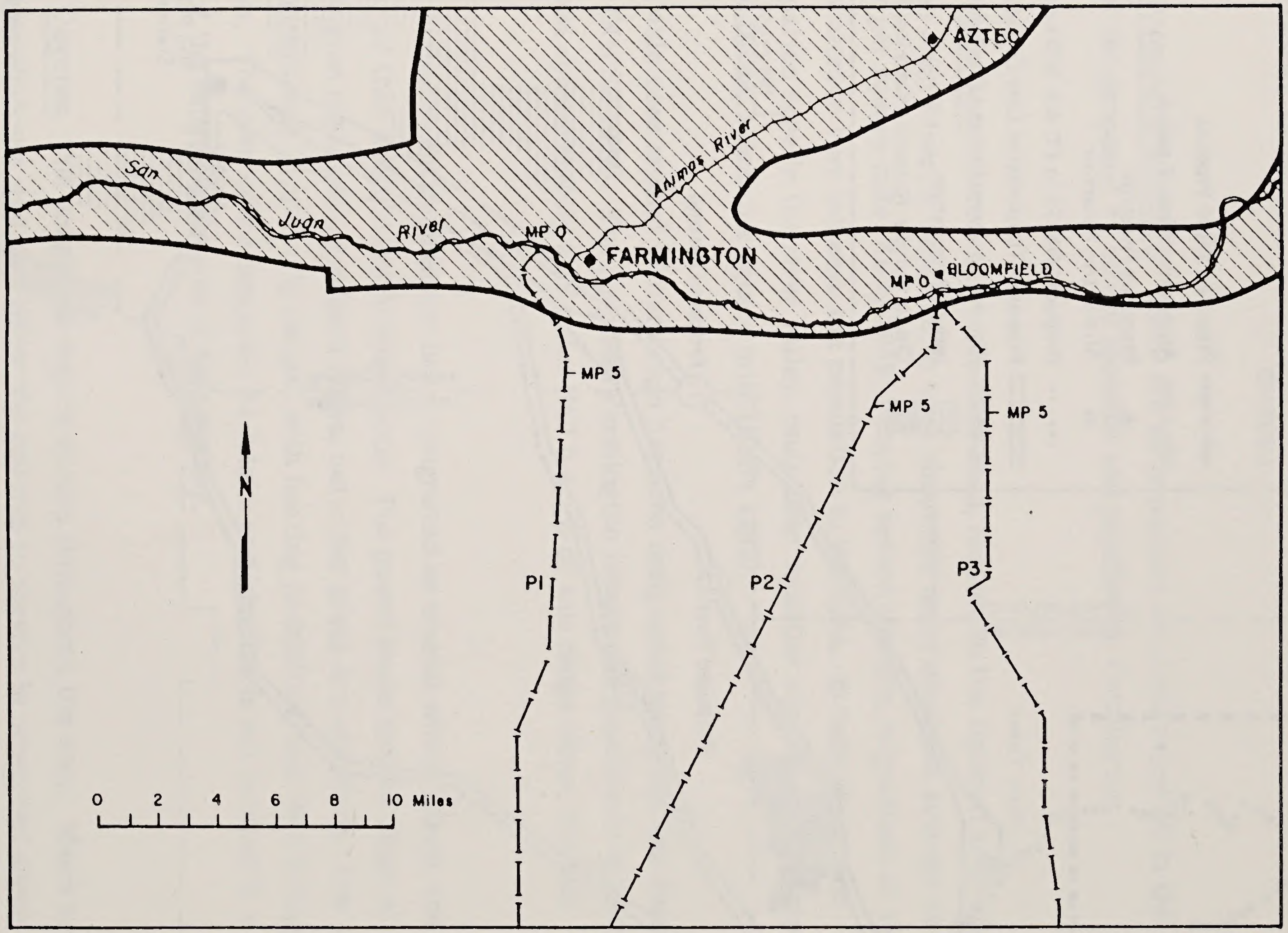
While the entire area has been designated as crucial winter range, the quality of that range is not homogeneous. The paved areas and buildings of Farmington are clearly not good range, but other areas are excellent. The B-Square Ranch is privately owned, with hunting prohibited, and feed is supplied to deer. The area of the proposed P1 intake and pipeline is not located in a part of the range considered of high quality.

Coyotes. The ubiquitous coyote occurs throughout the area. Man's scraps, garbage, chickens, and pets allow the coyotes to survive in populated areas despite traps and firearms.

Prairie Dogs. No prairie dog towns are reported along the route of P1.



Map 3-1. GENERAL LOCATION OF MULE DEER CRUCIAL WINTER RANGE NEAR FARMINGTON
(see Map 3-2 for specific location details)



Map 3-2. MULE DEER CRUCIAL WINTER RANGE NEAR FARMINGTON

Birds. A complete checklist of breeding birds in the San Juan River valley, between Navajo Dam and the Hogback Diversion Dam, was compiled by Schmitt (1976) during June and July, 1972. Additional ornithological surveys conducted in the basin include White and Behle (1961) and a recent survey completed by VTN and the Museum of Northern Arizona (1978).

Scaled Quail. Small numbers of scaled quail may exist along the washes crossed by P1.

Mourning Dove. Mourning doves breed, nest, brood, and feed young along the San Juan River.

Waterfowl. Although no waterfowl habitat exists along most of the water pipelines, the proposed intakes are located on the San Juan River, an area that provides habitat for many species of waterfowl. The area between Navajo Dam and Farmington has been censused for waterfowl for several years (VTN and Museum of Northern Arizona 1978). It has been noted that there has been an increase in waterfowl use since the construction of Navajo Dam. This increase was attributed to increased marsh habitat, larger open-water areas during the winter, and private waterfowl management activities on B-Square Ranch.

Sources of information for relative abundance, species occurrence, and habitat use in the area are included in Section 2.3.1.

Raptors. No raptor nests are reported in the geographic area of influence defined for the intake or water pipeline P1 (Ramakka 1981a). However, the area along the river provides excellent winter habitat and is used by many raptors. In addition, as many as five owl species and eight species of hawks and falcons breed along the San Juan River (USFWS 1981) and would be expected to use the intake area for foraging.

Other Wildlife.

Small and Medium-sized Mammals. The proposed intake site is located in the riparian zone of the San Juan River. Small to medium-sized mammals commonly found in the riparian woodlands and adjacent agricultural fields include cottontail rabbits, rock squirrels, striped skunks, racoons, foxes, and numerous mice and other small rodents (USFWS 1981). Beavers and muskrats are occasionally found along the river. The U.S. Fish and Wildlife Service (1981) reports that beavers are common and have created many small marshes along the river. Muskrats are numerous in and around the marshes and in the main channel of the river. Areas upstream from Largo Canyon, where the banks are suitable for denning, have the largest populations of muskrats. The banks are largely sand downstream from Largo Canyon. Beavers have been found throughout much of the river, where food is available. Both beavers and muskrats have been found in irrigation ditches.

Nongame Birds. The relative abundance of nongame birds in each habitat type in the basin was determined by VTN and the Museum of Northern Arizona (1978) using Emlen's (1971) transect technique. Their primary study area included the portion of the floodplain downstream from Navajo Dam to the Hogback Diversion Dam. The secondary study area included the stretch of the river from the Hogback Diversion Dam downstream to the river's confluence with the Colorado River. The relative abundance and species occurrence of nongame birds in the vicinity of the proposed intake and water pipeline P1 would be expected to be similar to that described in the VTN and Musuem of Northern Arizona studies.

Aquatic Species. The San Juan River is located in the Four Corners area of Arizona, Colorado, New Mexico, and Utah. It flows generally east to west, into the Colorado River. The San Juan can be separated into three sections, based upon fish habitat and angler use. The first section includes the first 8 miles below the Navajo Dam and is characterized by cool, relatively clear water, flowing over a gravel-rubble bottom (Bureau of Reclamation 1976).

The clear releases from the dam have tended to remove fine sediment from the streambed and cause an armoring (removal of fine particles, leaving the substrate covered with large cobbles and boulders) of the tailwater area (Holden et al. 1980). The second section extends from mile 8 to mile 18 below the dam and is typified by cool, clear water for most periods; however, high turbidities occasionally result following rainstorms. The third section, beyond mile 18, is characterized by increased turbidity, silt deposition, and heat absorp tion as inflows from the tributary canyons continually add fine materials in addition to the reduction in the silt-retention influence of Navajo Dam. The third section is characterized by perennial high turbidity, silt-laden bottom substrate, and warm water temperatures. Holden et al. (1980) state that the "area below the mouth of the Animas, and particularly below Shiprock, probably bears a close resemblance to the natural state of the San Juan River prior to the closure of Navajo Dam." The proposed intakes would be located in this third section.

Plankton. Primary production in most riverine ecosystems is generally low (Hynes 1970). Holden et al. (1980) reported periphyton density levels (excluding the collection made just below the dam) from 0.01 to 3.79 mg/m^2 chlorophyll a. The dominant taxa in the periphyton community of the downstream stations included diatoms (Synedra ulna, Synedra spp., Navicula spp., and Nitzschia spp.), bluegreen algae (Lyngbya sp., Oscillatoria sp.), and green algae (Stigeoclonium sp.). A species list of the periphyton collected from the San Juan is presented in Appendix 2. The San Juan River has a small assemblage of true phytoplankton species; the species list of the 51 taxa is presented in Appendix 3. The majority of these species are diatoms associated with the periphyton community (Holden et al. 1980). Densities downstream from Navajo Dam ranged from below 5000 to over 59,000 cells per liter.

Zooplankton represented a minor part of the plankton community. Less than 1 cell per square meter was reported from macroinvertebrate drift samples, while only random individuals were collected in plankton samples. The species collected included Diaptomus connexus and Cyclops vernalis.

Invertebrates. Macroinvertebrates were recently collected from the San Juan River (Holden et al. 1980). A species list of the organisms collected is presented in Table 3-2. Station locations are noted in Table 3-3. Macroinvertebrates were collected from riffle and run habitats, and the riffles supported consistently higher densities and biomass throughout the year (Appendix 4).

The proposed Farmington intake site (P1) is located between sampling stations 9 and 10 (Holden et al. 1980). Station 6 was located closest to Bloomfield (P2 and P3). All of these locations were considered biologically similar by Holden et al. (1980) and were classified together as the middle section. The upper section (below the dam) was characterized by higher densities and biomass, while the lower section had lower densities and biomass than the middle section.

Species composition by station for benthic macroinvertebrates collected by Holden et al. (1980) is presented in Appendix 5. Near Bloomfield (station 6), ephemeropterans contributed a greater proportion of the total fauna in comparison with stations farther downstream (stations 9 and 10). Chironomids were more prevalent at the downstream sites.

Fishes. Fishes that may occur in the San Juan River are presented in Table 3-4. Some of the species are not expected to occur in the areas of the proposed intakes. An example is the threadfin shad (*Dorosoma petenense*). A large number of juveniles were collected at Clay Hills Crossing (VTN 1978), but reported to be essentially restricted to reservoir conditions and unable to survive in the more turbulent river waters. VTN (1978) suggested that because of this, juvenile shad are unlikely to move much farther upstream in the San Juan.

Several species of trout and suckers have been reported in the San Juan River. The rainbow trout (*Salmo gairdneri*) has been found distributed from the Navajo Dam downstream to near Kirtland (VTN 1978). The highest densities were reported from the dam downstream to Archuleta, after which the densities decreased markedly. The distribution of the brown trout (*Salmo trutta*) was

Table 3-2. MACROINVERTEBRATES COLLECTED FROM THE SAN JUAN DRAINAGE, NEW MEXICO AND UTAH

INSECTA

Ephemeroptera

- ● Baetidae
  - Baetis sp.
  - Callibaetis sp.
  - Paracloedes sp.
- ● Oligoneuriidae
  - Lachlania sp.
- ● Heptageniidae
  - Heptagenia sp.
  - Rhithrogena sp.
- ● Ephemerellidae
  - Ephemerella ineris
- ● Tricorythidae
  - Tricorythodes sp.
- ● Leptophlebiidae
  - Paraleptophlebia sp.
  - Traverella albertana

Odonata

Anisoptera

- ● Gomphidae
  - Omphiogomphus severus
  - Gomphus sp.

Zygoptera

- ● Calopteryvgidae
  - Hetaeina sp.
- ● Coenagrionidae
  - Enallagma sp.
  - Ischnura sp.

INSECTA

Plecoptera

- ● Perlodidae
  - Isogenoides sp.
  - Isoperla sp.
- ● Chloroperlidae

Hemiptera

- ● Gerridae
  - Gerris sp.
- ● Corixidae
  - Trichocorixa sp.
- ● Notonectidae
- ● Mesoveliidae

Neuroptera

Trichoptera

- ● Hydropsychidae
  - Hydropsyche sp.
  - Cheumatopsyche sp.
- ● Hydroptilidae
  - Hydroptila sp.
- ● Brachycentridae
  - Brachycentrus sp.
- ● Limnephilidae
  - Limnephilus sp.

Lepidoptera

- ● Pyralidae

Table 3-2. (concluded)

INSECTA

Coleoptera
- Dytiscidae
  - Agabus sp.
  - Laccophilus sp.
- Noteridae
  - Pronoterus sp.
- Hydrophilidae
  - Helochares normatus
- Dryopidae
  - Helichus sp.
- Helidae
- Elmidae
  - Ordobrevia sp.

Hymenoptera
- Formicidae

Diptera
- Ceratopogonidae
- Simuliidae
- Chironomidae
- Empididae

NEMATODA

ANNELIDA

Oligochaeta

Hirudinea

CRUSTACEA

Ostracoda

Amphipoda
- Talitridae
  - Hyallela azteca

HYDRACARINA
- Hydrachnidae

MOLLUSCA

Gastropoda
- Lymnaeidae
  - Lymnaea sp.
- Physidae
  - Physa sp.

Source: Holden et al. (1980).

Table 3-3. LOCATIONS OF STATIONS USED IN COLLECTION OF MACROINVERTEBRATES

Station	River Mile	Location Description
1	298.0	Dam
2	295.3	Simon Wash
3	291.0	Ernie's Fishing Hole
4	287.0	State Land Bluff
5	279.5	Blanco Bridge
6[a]	273.3	Gasoline Alley
8	260.1	Fairgrounds
9[b]	253.5	Dump
10[b]	251.4	Farmington Bridge
11	----	Animas River
12	244.0	Lions Park
13	228.4	Hogback
14	217.6	Shiprock
16	187.4	Four Corners
17	166.7	Aneth, Utah
19	146.0	Bluff, Utah
20	113.5	Mexican Hat

Source: Holden et al. (1980).

[a]Closest collection made to the proposed Bloomfield site (P2-P3).

[b]Closest collections made to the proposed Farmington site (P1).

Table 3-4. FISHES OF THE SAN JUAN RIVER BASIN

Scientific Name	Common Name
Clupeidae	Herrings
Dorosoma petenense	threadfin shad
Salmonidae	Trouts
Salmo gairdneri	rainbow trout
Salmo trutta	brown trout
Salmo clarki	cutthroat trout
Salvelmus fontinalis	brook trout
Oncorhynchus kisutch	coho salmon
Oncorhynchus nerka	kokanee salmon
Esocidae	Pikes
Esox lucius	northern pike
Cyprinidae	Carp, minnows
Cyprinus carpio	carp
Notropis lutrensis	red shiner
Notropis heterolepis	bluntnose shiner
Pimephales promelus	fathead minnow
Hybognathus placita	plains minnow
Rhinicthys osculus	speckled dace
Ptychocheilus lucius	Colorado squawfish
Gila robusta	roundtail chub
Gila elegans	bonytail chub
Catostomidae	Suckers
Catostomus discobolus	bluehead sucker
Catostomus latipinnis	flannelmouth sucker
Catostomus commersoni	white sucker
Xyrauchen texanus	razorback sucker
Ictaluridae	Bullhead catfishes
Ictalurus punctatus	channel catfish
Ictalurus melas	black bullhead
Ictalurus furcatus	blue catfish
Cyprinodontidae	Killifishes
Fundulus zebrinus	plains killifish
Poeciliidae	Livebearers
Gambusia affinis	mosquitofish

Table 3-4. (concluded)

Scientific Name	Common Name
Centrarchidae	Sunfishes
Micropterus salmoides	largemouth bass
Lepomis cyanellus	green sunfish
Lepomis machrochirus	bluegill
Pomoxis annularis	white crappie
Pomoxis nigromaculatus	black crappie
Cottidae	Sculpins
Cottus bairdi	mottled sculpin

Sources: VTN (1978), Koster (1957), BLM (1978b).

the same as for the rainbow trout, although the areas near Blanco and Archuleta supported the highest relative densities. The remaining areas supported similar populations of rainbows and browns. The cutthroat trout (Salmo clarki) is maintained in the San Juan by stocking (VTN 1978). During 1976-77, about 150,000 cutthroat trout fry or fingerlings were stocked below Navajo Reservoir. The Colorado River cutthroat and brook trout, and coho and kokanee salmon are also reported to occur in the San Juan River Basin, or have done so historically (VTN 1978).

Bluehead suckers (Catostomus discobolus) and flannelmouth suckers (C. latipinnis) were collected in the San Juan from Blanco, New Mexico, to Glen Canyon National Recreation Area (VTN 1978). Reproduction was verified for both species by collection of juvenile fish, gravid females, and ripe females. A white sucker was collected near Blanco, and the species has been reported from several localities in the San Juan.

Several species of minnows are reported in the San Juan River (Table 3-4). The VTN (1978) report found carp (Cyprinus carpio) from Blanco to the Glen Canyon National Recreation Area. VTN verified reproduction through the collection of gravid females and ripe males. The red shiner (Notropis lutrensis) was found from east of the Hogback downstream to Glen Canyon National Recreation Area. Although Koster (1957) did not report this fish as occurring in New Mexico, it may have invaded the San Juan River from a population in Lake Powell (VTN 1978). VTN also reported that it is anticipated that the red shiner will invade upstream to Farmington, if not farther.

Fathead minnows (Pimephales promelas) were collected from Blanco upstream to the dam and sporadically throughout the area downstream to Glen Canyo (VTN 1978). The plains minnow (Hybognathus placita) was collected near Glen Canyon; its presence was attributed to bait bucket introduction. Speckled daces (Rhinichthys osculus) were collected from Blanco downstream to Glen Canyon. Relative densities were highest from Blanco to the Hogback and then drastically reduced.

Channel catfishes (Ictalurus punctatus) and black bullheads (I. melas) were collected throughout the San Juan, although channel catfishes were more abundant in the downstream areas. This species was stocked in 1962 and has maintained itself through reproduction and continued stocking. Black bullheads were collected sporadically throughout the river.

The plains killifish (Fundulus zebrinus), an introduced exotic, was collected more often in the upstream areas but was never collected in large numbers (VTN 1978). Although no year class 0 fish were collected, large adults in reproduction condition were collected.

Mosquitofishes (Gambusia affinis) were collected sporadically during the VTN (1978) study. They have been introduced into marshes of the upstream areas for mosquito control.

Sunfishes, bass, and crappies have been collected, although somewhat sporadically, in recent years (VTN 1978). Based on these records, it is assumed they still inhabit the San Juan.

The mottled sculpin (Cottus bairdi) was not collected by VTN (1978); but it is assumed to be present, based upon recent collections.

A survey was recently conducted on the San Juan River basin from Navajo Dam to Lake Powell (VTN 1978). Fishes collected from near the alternative (Bloomfield) intake site include S. Gairdneri, S. trutta, C. carpio, R. osculus, C. latipinnis, C. discobolus, C. latipinnis, C. discobolus, and F. sebrinus (Table 3-5). Fishes collected near the proposed Farmington intake sites included the same species, excluding the C. latipinnis x C. discobolus hybrid. The locations of VTN's sampling sites are presented in Table 3-6.

Relative densities of fishes collected by electrofishing near the alternative (Bloomfield) intake (P2-P3) included the following (VTN 1978):

Table 3-5. DISTRIBUTION OF FISH IN THE SAN JUAN RIVER DURING APRIL 1978

	Station									
Species	1	2	3	4[a]	5	6	7[b]	8	9	10
Salmo gairdneri	X	X	X	X	X	X	X	X		
Salmo trutta	X	X	X	X	X		X	X		
Cyprinus caprio			X	X	X	X	X	X	X	X
Notropis lutrensis										X
Pimephales promelas	X	X	X			X		X	X	X
Rhinichthys osculus			X	X	X	X	X	X	X	X
Catostomus latipinnis			X	X	X	X	X	X	X	X
Catostomus discobolus			X	X	X	X	X	X	X	X
Catostomus commersoni			X							
C. latipinnis x C. discobolus				X		X				
Ictalurus punctatus										X
Ictalurus melas	X	X								X
Fundulus zebrinus	X			X		X	X	X		X
Gambusia affinis	X									X
Lepomis cyanellus										X

Source: VTN Consolidated, Inc. (1978).

[a]Closest to alternative (Bloomfield) site.

[b]Closest to proposed (Farmington) site.

Table 3-6. SAMPLING SITE LOCATIONS ON SAN JUAN RIVER FROM NAVAJO DAM TO LAKE POWELL (Used in Table 3-5)

Site No.	Location
1	0.25 mile downstream of Navajo Dam
2	Highway 173 bridge at Archuleta
3	Highway 64 bridge at Blanco
4[a]	Highway 44 bridge at Bloomfield
5	2 miles west N.M. 44 near Salmon River and San Juan County Museum
6	6 miles east of Farmington, near San Juan County Fairgrounds
7[b]	1 mile east of Farmington, New Mexico, on private land of Tom Bolack
8	2 miles east of Kirtland, near Fruitland Lions Club Park
9	1 mile upstream of County Bridge 82, Fruitland
10	0.25 mile east of the "hogback"

Source: VTN (1978).

Note: All locations are in San Juan County, New Mexico.

[a]Closest to the Bloomfield intake sites.

[b]Closest to the Farmington intake sites.

Species	Percent
Rainbow trout	10
Brown trout	2
Bluehead sucker	12
Flannelmouth sucker	56
White sucker	2
Carp	18

The area near the proposed Farmington intake (P1) was also sampled by VTN (1978). The relative densities of the fishes collected at this location included:

Species	Percent
Rainbow trout	4
Bluehead sucker	30
Flannelmouth sucker	18
Carp	48

Woodward-Clyde Consultants conducted a field reconnaissance of the aquatic habitat in the proposed intake areas on September 10-11, 1981. Substrate characteristics, depth, and habitat types (i.e., runs, rapids, riffles, and pools) were determined at 5-meter intervals along across-river transects. Several transects were conducted at each site. Flow characteristics were to be collected, but a malfunction in the flow meter prevented the collection of these data. Fishery data were also to be collected, but problems associated with the acquisition of a New Mexico State collecting permit prohibited collecting fishes during this time period.

At the alternative intake near Bloomfield, 10 transects along a 340-meter stretch of river downstream from the bridge were surveyed. The river was divided by a large vegetated island near the right bank (Appendix 6). Situated behind the island was a silty backwater channel. A sand bar was located near the left bank. Construction workers in the area reported on September 11, 1981, that this sand bar had been created within the past 2 weeks, since construction work was started on the bridge. A smaller island was located at the head of the large, vegetated island. The substrate consisted primarily of cobble and boulder, with sand and silt stream banks. Except for the backwater areas behind the large island and at the sand bar, the habitat type varied from fast runs to rapids. A current of 125 cm/sec was recorded at station 1, which is above that needed to initiate the movement of medium gravel (Hynes 1970). Depth contours are presented in Appendix 6.

Three stations near the proposed Farmington intake (P1) were surveyed. The first station was located near the gaging station outside Farmington. The second station was located near the Farmington dump, and the third station was above the confluence of the San Juan and Animas rivers. Physical characteristics for each of these stations were also collected during the WCC (1981) survey. The Farmington 1 station was characterized by run-rapid habitat types with a few deep pools. Substrate was primarily sand with some cobble and boulder. Depth contours are presented in Appendix 6.

The Farmington 2 station was characterized by pools along part of the shoreline, with run or rapid habitat in the interior. Substrate was primarily boulder with some cobble. The stream banks were primarily silt and sand with some scattered boulders. The entire stream section at the Farmington station was a run habitat type. Substrate types were mixed, although boulders were found throughout much of the river. Depth contours are presented in Appendix 6.

Alternative Intake and Water Pipelines P2 and P3.

Unique and/or Highly Valued Species.

Elk. No elk crucial habitat has been designated in the vicinity of the P2-P3 intake or either P2 or P3 pipeline routes.

Pronghorn Antelope. The alternative intake for P2-P3 is located at the edge of the range of a small herd (approximately 25 animals) near Highway 44.

Mule Deer. A resident mule deer herd, located in the riparian area along the San Juan River in the vicinity of the alternative intake, is reported to have approximately 300 deer; densities average about 1 deer per section (Kelly 1982). Migrations from Colorado during severe winters increase the population levels. South of the riparian area, densities are reduced to less than 0.1 deer per section.

Mule deer crucial winter range (Maps 3-1 and 3-2) is located along the San Juan River (NMGF 1978). The P2 and P3 pipeline routes would each traverse approximately 1 mile of this range (MP 0-1).

Coyote. Coyotes are found throughout the areas crossed by P2 and P3.

Prairie Dogs. No prairie dog towns are reported along the P2 and P3 routes.

Scaled Quail and Mourning Dove. These upland species may exist along the P2 and P3 pipeline routes and intake site, as described for the Proposed Action.

Waterfowl. Waterfowl use of the alternative areas is the same as described for the Proposed Action.

Raptors. Raptor use of the alternative areas is the same as described for the Proposed Action.

Other Wildlife. Use of the alternative intake and pipeline corridors is the same as that discussed for the Proposed Action.

Aquatic Species. Aquatic resources in the areas of the intake and alternative pipeline corridors are similar to those discussed for the Proposed Action.

Reservoirs.

Proposed Action—Reservoir R1. The proposed reservoir (R1) is located approximately 2 miles south of the proposed NMGS site; it supports vegetation types and wildlife communities similar to those described for the NMGS site. In addition, a portion of the reservoir site (Dog-Eye Pond) serves as a water catchment. During the seasons in which water is present, the area is probably used by wildlife for water and by amphibians for water and breeding.

Alternative Reservoir, R2. The alternative reservoir site does not contain an intermittent pond. Presently, it supports a shrub-grass vegetation type and wildlife communities similar to those discussed for the plant site.

3.3.3 Transmission System

Proposed Action: First 500-kV Line, Route T2.

Unique and/or Highly Valued Wildlife.

Elk. No elk are reported in the geographic area of influence defined for transmission route T2 (PNM 1978; NMGF 1976).

Pronghorn Antelope. Pronghorn antelope have been reported in the area of transmission corridor T2 (PNM 1978; NMGF 1978), MP 0-30, 70-85, and 90 to Rio Puerco Station. One herd near Eagle Mesa (near MP 35) consists of approximately 11 animals, and another herd near Cabezon Peak has 50 animals. The pronghorn antelope population is apparently at carrying capacity for the habitat (BLM 1977). BLM (1977) and PNM (1978) have reported that the populations are low due to lack of kidding grounds, behavioral aspects, low precipitation, poaching, and the overgrazed condition of the range. The New Mexico Department of Game and Fish (1978) has not designated any critical habitat in the area of transmission corridor T2.

Mule Deer. The area traversed by T2 (MP 30 to Rio Puerco Station) supports an average of less than 0.1 deer per square mile (Kelly 1982). Habitat does not appear to be a limiting factor. Low fawn survival has resulted in overall low densities of mule deer.

Coyote. Coyotes are found throughout the area of T2.

Prairie Dog. Several prairie dog towns have been located near Tsaya Canyon (T22N, R12W, Sections 5 and 8), which transmission line T2 (MP 0-10) would traverse (J. Ramakka, 1981a). Another small prairie dog town (MP 30-40) was noted within a mile of the corridor near Chaco Canyon National Monument (T20N, R8W, Section 10).

Scaled Quail and Mourning Dove. Scaled quail and mourning doves are distributed throughout the grassland and brushland habitats and extend into the pinyon-juniper habitat (PNM 1978). These two upland game birds reach moderate densities. Density estimates of scaled quail were reported (PNM 1978, from the New Mexico Department of Game and Fish): near Aztec, 2.2 per linear mile; near Crownpoint, 5.9 per linear mile; and near San Luis, 5.4 per linear mile. No comparable data were available for the mourning dove, but surveys in these areas report that the species is moderately abundant.

PNM (1980) reported that the scaled quail is a resident in the area; the mourning dove conducts breeding, nesting, brooding, and feeding activities during the spring and summer months, then migrates in the early fall at the onset of cooler temperature.

Ramakka (1981b) reported that mourning doves and scaled quail had been reported from the Tanner Lake (MP 0-5, T23N, R12W) area, although densities were not known.

Waterfowl. Tanner Lake (T20W, R7N) is intermittently wet and therefore provides some waterfowl habitat (Ramakka 1981b). Several species of migrating waterfowl have been reported in the area, including blue-winged teal, Wilson's phalarope, shovelers, pintails, least sandpiper, and white-faced ibis.

Other potential waterfowl habitat includes gully-plug reservoirs and water tanks that migrating ducks and geese use for short periods (PNM 1980). Shorebirds, such as killdeer and spotted sandpiper, would be expected to occur around these ponds.

There are no permanent streams capable of providing adequate waterfowl habitat that would be traversed by this transmission line.

Raptors. Several species of raptors are known to occur in the geographic area of T2. Species reported in the area include the golden eagle, red-tailed hawk, American kestrel, Swainson's hawk, rough-legged hawk, marsh hawk, sharp-shinned hawk, prairie falcon, peregrine falcon, ferruginous hawk, and various species of owls (PNM 1978). Raptor nests reported in or near T2 are listed in Table 3-7. A possible prairie falcon perch was reported within 1 mile of T2 (MP 50-60), but no nest or scrape was sighted.

Aquatic Species. There are no perennial drainages that would be traversed by T1, T2, T3, or T4. All of the drainages are either ephemeral (flowing only in direct response to precipitation) or intermittent. The lack of permanent water precludes a permanent fish fauna. Macroinvertebrates would be present during periods of flow, but not in densities or diversities observed in areas with permanent water.

Table 3-7. NUMBER OF RAPTOR NESTS ALONG T2

Species	Within 1-Mile Corridor	Within 5-Mile Geographic Area of Influence	General Milepost Location
Golden eagle or red-tailed hawk	—	1	0-10
Red-tailed hawk	—	1	40-50
	—	1	50-60
	—	2	60-70
Golden eagle	1	5	10-20
	—	1	50-60
	—	1	60-70
Burrowing owl	—	2	0-10
	—	1	10-20
	—	1	20-30
	—	1	30-40
Ferruginous hawk	—	2	0-10
	—	4	10-20
Swainson's hawk	—	1	10-20
Prairie falcon	—	1	60-70

Sources: Ramakka (1981a), Bio/West, Inc. (1982).

Note: At BLM's request, specific locations are not given.

Gully-plug reservoirs and stock tanks are scattered throughout the area. There are no fishery resources reported from these water sources (NMGF 1978; PNM 1980), although some may have been stocked by local ranchers or have fishes introduced by other means. These ponds would support a macroinvertebrate fauna as long as water is available.

Proposed Action: Second 500-kV Line, Route T1.

Unique and/or Highly Valued Wildlife.

Elk. No elk habitat would be traversed by T1 (NMGF 1978). The nearest elk populations are in the Mt. Taylor area.

Pronghorn Antelope. Pronghorn antelope habitat in the area of T1 is similar to that described for T2 (approximately MP 35). The last 5 miles of T1 (MP 100 to Rio Puerco Station) is reported as antelope-occupied range. No critical habitat has been designated by NMGF (1978).

Mule Deer. Route T1 traverses no crucial habitat (NMGF 1978). Mule deer densities (MP 25-Rio Puerco Station) are low and are reported to be less than 0.1 deer per square mile (Kelly 1982).

Coyote. Coyotes are found throughout the area of T1.

Prairie Dog. No prairie dog towns are reported along T1.

Game Birds. The population of game birds along the corridor is expected to be similar in composition and abundance to that discussed for T2.

Waterfowl. Gully-plug reservoirs and water tanks along T1 would provide limited waterfowl habitat. Migrating ducks and geese may be expected to use these ponds for short periods of time; and shorebirds, such as killdeer and spotted sandpiper, would be expected to occur around these ponds (PNM 1980).

No permanent streams would be traversed by T1. No adequate waterfowl habitat is provided by any of the drainages traversed (PNM 1980).

Raptors. Several raptor nests have been reported in and/or near T1 (Table 3-8).

Aquatic Species. Aquatic species are discussed above.

Alternative Route T3.

Unique and/or Highly Valued Wildlife.

Elk. There are no elk in the area traversed by T3 (PNM 1980; NMGF 1978).

Pronghorn Antelope. Pronghorn antelope are distributed throughout the area traversed by T3 (PNM 1980; NMGF 1978). A detailed discussion of these herds is given above for T2 (MP 0 to approximately MP 35, approximately MP 45, MP 70 to Rio Puerco Station). No crucial habitat would be traversed by this corridor (NMGF 1978).

Mule Deer. Mule deer are distributed over approximately half of T3 (MP 35 to Rio Puerco Station). Mule deer densities are low and are reported to be less than 0.1 deer per square mile (Kelly, personal communication). There is no crucial habitat designated by the New Mexico Department of Game and Fish (1978).

Table 3-8. NUMBER OF RAPTOR NESTS AND ROOSTS ALONG T1

Species	Within 1-Mile Construction Corridor	Within 5-Mile Geographic Area of Influence	General Milepost Location
Ferruginous hawk	—	2 Nests	0-10
Long-eared owl	—	1 Nest, 1 Roost	0-10
	—	1 Roost	60-70
Prairie falcon	—	1 Nest	0-10
Swainson's hawk	—	1 Nest	0-10
Burrowing owl	—	2 Nests	0-10
Golden eagle	—	4 Nests	50-60
	—	1 Nest	60-70
Red-tailed hawk	1 Nest	2 Nests	50-60

Sources: Ramakka (1981a), Bio/West, Inc. (1982).

Note: At BLM's request, specific locations are not given.

Table 3-9. NUMBER OF RAPTOR NESTS ALONG T3

Species	Within 1-Mile Construction Corridor	Within 5-Mile Geographic Area of Influence	General Milepost Location
Burrowing owl	—	2	0-10
Ferruginous hawk	—	2	0-10
Golden eagle	—	1	0-10
	1	—	10-20
Prairie falcon	—	1	0-10
	—	1	70-80
Red-tailed hawk	—	1	0-10
Red-tailed hawk or Golden eagle	—	1	0-10
Prairie falcon	—	1	70-80

Sources: Ramakka (1981a), Bio/West, Inc. (1982).

Note: At BLM's request, specific locations are not given.

Coyote. Coyotes are found throughout the area of T3.

Prairie Dog. Several prairie dog towns are located in T22N, R12W, Sections 5 and 8 (MP 0-10).

Game Birds. Mourning doves and scaled quail are distributed throughout grassland and pinyon-juniper vegetation types (PNM 1980). A detailed discussion is provided above.

Waterfowl. Since there are no permanent streams that would be traversed by T3, waterfowl habitat is limited. Waterfowl use of small tanks and reservoirs would be similar to that described for T2.

Raptors. Data on raptor nests located in or near T3 are presented in Table 3-9. Several species are known to occur in the area and would be expected to use the area for foraging (PNM 1980).

Aquatic Species. Aquatic species are discussed above.

Alternative Route T4.

Unique and/or Highly Valued Wildlife.

Elk. Elk inhabit in the area of T4 from approximately MP 64 to MP 96 (NMGF 1978). Summer range and key winter habitat are present in this area. Mesa Chivato is considered permanent habitat, as it is used primarily as summer range, but occasionally it may be used as winter range during mild winters. San Mateo and La Jara Mesa are considered crucial winter habitat for the elk.

The San Mateo herd is estimated at several hundred animals, while the Mesa Chivato herd is estimated at 15 to 20 animals.

Transmission route T4 would traverse approximately 12 miles of crucial winter habitat, reported between MP 65-75 and MP 93-95 (Maps 3-3 and 3-4).

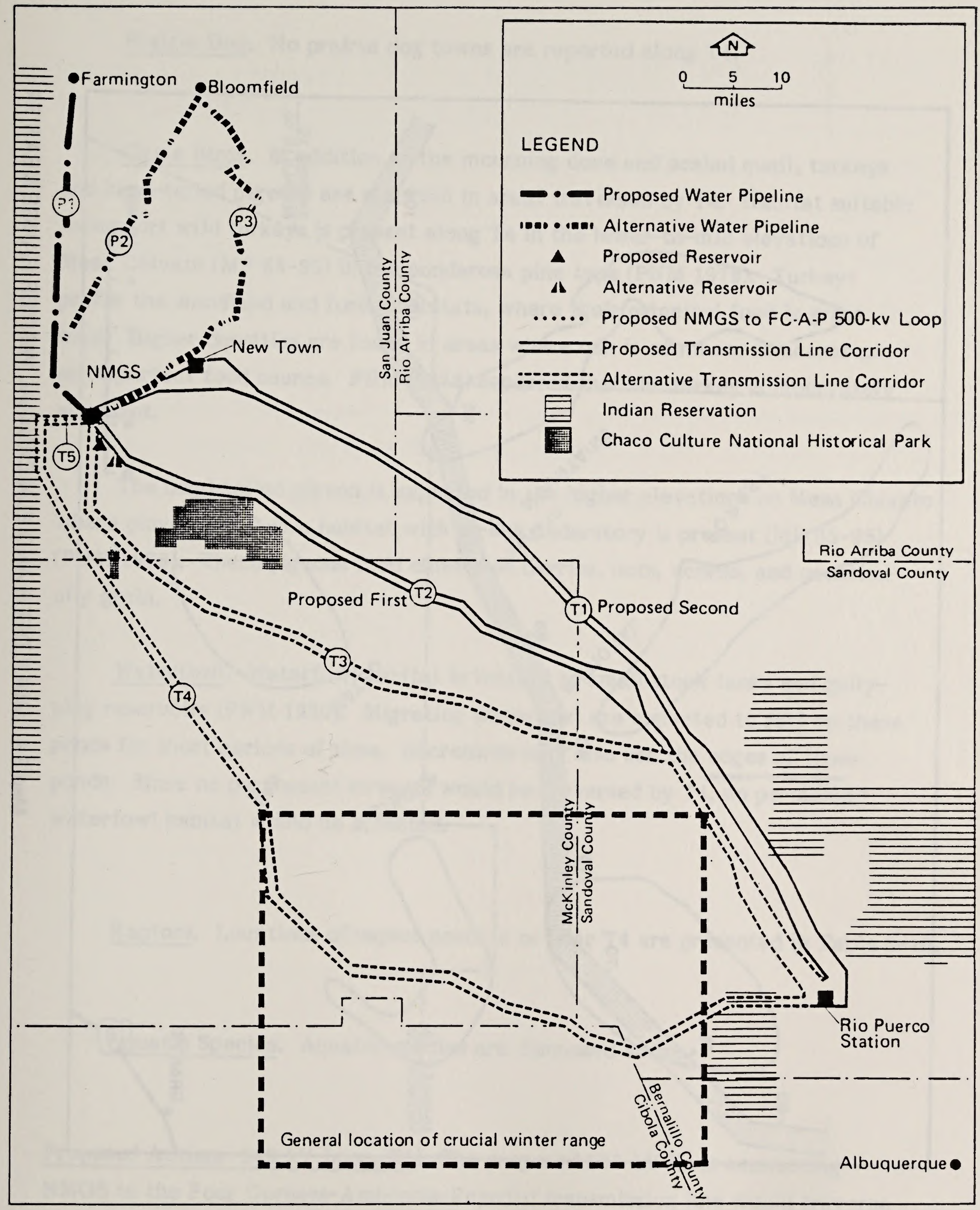
Pronghorn Antelope. T4 would traverse the same antelope range as T2 and T3 (MP 0-45, MP 115 to Rio Puerco Station). A detailed discussion of the pronghorn antelope is given above.

Mule Deer. Mule deer are the most abundant large mammals in the area and are distributed throughout approximately 75 percent of the area traversed by T4 (MP 40 to Rio Puerco Station). Populations in the area near the San Mateo Mountains range from 1 deer per square mile in the grasslands to 18 per square mile in the crucial winter habitat (NMGF 1976).

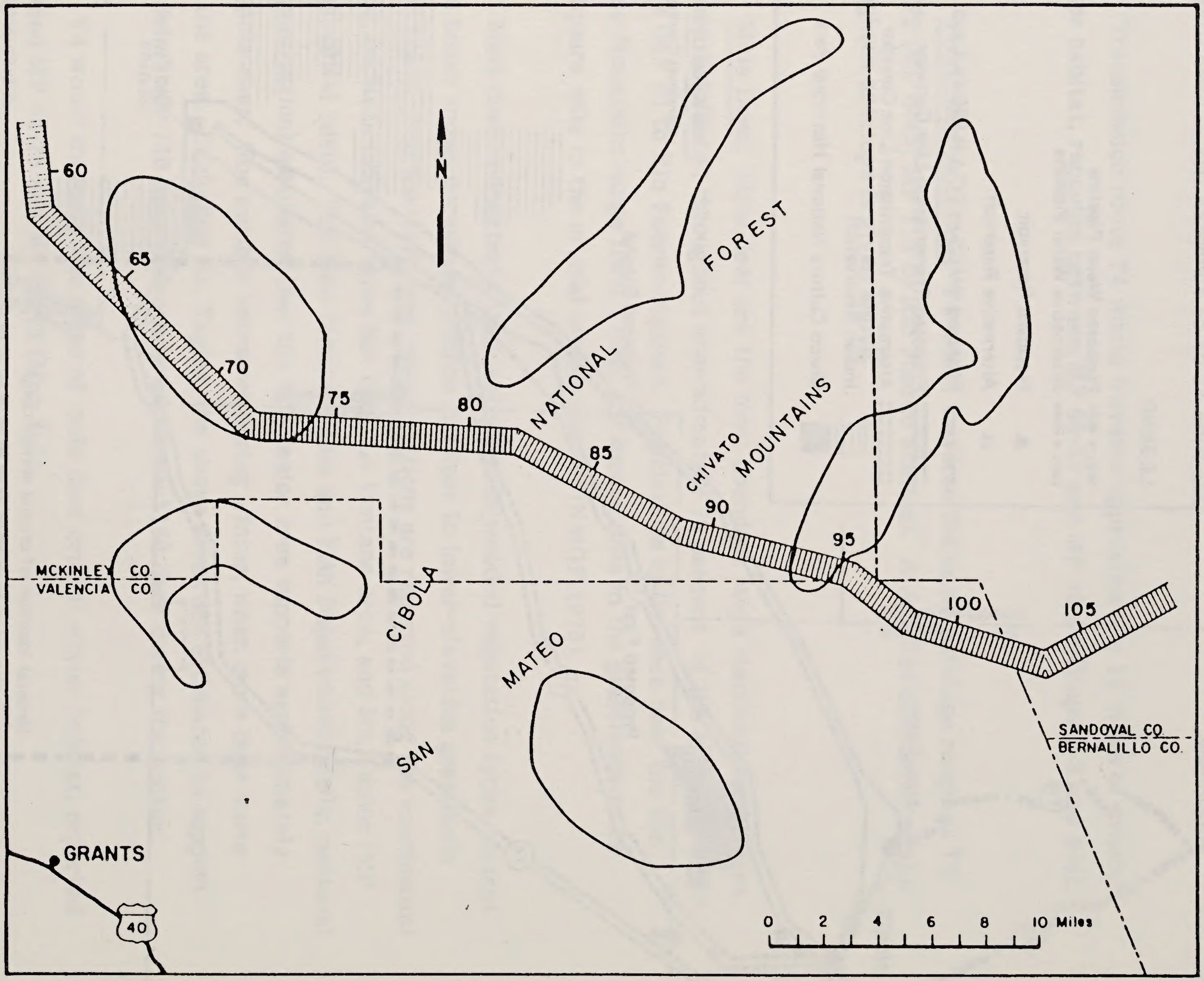
Mule deer concentrate their activities in wooded vegetation types, except when heavy snows occasionally force the deer to lower-elevation grasslands (PNM 1980). The heaviest deer concentrations are reported along the continental divide, on Mesa Chivato, Mesa San Luis, La Ventana area, and Mt. Taylor (MP 65-95) (PNM 1980). The New Mexico Game and Fish Department (Kelly, personal communication) estimates that the Mt. Taylor area supports approximately 500 mule deer. The number increases during winter, when more deer move into the area. Excluding Mt. Taylor, the above areas are estimated to support approximately 750 deer year-round and some 1160 deer during the winter.

T4 would traverse two areas of mule deer crucial winter habitat, reported between MP 65-75 and MP 93-95 (Map 3-3).

Coyote. Coyotes are found throughout the area of T4.



Map 3-3. GENERAL LOCATION OF CRUCIAL WINTER RANGE FOR MULE DEER AND ELK (see Map 3-4 for specific location details)



Map 3-4. MULE DEER AND ELK CRUCIAL WINTER RANGE NEAR T4

Prairie Dog. No prairie dog towns are reported along T4.

Game Birds. In addition to the mourning dove and scaled quail, turkeys and band-tailed pigeons are reported in areas traversed by T4. Habitat suitable to support wild turkeys is present along T4 in the lower-to-mid elevations of Mesa Chivato (MP 65-95) in the ponderosa pine type (PNM 1978). Turkeys prefer the woodland and forest habitats, where their principal food is grass seed. Higher densities are found in areas where oak is common, as acorns are an important food source. PNM (1978) reported that the turkey is moderately abundant.

The band-tailed pigeon is expected in the higher elevations on Mesa Chivato where pinyon-ponderosa habitat with an oak understory is present (MP 65-95) (PNM 1978). These pigeons feed chiefly on berries, nuts, acorns, and occasionally grain.

Waterfowl. Waterfowl habitat is limited to small stock tanks and gully-plug reservoirs (PNM 1980). Migrating waterfowl are expected to rest on these ponds for short periods of time. Shorebirds may also use the edges of these ponds. Since no permanent streams would be traversed by T4, no permanent waterfowl habitat would be affected.

Raptors. Locations of raptor nests in or near T4 are presented in Table 3-10.

Aquatic Species. Aquatic species are discussed above.

Proposed Action: 500-kV Loop, T5. The proposed 500-kV lines connecting NMGS to the Four Corners-Ambrosia-Pajarito transmission line would traverse the same type of habitat as that described for the proposed NMGS plant site (Section 3.3.1). Raptor nests and roosts within 5 miles of the T5 corridor are listed in Table 3-11.

Table 3-10. NUMBER OF RAPTOR NESTS ALONG T4

Species	Within 1-Mile Construction Corridor	Within 5-Mile Geographic Area of Influence	General Milepost Location
Prairie falcon	—	1	0-10
Red-tailed hawk	1	1	0-10
Ferruginous hawk	—	1	0-10

Sources: Ramakka (1981a), Bio/West, Inc. (1982).

Note: At BLM's request, specific locations are not given.

Table 3-11. NUMBER OF RAPTOR NESTS WITHIN 5 MILES OF T5

Species	No. of Nests	Milepost
Prairie falcon	1	0-5
Red-tailed hawk	1	0-5
Ferruginous hawk	1	0-5
Burrowing owl	1	0-5

Sources: Ramakka (1981a), Bio/West, Inc. (1982).

Note: At BLM's request, specific locations are not given.

Proposed Action: NMGS Switching Station. Approximately 40.4 acres of wildlife habitat would be occupied by the proposed switching station. This habitat is similar to that reported for the proposed plant site (Section 3.3.1) and contains no crucial wildlife habitat or sensitive species.

Proposed Action: Rio Puerco Station. The Rio Puerco Station would be located on 109.2 acres, with 45.7 acres completely enclosed by an 8-foot chain-link fence topped by barbed wire. This area is biologically similar to that reported on the southern portions of the transmission lines and has been discussed in these sections.

3.4. SPECIAL STATUS SPECIES

Four species that occur, or have occurred historically, in the geographic area of influence have been identified as species with special status by various management agencies. Rationale resulting in special status classification is detailed below:

- Mink (State of New Mexico - Group II - Endangered)
  Species whose prospects of survival or recruitment within the state may become in jeopardy in the foreseeable future

- Roundtail chub (State of New Mexico - Group I - Endangered)
  Species whose prospects of survival or recruitment in the state are in jeopardy

- Peregrine falcon (State of New Mexico - Group I - Endangered)

- Mountain plover (Bureau of Land Management)
  Species of high interest

Other species that are afforded legal protection by the U.S. Fish and Wildlife Service are discussed in the Threatened and Endangered Species Technical Report.

3.4.1 Mink

The mink, a state-listed Group II endangered species, has been reported in the river valley in the past (Findley et al. 1975; Hubbard et al. 1979), but the current population status of this species is unknown (USFWS 1981). The mink has not been seen in the area of the proposed and alternative intakes for nearly 50 years (Schmitt 1981; Findley et al. 1975; Hubbard et al. 1979). In New Mexico the mink tends to stay away from areas when humans are present (Schmitt 1981). Both the Farmington and Bloomfield intake sites are located in areas where humans live and/or visit. The probability of observing a mink in the area of project components is considered low.

3.4.2 Roundtail Chub

The roundtail chub (Gila robusta robusta) is listed as endangered (Group I) by the New Mexico Department of Game and Fish (Hubbard et al. 1979). Generally, this subspecies of roundtail chub is found in the upper Colorado River drainage (Minckley 1973). In New Mexico, this species is known only from the San Juan drainage in San Juan County and from the Navajo Reservoir in Rio Arriba County (Hubbard et al. 1979).

The abundance and distribution of the roundtail chub has been reduced because of environmental modifications and from competition with non-native fishes. The U.S. Fish and Wildlife Service (1977) reported that the "roundtail chub is presently common in the warm intermediate-zone streams of the Colorado River basin except for the main San Juan and its tributaries below Navajo Dam."

Although roundtail chubs generally favor pools and eddies, adults have been collected in a variety of habitat types, including riffles and backwaters (Vanicek, Kramer, and Franklin 1970). Spawning appears to occur at water temperatures of 65°F, but no observations of actual spawning have been made and exact spawning locations have not been found (Vanicek, Kramer, and Franklin 1970).

Prior to rotenone poisoning in 1961, the roundtail chub was among the most abundant species in the San Juan River (Olson 1962). After impoundment in 1962, the relative abundance changed and the roundtail chub disappeared from a large section of the river. According to Hatch (1981), the roundtail chub is now found in the San Juan River below Farmington. The stretch between Farmington and the Navajo Dam presently supports a combination of coldwater (rainbow and brown trout) and warmwater species (channel catfish).

3.4.3 Peregrine Falcon

The peregrine falcon (Falco peregrinus anatum), a state-listed endangered species (Group I) breeds on cliffs that are typically high, relatively near water, and overlooking large expanses (Hubbard et al. 1979). It is found throughout the state during migration and winter. Hubbard (1970) reported that the peregrine falcon is a breeding resident of San Juan and Rio Arriba counties. Its prey includes a wide variety of birds, especially shorebirds, marsh-inhabiting passerines, swallows, and swifts.

3.4.4 Mountain Plover

The mountain plover (Charadrus montanus) is considered a sensitive wildlife species by the Bureau of Land Management (Ramakka 1981a). This species is not a federally listed endangered or threatened species (Federal Register 45:33768-33781) or a New Mexico state-listed endangered species (NMGF 1979). The mountain plover has not ever been placed on the Blue List (Tate 1981).

Johnsgard (1981) and Graul and Webster (1976) reported that the status of this species is deteriorating, and there is no doubt that within historical times the range has contracted. Some of the reasons for the mountain plover's decline were cited as market huntings (early 1900s), and cultivation and dairying activities that have reduced its breeding range (Graul and Webster 1976).

Graul and Webster (1976) reported that in Colorado the mountain plover tended to nest on blue-grama-buffalo grass flats, although Tolle (1976) reported that in New Mexico the mountain plover nested in "the basin sagebrush biociation." A New Mexico nest was reported from an area with flat to slightly rolling terrain, with sparse, overgrazed, shrubby vegetation interspersed with bare areas (Tolle 1976).

No critical habitat for the mountain plover exists in the area of influence defined for NMGS project components.

3.4.3 Peregrine Falcon

The peregrine falcon (*Falco peregrinus anatum*), a state-listed endangered species (Group 1) [illegible] on cliffs that are typically high, [illegible] near water, and overlooking large expanses (Hubbard et al. 1979). It is found throughout the state during migration and winter. Hubbard (1970) reported that the peregrine falcon is a breeding resident of San Juan and Rio Arriba counties. Its prey includes a wide variety of birds, especially shorebirds, marsh-inhabiting passerines, swallows, and swifts.

3.4.4 Mountain Plover

The mountain plover (*Charadrius montanus*) is considered a sensitive wildlife species by the Bureau of Land Management (Sandoval 1981a). This species is not a federally listed endangered or threatened species (*Federal Register* [illegible]) or a New Mexico state-listed endangered species (NMDGF [illegible]). The mountain plover has not ever been placed on the Blue List (Tate 1981).

[illegible] (1981) and Graul and Webster (1976) reported that the status of this species is [illegible], and there is evidence that within historical times the range has [illegible]. Some of the reasons for the mountain plover's

4.0
ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

Projected impacts to wildlife resulting from the proposed NMGS project components are discussed in two general categories:

- "Direct effects, which are caused by the action and occur at the same time and place
- "Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems." (NEPA, Chapter V-CEQ, Section 1508.8)

Some effects are clearly assignable to one of these categories—crushing of a rodent by a trenching machine is a direct effect, while deterioration of a fishery in a distant lake after five years of acid rain is certainly an indirect effect. Other consequences may not be as easily categorized. Increased poaching would occur during construction periods (direct effect), but would also occur in the future and in areas away from the proposed project as a result of the increased human population (indirect effect).

Projection of such impacts is accomplished with demographic change information (Social and Economic Conditions Technical Report). This information assumes population changes including families of workers and individuals in the service industries that accompany the families. For these reasons such effects are largely indirect and are discussed under "Indirect Effects," recognizing that a portion of these consequences could be considered under "Direct Effects."

A complete description of the indicators of impact significance criteria is presented in Section 2.0.

4.2 GENERAL CONSEQUENCES (IMPACT OVERVIEW)

4.2.1 Direct Effects

Direct effects on animals include loss of wildlife populations as the result of construction or operation of the proposed project components, or by destruction of habitat crucial to the animals' survival.

Unique and/or Highly Valued Wildlife. Potential direct effects to unique and/or highly valued wildlife are discussed under each project component.

Other Wildlife.

Small and Medium-Sized Mammals. Any construction activity that results in land surface disturbance and/or vegetation removal would probably kill most of the small burrowing mammals within the area disturbed. Individuals that are not destroyed but are displaced may be lost to predation, stress, or failure to establish new territories. The high reproductive potential of small mammals and their ability to reinvade disturbed habitat indicate that repopulation of the reclaimed areas would be rapid. Successful revegetation on disturbed lands could result in a different species composition of small mammals due to specific habitat affinities.

Many species would reinvade disturbed areas soon after completion of the project and successful revegetation. The time required for reinvasion of disturbed areas is basically a function of the recovery of the habitat to meet species requirements. Herbivorous mammals would be the first to reinvade, followed by carnivores. At permanent facilities, losses of small mammals would be locally appreciable for the life of the project but would not represent regionally significant impacts.

An estimation of the numbers of animals removed would be tenuous at best. Olding and Cockrum (1977) used intensive removal as a measuring technique, which coincidentally models the action of construction. Their discussion of the many assumptions and large sample area necessary to accomplish estimations indicate the variability, lack of precision, and difficulties in extrapolating from other data. Given these restrictions, and because no significant impacts are expected, estimates of small mammals lost to construction were not projected.

Nongame Birds. The loss of habitat along linear corridors or permanent facilities such as the plant site would have only a temporary adverse impact on most nongame birds foraging in proposed ROWs or on the NMGS site. The area involved would probably constitute only a small proportion of the total area in which they normally forage. There may be a local impact on birds living or breeding at permanent facilities or adjoining areas, but the effect is not expected to be regionally significant.

Nesting sites within the proposed ROWs or at permanent facilities would be destroyed. Consequently, some eggs or young birds may be lost or abandoned. This impact is considered to be localized, short-term, and not significant in terms of regional populations.

Reptiles and Amphibians. Some reptiles and amphibians would escape from the path of construction equipment. Others may be killed or injured, particularly species that may have retreated to dens or nests. The loss of these individuals would have an immediate effect on local populations but would not have significant impacts on regional populations. Where all shrub growth is removed from grassland habitat, reptiles may not readily reoccupy the area because of the lack of shelter from the sun.

Aquatic Species. Potential direct effects to aquatic species are discussed by project component.

4.2.2 Indirect Effects

Indirect effects include the inability of displaced individuals to survive in other habitats increased hunting and fishing pressure, poaching, and effects resulting from increased human activity, such as noise, dust, road kills, or simple human presence in areas formerly isolated.

Unique and/or Highly Valued Wildlife.

Elk. Elk are present only on the T4 transmission route and are discussed in Section 4.5.4.

Pronghorn Antelope. In general, project activities would not result in displacement of pronghorn antelope, since they exist in low numbers and occupy large ranges. Pronghorn hunting is not permitted at present, so no increased hunting pressure can be projected. New Mexico's annual loss in deer and antelope to poaching is estimated at $4 million (NMGF 1981). In view of the lack of better projection data, increased poaching would probably be related to increased human population and easier access to animals. Human population increases are presented in Table 4-1 (see mitigation measure number 9). Population projections are given in the Social and Economic Conditions Technical Report.

Noise and dust would not be major impacts to pronghorn antelope, because their low numbers and large range would allow avoidance of areas where disturbances would occur.

An increase in road kills of pronghorn antelope is projected in areas where increased traffic volume and pronghorn habitat have been identified. (See the Transportation Networks Technical Report.) The magnitude of this impact

Table 4-1. PROJECTED INCREASED MULE DEER HUNTING DEMAND AND SUCCESS DUE TO NMGS PROJECT COMPONENTS

Year	Human Population Increase Due to NMGS	Increased Number of Hunting Days for Mule Deer[a]	Projected Increased Number of Mule Deer Harvested[b]
1985	100	40.2	2.0
1986	750	301.5	14.8
1987	2350	944.7	46.3
1988	2250	904.5	44.3
1989	1700	683.4	33.5
1990	2450	984.9	48.3
1991	2800	1125.6	55.2
1992	3100	1246.2	61.1
1993	2900	1165.8	57.1
1994	2700	1085.4	53.2
1995	3400	1366.8	67.0
1996	3150	1266.3	62.1
1997	2400	964.8	47.3
1998	2400	964.8	47.3
1999	2450	984.9	48.3
2000	2450	984.9	48.3

Source: Adcock and Associates, Inc. (1982).

[a]Population increase x 0.402 (Nonurban Recreation Technical Report).

[b]The projected number of deer harvested is based upon an estimated average of 20.4 hunting days required to take 1 deer: Harvey (1982).

would be low due to the low numbers of antelope present where the largest increases in traffic are expected. (See mitigation measure number 10.)

Mule Deer. Displacement of deer from crucial winter range is discussed by project component.

The potential for increased hunting pressure and harvest of mule deer is projected using data from the Social and Economic Conditions Technical Report and from the Nonurban Recreation Technical Report (Table 4-1). These numbers have been generated with the assumption that hunting will continue under present parameters. The possibilities are that some hunting areas may be by permit only, rather than the present open-area concept.

Often a radius from each human population center is used as the potential area to be used by the hunter population, but the variability in quality and the dispersed nature of big game habitat in northwestern New Mexico affects the validity of such an approach. In such areas, people will travel much greater distances to better hunting areas. As a result, the increases in hunting pressure are not projected for a specific area or for specific deer herd units. It is expected that most of the increased hunting pressure would occur in those areas with historical records of high hunting success.

Poaching of deer is considered a major problem in New Mexico, with annual statewide losses estimated at 34,000 animals (NMGF 1981). With increases in population due to NMGS, increases in poaching would be expected. Increases in road kills of mule deer would also be expected. Both of these impacts would be related to population increases (Table 4-1). The magnitude of these impacts would be greatest in areas supporting the largest densities of mule deer. For mitigation of mule deer poaching and road kills, see mitigation measures 9 and 10.

The town of Farmington is within an area identified as crucial winter range for mule deer (Maps 3-1 and 3-2). Increased human populations with the concomitant increased housing demand would reduce the amount of habitat available to mule deer within the crucial area.

Coyote. The adaptability of the coyote has allowed the species to expand its range and increase its numbers in spite of increases in human activities. Coyotes are hunted for their fur, and projected increases in human populations would probably cause increased hunting of the coyote. In addition, road kills due to increased human populations would also increase. Neither factor is likely to significantly affect regional populations.

Prairie Dogs. Prairie dogs are located only along transmission corridors T2 and T3; they are discussed in Section 4.5.1.

Scaled Quail. Increases in hunting pressure on the scaled quail would result from NMGS-induced population increases. The magnitude of this impact is not quantifiable. However, it is expected that increased hunting pressure would not cause large-magnitude impacts if high-quality regional habitat remains available for scaled quail. Recent studies have indicated that quality habitat is an overriding factor in scaled quail success and that populations are capable of recovery with habitat improvements, irrespective of hunting (Menedy et al. 1979; Campbell et al. 1973).

Mourning Dove. Indirect impacts to the mourning dove would result from increased hunting pressure, and possible loss of habitat due to housing developments for increased population numbers. Management strategies such as decreased take and a shortened season are available if these impacts become significant.

Waterfowl. Within the area of influence for project components, waterfowl are hunted primarily in San Juan and Rio Arriba counties. Between 1973 and 1978 in Rio Arriba County, 158-272 hunters harvested 155-460 waterfowl

(USDOI 1980). During this period, 707-920 hunters harvested 3380-7684 waterfowl in San Juan County. Waterfowl hunting pressure is greatest along the first 8 river miles, south of Navajo Dam (Ramakka 1982) because of good public access and quality waterfowl habitat (marshes). A lack of marsh habitat limits waterfowl densities in the area of the proposed intakes (P1, P2, P3). The potential for increased hunting pressure and harvest of waterfowl would be greatest along the stretch of river immediately below Navajo Dam. The increase in hunting days due to population increases from NMGS could be appreciable. The increase in waterfowl harvest has not been quantified, but it would be in proportion to increased hunting pressure.

Raptors. Indirect effects to raptors would result from the presence of increased numbers of people. An increase in the number of people with firearms in the geographic areas of indirect influence would result in an increase of raptors being shot at. In addition, heavier traffic volume would result in more road kills, and some raptors feeding on these may also be struck. Road kills are a food source, however, and a percentage of the displaced small mammals and birds considered lost to the region's population by construction activities would become prey to raptors and other predators.

Increased access and the presence of humans in areas formerly isolated may be the most important indirect effects to raptors (Meneely et al. 1979). Fyfe and Olendorff (1976) list the following potential impacts that could result when nesting raptors and other "sensitive" bird species are disturbed:

1. The parent birds may desert the eggs or young completely.
2. Incidence of egg breakage or trampling of young by parent birds may be increased, as may be the chance of cooling, overheating, loss of humidity, and avian predation of eggs.
3. Newly hatched birds may be chilled or overheated, and may die in absence of brooding.
4. Older nestlings may leave the nest prematurely, damaging growing feathers and/or breaking bones, or may be forced to spend time on the ground where they may be vulnerable to predation.

5. Mammalian predators may follow human scent trails directly to eggs or young.
6. The attention of other people may be attracted by the visitors' activities.
7. Mishandling a nestling may injure the bird.
8. On cliffs, visitors may inadvertently knock rocks or other debris onto eggs or young.

Aquatic Species. Increased fishing pressure and harvests are projected in Table 4-2. These numbers have been generated with the assumption that present success rates will be maintained. It is likely that fishing success would decrease. With a decline in the number of catchable fish, more fishing days would be needed to catch the same number of fish.

As with mule deer hunting, the traditional considerations that a fisherman's radius is 60 or 100 miles from his home does not hold in northwestern New Mexico. The lack of plentiful fishing areas causes fishermen to travel greater distances.

Human population increases could add a meaningful demand on the fishery of the Navajo Reservoir, which is already experiencing rapid increases in participation rates (Nonurban Recreation Technical Report).

Additionally, the stretch of the San Juan River immediately below the Navajo Dam is considered to have the best trout fishing in the state. Because flows are expected to be maintained in the future (see the Hydrology Technical Report), it would become even more heavily exploited. The area is currently stocked; future increases in stocking may be necessary to maintain a fishery, but the quality of the fishery would probably decline.

Acid Rain. The term "acid rain" is generally understood to describe precipitation that has a pH lower than 5.6 (the approximate pH of distilled water equilibrated with atmospheric concentrations of CO_2) (Haines 1981). No quantitative techniques are currently available with which to project acid rain forma-

Table 4-2. PROJECTED INCREASED FISHING DEMAND AND HARVEST DUE TO THE NMGS PROJECT

Year	Human Population Increase Due to NMGS	Increased Number of Fishing Days[a]	Projected Increased Fish Harvest[b]
1985	100	221.0	663
1986	750	1657.5	4972
1987	2350	5193.5	15,580
1988	2250	4972.5	14,917
1989	1700	3757.0	11,271
1990	2450	5414.5	16,243
1991	2800	6188.0	18,564
1992	3100	6851.0	20,553
1993	2900	6409.0	19,227
1994	2700	5967.0	17,901
1995	3400	7514.0	22,542
1996	3150	6961.5	20,884
1997	2400	5304.0	15,912
1998	2400	5304.0	15,919
1999	2450	5414.5	16,243
2000	2450	5414.5	16,243

[a]Human population x 2.21 (Nonurban Recreation Technical Report).

[b]Based on harvest of 3 fish per day (McNall 1981).

tion and effects due to a particular source (Haines 1981; CAB 1981; EPA 1980). Within the San Juan Basin, any acid rain that is formed due to NMGS or other sources would probably be neutralized because of the high alkaline content of soils in this region. Further, since rainfall is low in this area, the occurrence of such rain would be very infrequent.

Acid rain formation appears to be a long-range transport phenomenon. At present, no information exists that would allow for projections of acid levels linked to a specific source, such as NMGS. However, the potential exists that NMGS may contribute to acid rain problems in high mountain lakes in areas outside the San Juan Basin, such as Colorado and northern New Mexico (see the Air Quality Technical Report).

Little background information exists for projecting potential impacts to southwestern aquatic biota from acid rain. The Southwest does not have the heavily industrialized regions that have apparently been the source of the acid precipitation in eastern North America and Scandinavia. Most biological studies on acid rain effects have been done in these areas. Soils in the area of NMGS are alkaline. Erosion causes high turbidity in local streams and rivers, which may increase the buffering capacity of the water.

Haines (1981) has synthesized the literature on acid rain and its consequences to aquatic systems. The studies reviewed in his work were generally conducted in areas subject to heavy industrial sources and are not directly comparable with the American Southwest. With this background, the following abstract from Haines (1981) is a good summary of potential effects:

> Precipitation in Europe and eastern North America has become acidic, a result of increases in sulfuric and nitric acid aerosols produced by fossil-fuel combustion, metal-smelting, and industrial processes. The increased use of tall smoke stacks and particle removers has increased long-range transport of acidic gases. Some metals and organic compounds also are transported atmospherically and deposited in acidic precipitation. In regions where the acid-neutralizing capacity of soils and water is low, the pH of lakes and streams has decreased and concentrations of metals have increased. Aquatic organisms have been affected in all trophic levels (decomposers, primary producers, primary and secondary consumers); abundance, production, and growth have been reduced and sensitive species have been lost. Fish have suffered acute mortality, reduced

> growth, skeletal deformities, and especially reproductive failure. Valuable commercial and recreational fisheries have been lost in certain areas and such losses will become more widespread if acidic precipitation continues. Remedial or mitigative actions directed toward the problem include hatchery production of acid-tolerant fish and chemical neutralization of selected lakes and streams. The ultimate solution is reduction of the sources of atmospheric acid.

Other Indirect Effects. Indirect effects specific to each project component are discussed individually by component.

4.3 PROPOSED NMGS PLANT SITE

The proposed NMGS would remove approximately 2400 acres of wildlife habitat for the life of the project. Approximately 1 percent of the regional wildlife population (within a 10-mile radius of the plant) would be affected. No crucial or sensitive species or habitat is present in the area. The main wildlife species affected would be small mammals, birds, and reptiles.

4.3.1 Direct Effects

Unique and/or Highly Valued Wildlife.

Big Game. No elk, deer, or pronghorn antelope use habitat on the proposed plant site.

Coyote. The regional coyote population would not be affected by the plant site.

Prairie Dog. There are no prairie dog towns on the plant site.

Scaled Quail. A small number of scaled quail may be displaced, but it would not affect the regional population.

Waterfowl. No waterfowl use the plant site.

Raptors. No raptor nests would be directly affected by construction or operation of NMGS, although within the 5-mile area of influence there is a reported long-eared owl roost. Indirect impacts to raptors are discussed in Section 4.2.2.

Other Wildlife. Impacts to small mammals, nongame birds, reptiles, and amphibians are discussed in Section 4.2.1.

Aquatic Species. The only aquatic habitat at the proposed plant site consists of stock ponds and ephemeral drainages that traverse the site. No other aquatic habitat is known within the area of influence. None of these aquatic habitats support a fishery. Construction activities as well as project operation and maintenance would not have any significant impacts on the regional aquatic habitat.

4.4 WATER SUPPLY SYSTEM

4.4.1 Proposed Action: Intake and Water Pipelines P1

The intake and water pipeline P1 would disturb approximately 434 acres of wildlife habitat. Direct and indirect effects are discussed below.

Direct Effects.

Unique and/or Highly Valued Species.

Elk and Pronghorn Antelope. Impacts to elk and pronghorn antelopes are not anticipated.

Mule Deer. Approximately 30 acres of mule deer crucial winter range would be disturbed by construction of water pipeline P1 (MP 0-2.75). Less than 1 percent of the regional (defined by a 20-mile corridor) crucial winter range would be affected (Table 4-3); thus the direct removal of mule deer habitat would not be considered significant.

In addition to habitat removal, direct impacts to mule deer populations would result if construction activities were scheduled for the period when crucial winter range is being used. Impacts would include displacement of deer, harrassment, road kills, and poaching. Appropriate mitigation would reduce or eliminate these impacts (see mitigation measure 1).

A second pipeline is planned within the same ROW as that for the first pipeline, from the first intermediate pump station (approximately MP 0.8) to the reservoir near NMGS. Approximately 2 miles of this route would cross mule deer crucial winter range, but in an area already disturbed. The additional disturbance of this second pipeline could be minimized by mitigation measure 5.

Coyote. No significant impacts to the regional coyote population are anticipated.

Prairie Dogs. There are no known prairie dog towns along P1.

Game Birds. No significant direct impacts to scaled quail or mourning dove are anticipated.

Waterfowl. Some waterfowl habitat would be affected by construction of the proposed intake. Because waterfowl populations have increased in the past few years along the San Juan River, and since vegetation should return to normal within a few years after construction, there should be no significant impacts to the regional population levels of waterfowl (within the 20-mile corridor). Construction of the water supply system is not expected to result in any long-term, significant impacts to waterfowl. Releases of water from Navajo Dam for intake by NMGS would make a small contribution to the maintenance of aquatic and wetland habitat in the river between the dam and the intake during periods of low flow. (See the Hydrology Technical Report for projected flow rates.)

Table 4-3. CRUCIAL WILDLIFE HABITAT DISTURBANCE EXPECTED TO RESULT FROM THE PROPOSED PROJECT COMPONENTS AND ALTERNATIVES

Component	Crucial Wildlife Use Areas	Milepost	Estimated Acreage In Region[a]	Estimated Acreage Disturbed by Component[b]	Percent Disturbed
NMGS Plant Site	None	----	----	----	----
Transmission Line Alternatives					
T1	None	----	----	----	----
T2	None	----	----	----	----
T3	None	----	----	----	----
T4	Deer and Elk Crucial Winter Range	65-75	34,099	242.4	$<$1.0%
		93-95	19,149	48.5	$<$1.0%
Pipeline Route Alternatives					
P1	Deer Crucial Winter Range	0-2.75	15,155	30.0	$<$1.0%
P2	Deer Crucial Winter Range	0-1.0	7,885	10.9	$<$1.0%
P3	Deer Crucial Winter Range	0-1.0	7,885	10.9	$<$1.0%
Reservoir Alternatives					
R1	None	----	----	----	----
R2	None	----	----	----	----

[a]Regional basis for comparison equals a 20-mile corridor for transmission lines and water pipelines. Acreage in the region is based on the available habitat, assuming implementation of Baseline 1 projects. Baseline 2 projects did not affect this analysis.

[b]Acreage disturbed is based on a 90-foot right-of-way for water pipelines and a 200-foot right-of-way for transmission lines.

Raptors. No reported raptor nests would be affected by the P1 route.

Other Wildlife. Approximately 434 acres of habitat for small nongame mammals, nongame birds, reptiles, and amphibians would be removed by the Proposed Action. A discussion of impacts for these species is presented in Section 4.2.1.

The potential exists for a water pipeline rupture. This could cause localized flooding, and some small burrowing animals could drown. It is not anticipated that any significant impacts to wildlife would result from a localized spill.

Aquatic Species. The proposed water pipeline P1 would not traverse any permanent waters. The only perennial waters that would be affected by the proposed water supply system would be the San Juan River, where the intake would be located. Potential impacts associated with the construction of the proposed intake include disturbance and/or elimination of habitat, and siltation.

Construction of the intake would eliminate a certain amount of natural substrate that would be replaced by the intake structure. This elimination of habitat would result in a decrease in macroinvertebrate and fish productivity. The approximate fish food quantity, in the form of benthic invertebrates, expected to occupy 1 square yard of substrate would weigh no more than 0.50 (dry weight) ounce (calculated from various benthic studies by Neves 1979; Bane and Lind 1978; Andrews and Minshall 1979). While an estimation, this figure is selected as the higher end of any range of values. If a fish is assumed to be 15 percent efficient in converting its food to flesh (also an estimate on the higher side of any range of values), then approximately 0.08 (dry weight) ounce of fish flesh would be lost for every square yard of substrate covered. Regionally, the impact would not be considered significant because less than 1 percent of the area would be affected. In addition to this, some colonization of the structures by macroinvertebrates (e.g., dipteran midges) would be expected. The habitat would not so much be removed as replaced by hard substrate habitat, which can be colonized, although probably by a different assemblage of species.

Although quantification of the total area affected by construction cannot be determined, it can be estimated that approximately 50 feet upstream could sustain some disturbance. Sediment is expected to be carried downstream from the intake structure due to increased stream turbidity from construction activities. Extensive literature is available regarding the biological effects of increased turbidity, and it has been generally demonstrated that stream productivity is adversely affected throughout all trophic levels (e.g., Karr and Schlosser 1978; Stern and Stickle 1978; Cordone and Kelly 1961). While it has been reported that high levels of suspended solids can have severe physical effects on fish under laboratory conditions (Herbert and Merkens 1961; Herbert and Richards 1963; Horkel and Pearson 1966), it has been shown that under natural conditions fish do not remain in areas of high turbidity (Herbert et al. 1961; Peters 1967; Burnside 1967; Gammon 1970). Additionally, western streams are characteristically turbid for at least part of the year and native fish species have adapted to such conditions. It is anticipated that adult and juvenile fishes would move away from areas of turbidity and the direct effects of turbidity would be insignificant.

A reduction in reproductive success could result from construction activities. Suspended sediments can disrupt reproduction by covering spawning grounds (Karr and Schlosser 1978), by preventing the removal of metabolic wastes from the substrate, and by preventing the entrance of oxygen-rich water into the substrate (Cooper 1965; Sheridan and McNeil 1968; Meehan and Swanston 1977), all of which can result in fish egg and larval mortality as high as 85 percent (Shelton and Pollock 1966). This could occur if construction coincided with the period of major fish spawning activity (March to June). In a worst-case analysis, spawning success could be eliminated during the time of construction. No unique habitat exists in the potentially affected area, and resident species are distributed throughout this section of the San Juan River. Fish spawned upstream and downstream of the area would move into any suitable location, showing lessened numbers, after construction activities cease. Construction at times of year when eggs and larvae are not present would not affect recruitment.

Temporary removal of benthic substrate would probably result in the loss of 0.5 (dry weight) ounce of benthic macroinvertebrates for every square yard of river affected (see discussion above). While the effect of such habitat disturbance could be locally significant, it is anticipated that benthic population recovery and reestablishment in the disturbed area would be complete within a few months of the termination of construction activity. This recovery has been discussed by Hynes (1970) and recently documented by Gore and Johnson (1979).. The phenomenon of behavioral drift, detailed by Waters (1969, 1972), allows rapid recovery after such disturbances. Disturbed benthic habitat and upstream habitat are sufficiently homogeneous to allow potential colonizers in the drift.

The combined effects of macroinvertebrate habitat disturbance and stream siltation are anticipated to be localized and of short-term duration. Recovery of invertebrate populations would be expected within 1 year.

Impingement and Entrainment. Operation of the intake structure could potentially result in impingement and entrainment of organisms. Entrainment is the incorporation of small organisms into the cooling-water system. Impingement is the physical blockage of larger organisms from joining this entrainment through placement of barrier screens. Fish eggs, larvae, and insects would be entrained by the proposed intake. The water would be deposited in the reservoir, prior to using it as cooling water in the power plant, and a certain percentage of these organisms would be expected to survive and reproduce. Intake volume and velocity would ultimately determine the physical limits of the intake's influence. Impingement is also a characteristic of intake operation and involves drawing of larger organisms (e.g., adult and juvenile fishes) against the intake structure, primarily as a result of intake velocity.

Entrainment and impingement impacts have been studied at cooling-water intakes of hundreds of power plants throughout the United States (Schubel and March 1978). In a review article published by Uziel (1980), it was suggested that phytoplankton and zooplankton entrainment impacts were "generally small and unlikely to cause ecosystemwide impacts." In the same review article, it is suggested that even when extensive site-specific data bases are established and ecosystem models developed, fish population impact assessments are tenuous, at best (Uziel 1980).

Although several sportfish species occur in the San Juan River (Appendix 7), these species do not dominate the ichthyofauna near the proposed intakes. At the proposed Farmington intake site, 96 percent of the fish collected were bluehead and flannelmouth suckers, and carp. Eighty-eight percent of the fish sampled by electrofishing near the alternative Bloomfield intake were suckers or carp.

Impingement and entrainment would occur on those species present at the intake. The intake velocities, volumes, and season of withdrawal, considered with the ecology and life histories of the species present, would affect the significance of impacts.

Water Diversion for NMGS Operation The quantity of water that would be diverted from the San Juan River for use at NMGS is discussed in a general sense and for worst-case conditions in the Hydrology Technical Report. The following discussion of potential effects to aquatic resources is based on the information presented in that report.

Water to be used by NMGS would be assigned from existing water contracts. If this water were not used by NMGS, it would be stored in Navajo Reservoir (sale of the water rights by the present holder to a different consumer is beyond the scope of this study). Based upon these considerations, the effect of NMGS on the amount of water in the San Juan River would probably fall into three categories:

- No appreciable effect during times of natural high flows
- An increase in the amount of water up to 48 cfs in the river between Navajo Reservoir and the intake location during times of low flow
- No appreciable decrease in the amount of water in the river downstream of the intake site (Hydrology Technical Report)

Impacts to aquatic resources that are expected as a result of flow in the San Juan River are:

- A potential beneficial impact to the trout fishery between Navajo Dam and the proposed NMGS intake during times of low flow. The 48 cfs of water would not maintain the trout fishery by itself, but could contribute to the minimum required during the critical low flow periods. This same potential would occur in the warm-water fishery downstream of the trout fishery to the intake area.
- No impacts to aquatic resources are expected below the proposed intake, because flow rates to senior water rights holders farther downstream would be unaffected.

Indirect Effects.

Unique and/or Highly Valued Species. Pipeline and reservoir construction would require 115 workers in 1987 and 295 workers in 1988 (Social and Economic Conditions Technical Report). Increased hunting, fishing, poaching, or road kills would be expected over a wide geographic area in proportion to the population increase from these workers (and some families) for that 2-year period when the water pipeline would be (see Section 4.2.2).

Other Wildlife. Beaver and muskrat occur in the San Juan River in the area of the proposed intake. A few animals could be displaced by, or denning sites abandoned because of, construction activities. No significant impact to regional populations is anticipated.

Aquatic Species. By definition, aquatic species are limited to their medium, which makes most impacts direct rather than indirect, and they are discussed in Section 4.4.1. General indirect impacts from projected increased fishing pressure are discussed above.

4.4.2 Alternative Intake and Water Pipeline P2

Pipeline P2 and an alternative intake at Bloomfield would result in disturbance to 469 acres of wildlife habitat. Approximately 1 mile of crucial deer winter habitat would be traversed, resulting in disturbance to about 11 acres (Table 4-3). This represents less than 1 percent of the regional (within a 20-mile corridor) habitat. No impacts to other unique or highly valued species would be expected. Other wildlife species that would be affected by this proposed pipeline are similar to those discussed for P1. Indirect impacts would be similar to those discussed for P1.

4.4.3 Alternative Intake and Water Pipeline P3

The alternative intake at Bloomfield and water pipeline P3 would result in disturbances to approximately 531 acres of wildlife habitat. Other than the difference in the amount of habitat disturbed, all impacts are the same as those discussed for P2. No additional impacts to unique or highly valued species would be expected.

4.4.4. Proposed Action Reservoir, R1

The proposed reservoir site is located in a catchment area that is dry during most of the year. Maintaining a permanent water source would permit a fauna to develop that is dependent on water. Small mammals, birds, and amphibians would probably increase both in density and diversity in the immediate area of the reservoir, but changes in the overall regional population would probably be negligible.

Medium and large mammals would be excluded from the reservoir area, since the construction of a fence is proposed. These animals would be precluded from using a water source that previously was available to them on an intermittent basis. Gully-plug reservoirs are located in the area and would provide water, but with the increased use the other water sources could go dry earlier in the season. Since it is not known how many animals now use the pond, it is assumed that the impact could be locally significant but no significant impacts to the regional populations are anticipated. Potential mitigation for the loss of the existing intermittent water source to wildlife excluded by a fence is proposed as mitigation measure 4.

A potential beneficial impact of the reservoir is the establishment of waterbird habitat otherwise lacking in the immediate area. A similar reservoir, Morgan Lake, is located at the Four Corners Power Plant. Birds sighted at Morgan Lake include the western grebe, double crested cormorant, little blue heron, semi-palmated plover, pectoral sandpiper, sanderling, white-rumped sandpiper, Baird's sandpiper, northern phalarope, and California gull. These species formerly were rarely seen or not reported for this area. Similar avifauna would probably be attracted to the proposed reservoir site (Renwald 1981). Other waterfowl that have traditionally used gully-plug ponds in the area would also be attracted to permanent water in the reservoir.

Some fish eggs or larvae are likely to survive entrainment and be deposited in the reservoir. These could supply a food base to fish-eating waterbirds. If fishes do not become established, introduction of a good forage species could be considered as an enhancement effort.

4.4.5 Alternative Water Reservoir

While the alternative reservoir site may contain some water during periods of rain, it does not have even the remnant of a diked pond, as does the proposed site. As such, no loss of even an intermittent water source would occur if the reservoir were constructed on the alternative site. The site's potential as a water source and as an aquatic habitat is discussed in Section 4.4.4.

4.5 TRANSMISSION SYSTEM

4.5.1 Proposed Action: First 500-kV Line, Route T2

Direct Effects.

Unique and/or Highly Valued Species. Two raptor nests are located near T2: a golden eagle nest and a red-tailed hawk nest (Table 3-7). If the nesting trees are removed, or if construction takes place during breeding or rearing of young, successful rearing may not occur. This would be a locally significant impact but would not be a significant impact to regional populations. Final location of the centerline could alter the magnitude of impacts to nesting raptors. Potential mitigation for disturbances to nest sites is discussed under mitigation measures 3 and 7.

The transmission towers, conductors, and spacing of lines would be designed to preclude the electrocution of raptors, including species with the largest wingspans, such as bald eagles and golden eagles.

Collisions of avifauna with transmission lines are a potential direct impact. The magnitude of this impact cannot be quantified, but several factors that would influence the general level of anticipated impacts are listed below:

- Meyer and Lee (1979) recently completed an analysis of the effects of transmission lines on flight behavior of waterfowl and other birds. They concluded that transmission lines do not act as flight barriers to most birds, although birds typically increased their altitude to cross above the lines. Birds that fly fast and at low altitudes in tight flocks were most vulnerable to collisions. They also reported that transmission lines located perpendicular to low-altitude flyways near water had the highest occurrence of collisions. Small-diameter guywires were the cause of all observed bird collisions with 230-kV and 500-kV transmission lines. The overall bird mortality caused by bird collisions was not considered significant (Meyer and Lee 1979).

- Generally, avifauna collisions are greatest in areas where decreased visibility due to fogging or other localized adverse weather conditions is a regular occurrence. These conditions are not expected along T2.

- Avifauna collisions are also more severe in areas adjacent to raptor concentration areas, waterfowl wintering staging areas, or other areas with avifauna concentrations. No such concentration areas are located in the geographic area of influence defined for T2. Although occasional waterfowl use has been reported in Tanner Lake, the level of use does not qualify the site as a concentration area.

- In one recent survey, collisions of raptors with automobiles, telephone and power lines, machinery, buildings, and other objects accounted for 0.1 percent of the total nonhunting mortality (Meyer and Lee 1979).

Based upon the considerations discussed above, the level of impacts due to avifauna collisions with transmission lines would be low.

Since most of the area directly affected by the transmission lines is very sparsely populated and offers few facilities and services, it is most likely that workers would commute from larger towns up to 70 miles away. When this is not feasible, they would camp near the ROW. Transmission line construction would require a work force of 104 workers in 1989 and 78 workers in 1994. Because of the nature of construction activity, however, these work forces would be broken down into much smaller units—survey crews, clearing crews, access road construction crews, foundation pouring crews, tower construction crews, and so on (Social and Economic Conditions Technical Report).

As in the case of construction of the other components, human presence could result in increased levels of road kills, poaching, and harassment in the area of influence and/or traveling to and from work.

Other Wildlife. Construction of T2 would result in temporary disturbances to approximately 2400 acres of wildlife habitat within a 200-foot ROW. Areas that would be cleared and graded but allowed to revegetate include a total of 541 acres. Approximately 1.6 acres would be permanently removed due to tower sites. Impacts to small mammals, reptiles and amphibians, and nongame birds are discussed in Section 4.2.1.

Aquatic Species. No perennial waters would be traversed by T2. Ephemeral and intermittent drainages would be traversed by T2, but even if water were flowing during the construction activity, impacts would be localized and insignificant due to the lack of permanent fish fauna.

Indirect Effects. Raptor nests located within the 5-mile area of influence (Table 3-7) could be indirectly affected by human presence, noise, or harassment. It is unknown (and unquantifiable) whether any raptor would leave a nest, abandon its young, or suffer any negative impacts. Generic categories of indirect impacts resulting from increased human presence in areas outside the construction zone are discussed in Section 4.2.2.

4.5.2 Proposed Action: Second 500-kV Line, Route T1

Direct Effects.

Unique and/or Highly Valued Wildlife. One red-tailed hawk nest is located near T1 (Table 3-8). As discussed in Section 4.5.1, this could result in a local impact, but no significant impacts to the regional population are anticipated. Final selection of centerline for construction could affect the significance of identified impacts (see mitigation measures 3 and 7).

Other Wildlife. Construction of T1 would result in temporary disturbances to approximately 2570 acres within a 200-foot ROW. Areas that would be cleared and graded but allowed to revegetate include a total of 550 acres. Approximately 1.7 acres would be permanently removed due to tower sites. Impacts to small mammals, reptiles and amphibians, and nongame birds are discussed in Section 4.2.1.

Aquatic Species. No permanent aquatic habitat would be traversed by T1.

Indirect Effects. Indirect effects would be similar to those described in Section 4.2.2. There are raptor nests located within the 5-mile area of influence. These nests may be indirectly affected by human presence, noise, or harassment. The probability that increased human presence, noise, or harassment would result in abandonment of the nest of young is unknown.

4.5.3 Alternative Transmission Line T3

Direct Effects.

Unique and/or Highly Valued Species. Localized disturbance would occur to white-tailed prairie dogs located near the center of the proposed corridor. Until the ROW is selected and the centerline has been surveyed, no quantification of disturbance is possible.

One golden eagle nest is near T3. As discussed above, there may be a local impact but not a significant regional impact (see mitigation measures 3 and 7).

Other Wildlife. Construction of T3 would result in temporary disturbances to approximately 2520 acres, within a 200-foot ROW. Areas that would be cleared and graded but allowed to revegetate include a total of 540 acres.

Approximately 1.7 acres would be permanently removed due to tower sites. Impacts to small mammals, reptiles and amphibians, and nongame birds are discussed in Section 4.2.1.

Aquatic Species. There is no permanent aquatic habitat on T3.

Indirect Effects. Indirect impacts to raptor nests within the 5-mile area of influence may be attributed to human presence, noise, or harassment. It is unknown whether these disturbances would result in abandonment of nests or any population decline. These impacts are discussed in Section 4.5.1.

4.5.4 Alternative Transmission Line T4

Direct Effects.

Unique and/or Highly Valued Wildlife. T4 traverses elk and deer crucial winter habitat (Table 4-3, Map 3-3).

Based on a 200-foot ROW, less than 1 percent of the available habitat (within a 20-mile corridor) would be disturbed. If construction activities are conducted during the period (December 1 - March 31) when deer and elk are concentrated in crucial winter habitat, noise, human presence, and harassment would result in elk and deer being displaced within the 5-mile area of influence. This impact could further stress animals on winter range, but the magnitude of this impact cannot be quantified. Potential mitigation is discussed in mitigation measures 6 and 2.

One red-tailed hawk nest may be located within the 1-mile construction corridor. The nest location is at or on the border of the zone. Potential effects are described in Section 4.5.1. (mitigation measures 3 and 7).

Other Wildlife. Construction of T4 would result in temporary disturbances to approximately 3024 acres within a 200-foot ROW. Areas that would be cleared and graded but allowed to revegetate include a total of 648 acres. Approximately 2.0 acres would be permanently removed due to tower sites. Impacts to small mammals, reptiles and amphibians, and nongame birds are discussed in Section 4.2.1.

Aquatic Species. There is no permanent aquatic habitat along T4.

Indirect Effects. Elk are hunted only by permit in New Mexico, which allows the resource agency to limit the harvest to optimal size. As a result, the increased number of potential hunters would not increase the number of permits granted. Other indirect impacts to unique or highly valued wildlife are discussed in Section 4.2.2.

There are raptor nests within the 5-mile area of influence, and raptor activity has been noted in the northern and southern portions of T4. Indirect impacts may result from human presence, noise, or harassment, but the magnitude of this impact cannot be determined. These impacts are discussed in Section 4.5.1.

4.5.5. Proposed Action: 500-kV Loop, T5

The proposed 500-kV loop connecting NMGS with the Four Corners-Ambrosia-Pajarito transmission line would temporarily affect 242.4 (24.24 x 10 miles) acres. The habitat is similar to that reported on NMGS and contains no crucial wildlife habitat or sensitive species. Raptors nest within the 5-mile radius of the site; impacts are discussed in Section 4.5.1.

4.5.6. Proposed Action: NMGS Switching Station

Approximately 40.4 acres of wildlife habitat would be permanently removed from use. No crucial habitat or sensitive species would be significantly affected. The area that would be removed by the switching station is biologically similar to that reported at the NMGS site; it is described in Section 4.1.

4.5.7. Proposed Action: Rio Puerco Station

The Rio Puerco Station would permanently remove about 46 acres of wildlife habitat. There are no known crucial wildlife habitats, raptors' nests, or other sensitive wildlife species or habitats in the area of influence. The area that would be removed represents less than 1 percent of the regional area (10-mile radius from the station). No significant impacts to the regional wildlife are anticipated.

4.6 SPECIAL STATUS SPECIES

The mink has not been seen in the area of the proposed or alternative intake sites for nearly 50 years. Both sites are in areas frequented by humans, which mink avoid. An adult animal would move away from a construction area. It is very unlikely that any animals present would have dens in the area. The probability of the proposed project having any effects on the mink is very small.

The roundtail chub may be found near the proposed and alternative intake sites. Even if present, adults and juveniles would probably move away from the intake sites during construction. Some larvae or eggs could be lost during construction and intake operations. If the roundtail chub is already declining in the area, these project effects may hasten the decline.

The mountain plover's status is deteriorating, and its range has contracted. No crucial habitat exists in the area of influence of the proposed NMGS project. Based on these data, the proposed project should not affect the mountain plover.

Although the peregrine falcon has been reported in San Juan County, no impacts are expected because there are no known nests, crucial habitats, or hunting territories reported in the areas that would be affected by any NMGS project component (Ramakka 1981a).

No Colorado state-listed special status species that occur in high mountain areas of southern Colorado would be affected by potential acid precipitation (see Appendix 8).

5.0
SUGGESTED MITIGATION

5.1 DIRECT EFFECTS

No significant impacts to a regional population of any wildlife species was determined. Local direct impacts could be mitigated in the following ways:

1. If the location of the water intake structure is in mule deer crucial range, avoidance of construction during the period of December 1 through March 31 is recommended (P1, MP 0-1; P2 and P3, MP 0-2.25).

2. Avoidance of construction through the crucial winter range of elk and mule deer on T4 between December 1 and March 31 is recommended (MP 65-75, 93-95).

3. It is recommended that construction avoid areas with nesting raptors for the general period of February 1 through June 30. Modification to this period can be made by the BLM Area Manager with site-specific information from raptor specialists.

4. Construction of a wildlife waterer at the reservoir to provide water for mammals too large to move through the fence is suggested. This would eliminate the local impact of denying this seasonal water source. Because it would be a permanent water source, the waterer would be an enhancement to the local area.

5. It is suggested that both water pipelines be simultaneously constructed to avoid disturbing habitat twice. This is particularly important for crucial areas delineated in mitigation measure 1.

5.2 INDIRECT EFFECTS

Indirect effects could be mitigated in the following ways:

6. Revegetation of disturbed areas with plant species recommended by wildlife specialists, especially in the elk and deer crucial range areas delineated in mitigation measures 1 and 2.

7. Allowing trees used as nesting sites to stand if removal is not essential to component construction. This would allow raptors to return to historical nest sites after construction disturbances end.

8. If fish do not become established in the reservoir, introduce a suitable forage species that could serve as a food source for various water birds that may be attracted to the reservoir. Because no permanent water now exists, this step would be an enhancement.

9. Restrict public access to ROWs to minimize habitat destruction and poaching opportunity.

10. Use buses or vans to transport workers from the population centers to and from the job. Road kills are related to traffic volume. Use of private vehicles would allow much easier opportunity for increased recreational vehicle use in relatively undisturbed areas. Such activity would probably increase habitat degradation, harassment of wildlife, and poaching opportunity.

11. Prohibit the possession of firearms by employees during working hours.

12. Plant cottonwood saplings in auger holes along disturbed desert washes so that subsurface water can contribute to their establishment and growth.

6.0 UNAVOIDABLE ADVERSE IMPACTS

6.1 NMGS PLANT SITE

Approximately 4 square miles of wildlife habitat would be lost for the 40-year project life.

6.2 WATER SUPPLY SYSTEM

Approximately 11-30 acres of mule deer crucial winter range would be disturbed within the pipeline ROW, depending on the alternative selected. Approximately 145 acres of wildlife habitat would be displaced by the proposed reservoir R1. Increased hunting and fishing pressure would result in an average of 15,500 additional fish harvested per year through the year 2000 and 45 additional mule deer harvested per year through the year 2000.

6.3 TRANSMISSION SYSTEM

Approximately 2 acres of wildlife habitat (depending on route selection) would be lost under tower bases on a long-term basis. The switching station would occupy 37.9 acres, and the Rio Puerco Station would occupy 45.7 acres of wildlife habitat.

If corridor T4 is used, approximately 291 acres of deer and elk crucial winter habitat would be disturbed on a long-term basis.

7.0 RELATIONSHIP BETWEEN THE SHORT-TERM USE OF THE AFFECTED ENVIRONMENT AND LONG-TERM PRODUCTIVITY

Disturbance to crucial elk and mule deer winter range within water pipeline alternatives and T4 would be a short-term use of the environment. Maintenance of long-term productivity would be likely as browse species recover and reestablish in the ROWs within 5-10 years.

Increased hunting and fishing pressure would be a short-term use of the environment during the 40-year project life. Long-term productivity would not be impaired, assuming adequate management and resources committed to replacement of harvested species.

8.0
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

None of the unavoidable adverse impacts identified in Chapter 6.0 would constitute an irreversible or irretrievable commitment of resources.

9.0 COMPARISON OF ALTERNATIVES

9.1 WATER SUPPLY SYSTEM

9.1.1 Water Supply Source

Use of ground water would decrease or eliminate the amount of water taken from the San Juan River. If water management policies permit the river water to remain in the river or behind Navajo Dam, maintenance of aquatic habitat for fish, waterfowl, and wetlands would be more easily accomplished. If the river water to be used at NMGS is destined to be removed, regardless of the presence or absence of NMGS, there would be no differences among the alternatives in terms of aquatic habitat.

9.1.2. Intakes: Proposed P1 vs. Alternative P2 or P3

Utilization of the intake for P1 (Farmington intake) would allow water scheduled for use at NMGS to remain in the San Juan River longer (about 10 river miles). As a result, aquatic and vegetative resources in the river section downstream from the Bloomfield intake would benefit from flow that would not occur if the Bloomfield intake were selected.

9.1.3. Water Pipeline: Proposed P1 vs. P2 vs. Alternative P3

Route P1 would cross approximately 2.75 miles of mule deer crucial winter habitat. Routes P2 and P3 would cross approximately 1 mile of mule deer crucial winter habitat (Table 9-1). Neither crossing would constitute a significant impact (less than 1 percent of resource affected).

Table 9-1. COMPARISON OF ALTERNATIVES

	Water Supply		
	P1	P2	P3
Crucial wildlife areas crossed: mule deer winter range	2.75 miles	1.0 mile	1.0 mile
Potential impingement and entrainment	x	x	x
Potential beneficial effect of additional water at low flow	x	x	x

	Transmission System			
	T2	T1	T3	T4
Approximate length of habitat crossed	101 miles	107	105	126
Approximate area permanently removed by towers	1.6 acres	1.7	1.7	2.0
Crucial wildlife areas crossed: mule deer and elk winter range	0	0	0	12 miles

Note: There were no differences in the results of analyses using Baselines 1 and 2.

9.1.4 Reservoir

The proposed site would exclude a seasonal water source, Dog Eye Pond, from use by mammals too large to move through the fence. No seasonal water source is present on the alternative site.

9.2 TRANSMISSION SYSTEM

A comparison of habitat traversed, area permanently removed, and crucial wildlife areas crossed is given in Table 9-1.

POSSIBLE NEW TOWN

1.0

AFFECTED ENVIRONMENT

There are no deer, elk, pronghorn antelope, or any other big game in the area where the possible new town site would be located. Typical small and medium sized mammals that would be associated with vegetation present on the site include: black-tailed jackrabbit, white-tailed antelope squirrel, silky pocket mouse, plains pocket mouse, northern grasshopper mouse, and coyote.

Game birds are not abundant on the site, although both scaled quail and mourning dove occur. Two raptor nests are reported within 5 miles of the possible new town site, including a Swainson's hawk and a long-eared owl nest.

Due to a lack of permanent aquatic habitat on the site, waterfowl or aquatic species are not present or occur infrequently and on a seasonal basis.

Detailed descriptions of regional wildlife in the area are available from other sources (Bio/West 1982).

The following state and/or federally listed or proposed threatened or endangered species have range or habitat overlap with the possible new town site.

- Black-footed ferret (Mustela nigripes)
- Bald eagle (Haliaeetus leucocephalus)
- Peregrine falcon (Falco peregrinus anatum)

No prairie dog colonies are present on the possible new town site or within a 5-mile buffer zone. No suitable nesting habitat for bald eagles or peregrine falcons exists on the new town site or within a 5-mile buffer. Occurrence of either species would therefore be as occasional migrants.

No suitable habitat for Mesa Verde cacti exists within the possible new town boundaries. However, the species has been reported immediately west of the proposed NMGS site, and heavy clay and gravelly soils in the De-na-zin BLM Wilderness Study Area (WSA) immediately north of the possible new town site are potential habitat.

2.0

ENVIRONMENTAL CONSEQUENCES

Approximately 2400 acres of wildlife habitat would be permanently disturbed or removed if a possible new town were built. The majority of small mammals, birds, and reptiles would likely either be destroyed or displaced. The only species that would likely recolonize would be those very tolerant and/or dependent upon humans for their survival.

The permanent presence of humans in the area would probably result in an increase in road kills, poaching, and general harassment. Animals would probably become more wary of humans and may move some distance away from the settlement.

No aquatic habitat is present at or near the possible new town site; therefore, there would be no impacts to any aquatic habitat.

THREATENED AND ENDANGERED SPECIES

If Mesa Verde cactus is present on the possible new town site, or in areas that may be affected because of increased recreational use or because of ORV activities, potential impacts could include:

- Direct destruction of populations or individuals
- Accelerated erosion in areas supporting the species
- Removal of local populations by cactus collectors

APPENDIX

Appendix 1. LENGTH, AREA, AND RELATIVE ABUNDANCE OF VEGETATION TYPES ALONG PROPOSED AND ALTERNATIVE PIPELINE AND TRANSMISSION ROUTES

Project Component	Vegetation Type: 1 Ponderosa and Pinyon Pine, Oakbrush	2 Sandwash and Saline Lowland	3 Badlands and Bare Slopes	4 Shrub-Grass	5 Juniper and Pinyon-Juniper	6 Irrigated Cropland and Riparian
Pipeline P1						
Total Miles	-	0.3	4.0	31.8	3.7	-
% of Total ROW	-	0.75	10.1	79.9	9.3	-
Total Area (acres)	-	3.3	43.6	346.9	40.4	-
Pipeline P2						
Total Miles	-	4.4	3.7	24.8	0.4	8.9
% of Total ROW	-	10.4	8.7	58.6	0.94	21.3
Total Area (acres)	-	48.0	40.4	270.5	4.4	97.1
Pipeline P3						
Total Miles	-	0.3	3.9	34.5	9.7	0.2
% of Total ROW	-	0.62	8.0	71.0	20.0	0.41
Total Area (acres)	-	3.3	42.5	376.4	105.8	2.2
Transmission Line T1						
Total Miles	-	6.2	2.9	82.3	15.9	-
% of Total ROW	-	5.8	2.7	76.7	14.8	-
Total Area (acres)	-	150.9	70.2	1995.1	385.0	-
Transmission Line T2						
Total Miles	-	4.2	0.6	84.0	12.2	-
% of Total ROW	-	4.15	0.59	83.16	12.07	-
Total Area (acres)		101.6	14.4	2036.2	295.5	-
Transmission Line T3						
Total Miles	-	3.2	3.5	86.1	14.3	-
% of Total ROW	-	3.0	3.3	80.4	13.4	-
Total Area (acres)	-	77.9	85.7	2087.5	347.9	-
Transmission Line T4						
Total Miles	19.6	0.7	-	91.4	15.7	-
% of Total ROW	15.4	0.54	-	71.7	12.3	-
Total Area (acres)	475.6	16.7	-	2214.4	379.9	-

Appendix 2. PERIPHYTON COLLECTED FROM THE SAN JUAN RIVER

CHLOROPHYTA
- Cladophorales
  - Cladophora spp.
  - Rhizoclonium sp.
- Chloroccales
  - Scenedesmus sp.
- Zygnematales
  - Spirogyra sp.

CYANOPHYTA
- Anabena spp.
- Lyngbya sp.
- Spirulinia sp.

BACILLARIOPHYTA
- Fragillariales
  - Cyclotella spp.
  - Melosira varians
  - Diatoma hiemale
  - Diatoma vulgare
  - Fragillaria sp.
  - Meridion circulare
  - Synedra spp.

BACILLARIOPHYTA (cont.)
- Achnanthales
  - Achnanthes sp.
  - Cocconeis pediculus
  - Cocconeis placentula
  - Rhoicosphenia curvata
- Naviculales
  - Anomoeneis sp.
  - Cymbella spp.
  - Gomphonema sp.
  - Navicula spp.
  - Navicula tripunctata
  - Pinnularia sp.
- Epithemiales
  - Epithemia sorex
  - Rhopalodia gibba
- Bacillariales
  - Nitzschia acicularis
  - Nitzschia sigmoides
  - Nitzschia spp.
- Surirellales
  - Cymatopleura sp.
  - Surirella ovata

Source: Holden et al. 1980.

Appendix 3. PHYTOPLANKTON COLLECTED FROM THE SAN JUAN RIVER

CHLOROPHYTA

Order Vlotrichales
- Vlothrix sp.

Order Cladophorales
- Cladophora spp.
- Rhizoclonium sp.

Order Chaetphorales
- Stigeocionium sp.

Order Chloroccoccales
- Pediastrum boryanum
- Pediastrum simplex
- Scenedesmus sp.

Order Zygnematales
- Spirogyra sp.
- Closterium sp.
- Cosmarium sp.
- Staurastrum sp.

CYANOPHYTA

Order Myxophyceae
- Merismopedia sp.

Order Hormogonales
- Anabena spp.
- Glectrichia sp.
- Lyngby sp.
- Oscillatoria spp.
- Spirulinia sp.

BACILLARIOPHYTA

Order Euphodiocales
- Cyclotella spp.
- Melosira varians

Order Fragillariales
- Asterionelia formosa
- Diatoma hiemale

BACILLARIOPHYTA (cont.)
- Diatoma vulgare
- Fragillaria spp.
- Fragillaria crotchensis
- Meridion circulare
- Synedra spp.

Order Achnanthales
- Achnanthes sp.
- Cocconeis spp.
- Rhoicosphenia curvata

Order Naviculales
- Anomoeoneis sp.
- Cymbella spp.
- Gomphonema spp.
- Gyrosigma sp.
- Navicula spp.
- Pinnularia sp.

Order Epithemiales
- Epithemia sorex
- Rhopalodia gibba

Order Bacillariales
- Nitzschia acicularis
- Nitzschia sigmoidea
- Nitzschia spp.

Order Surirellales
- Cymatopleura sp.
- Surirella sp.

Order Rhizosoleniales
- Rhizolenia sp.

PYRROPHYTA

Order Diokontae
- Ceratium sp.

Order Ochromonadales
- Dinobryon sp.

Source: Holden et al. 1980.

Appendix 4

LOCATIONS OF STATIONS USED IN COLLECTION OF MACROINVERTEBRATES

Station	River Mile	Location Description
1	298.0	Dam
2	295.3	Simon Wash
3	291.0	Ernie's Fishing Hole
4	287.0	State Land Bluff
5	279.5	Blanco Bridge
6[a]	273.3	Gasoline Alley
8	260.1	Fairgrounds
9[b]	253.5	Dump
10[b]	251.4	Farmington Bridge
11	——	Animas River
12	244.0	Lions Park
13	228.4	Hogback
14	217.6	Shiprock
16	187.4	Four Corners
17	166.7	Aneth, Utah
19	146.0	Bluff, Utah
20	113.5	Mexican Hat

Source: Holden et al. (1980).

[a]Closest collection made to the proposed Bloomfield site (P2-P3).

[b]Closest collections made to the proposed Farmington site (P1).

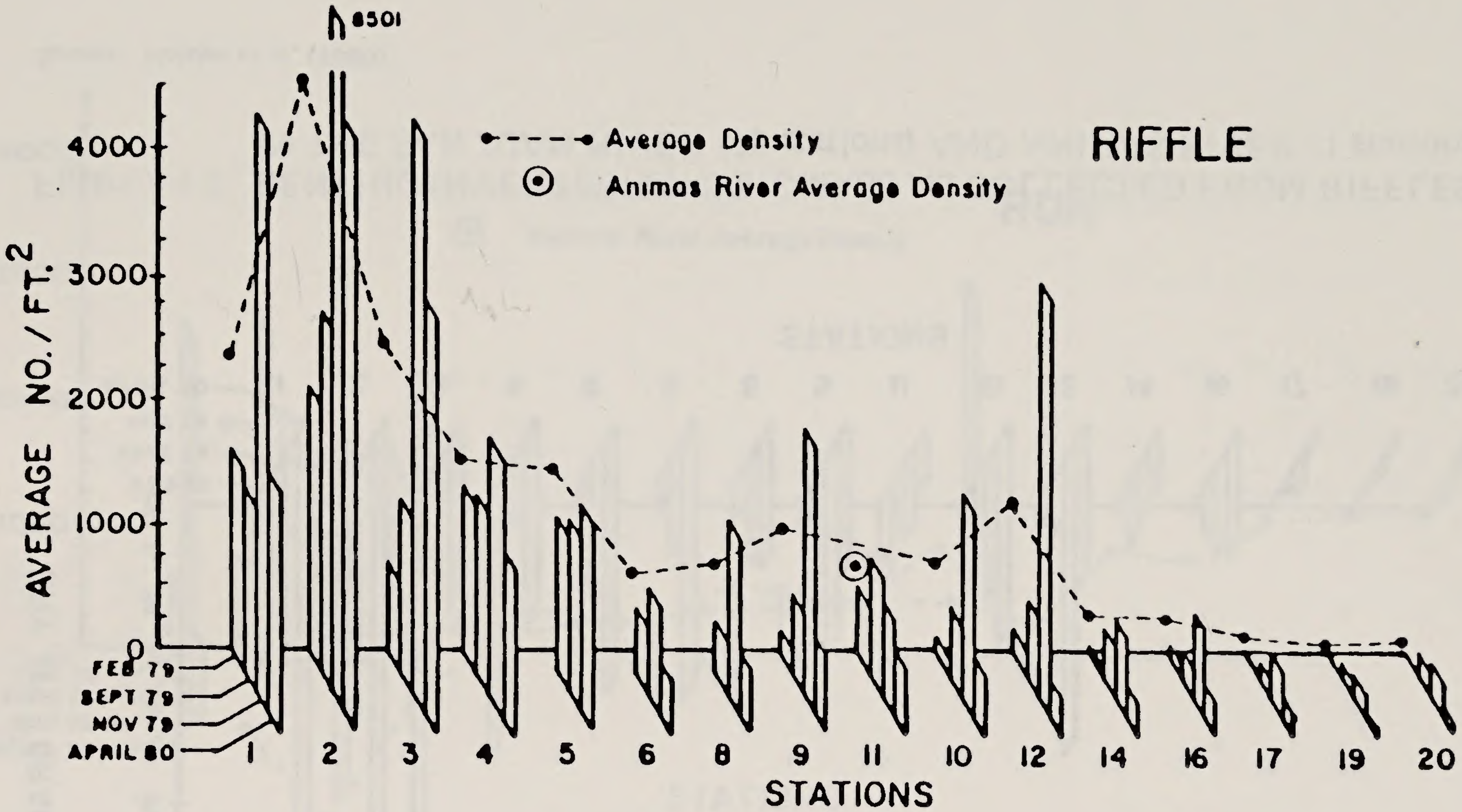


Figure A4-1. BENTHIC INVERTEBRATE DENSITY AS COLLECTED FROM RIFFLES IN THE SAN JUAN RIVER (15 stations) AND ANIMAS RIVER (1 station)

Source: Holden et al. (1980)

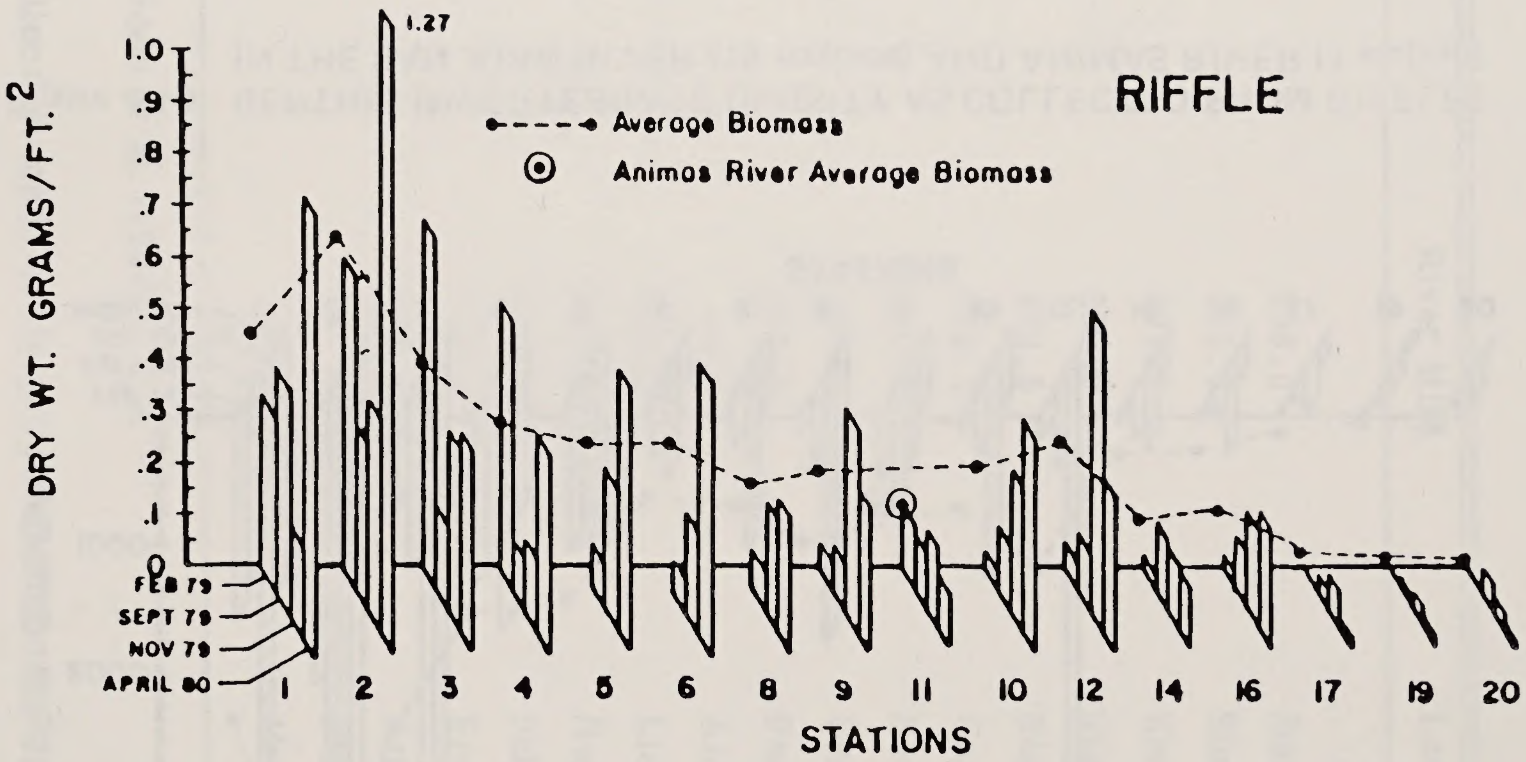


Figure A4-2. BENTHIC INVERTEBRATE BIOMASS AS COLLECTED FROM RIFFLES IN THE SAN JUAN RIVER (15 stations) AND ANIMAS RIVER (1 station)

Source: Holden et al. (1980)

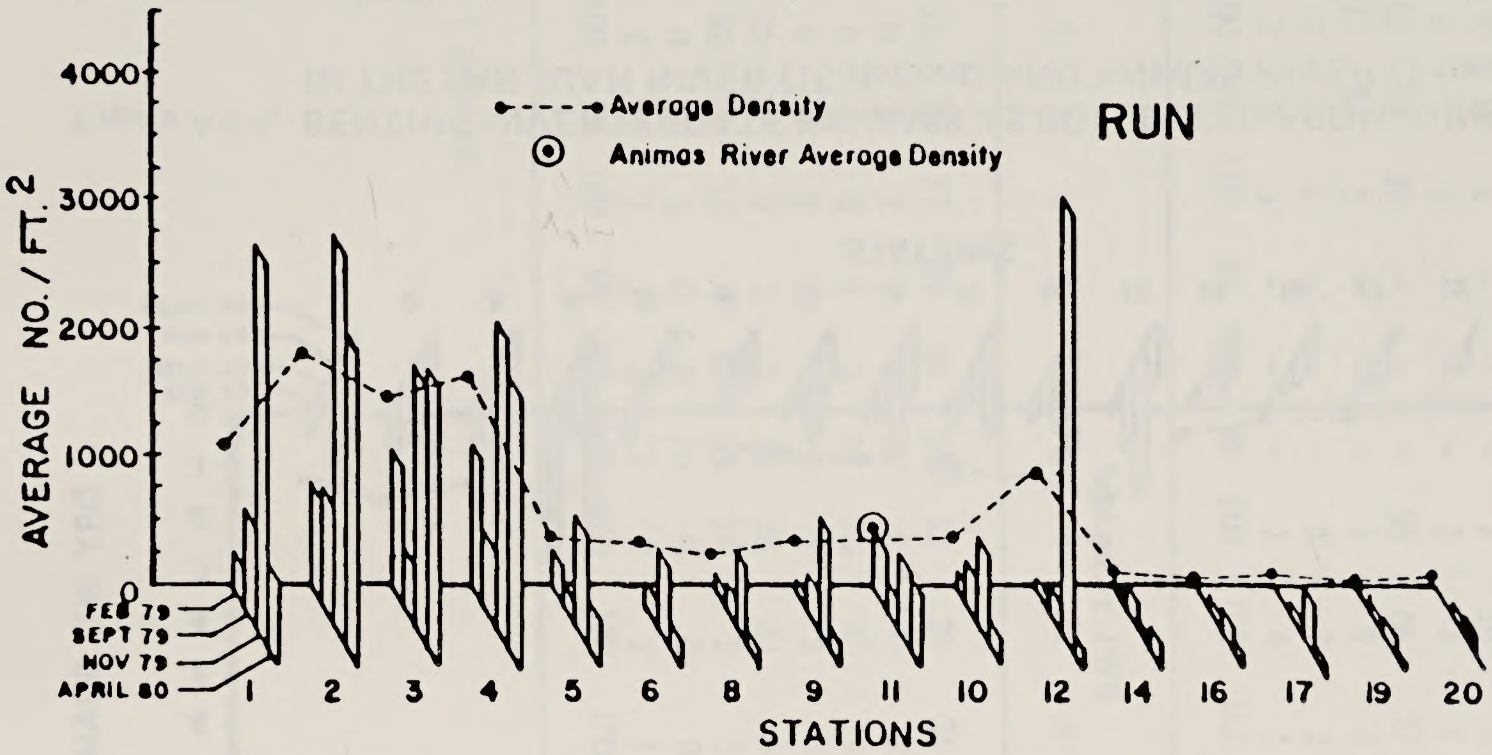


Figure A4-3. BENTHIC INVERTEBRATE DENSITY AS COLLECTED FROM RUNS IN THE SAN JUAN RIVER (15 stations) AND ANIMAS RIVER (1 station)

Source: Holden et al. (1980)

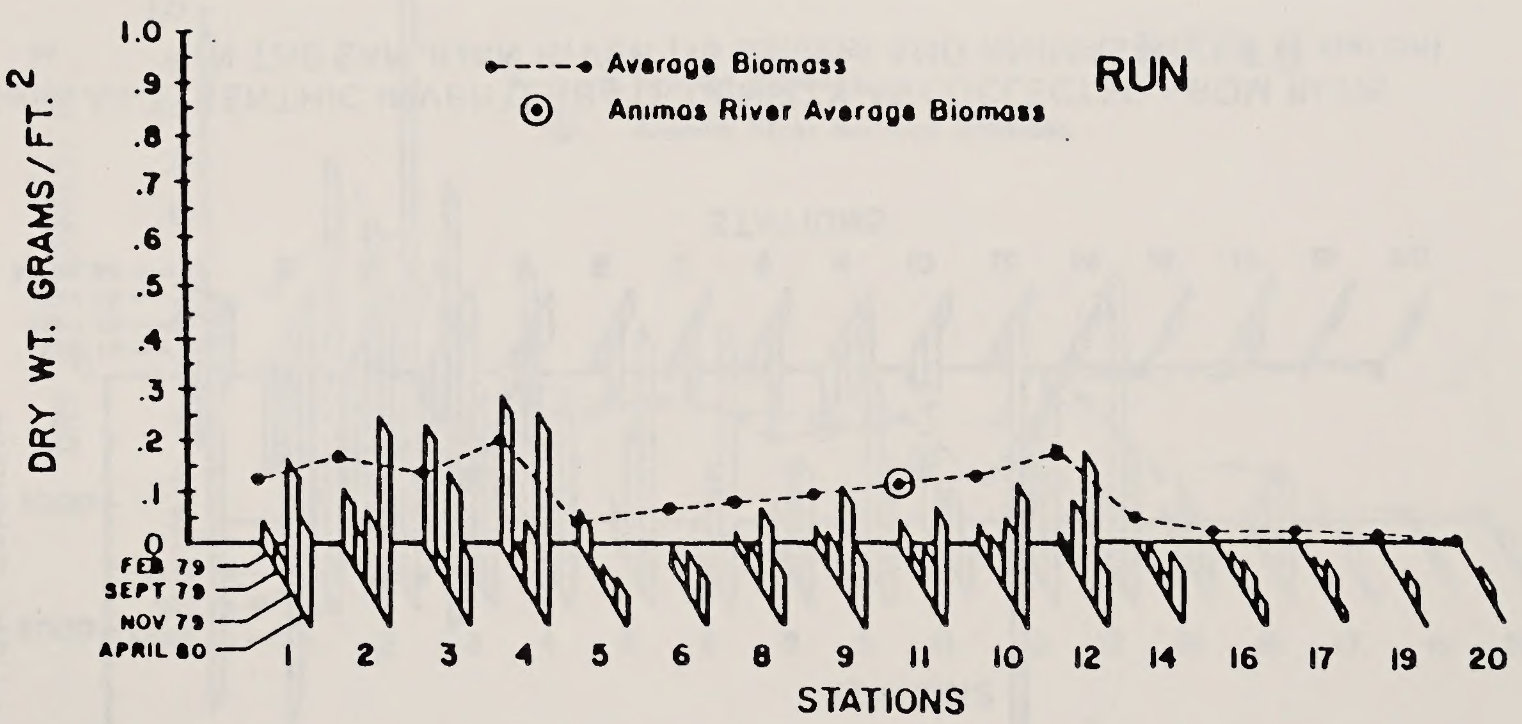


Figure A4-4. BENTHIC INVERTEBRATE BIOMASS AS COLLECTED FROM RUNS IN THE SAN JUAN RIVER (15 stations) AND ANIMAS RIVER (1 station)

Source: Holden et al. (1980)

Appendix 5. PERCENT SPECIES COMPOSITION, BY STATION, FOR BENTHIC MACROINVERTEBRATES IN RIFFLES IN THE SAN JUAN RIVER

Sampling Date:	February 1979															
Station No.:	1	2	3	4	5	6	8	9	11	10	12	14	16	17	19	20
Baetis spp.	2	14	31	32	-	-	-	26	8	57	4	3	1	-	-	-
Ephemerella inermis	0	1	1	15	-	-	-	7	2	6	2	0	1	-	-	-
Hydropsyche sp.	0	T	0	1	-	-	-	7	19	3	18	29	6	-	-	-
Plecoptera	0	1	T	4	-	-	-	3	1	6	2	2	4	-	-	-
Chironomidae	94	63	44	39	-	-	-	55	66	27	68	63	83	-	-	-
Simultidae	3	17	14	5	-	-	-	1	T	0	0	0	0	-	-	-
Oligochaeta	1	2	5	1	-	-	-	T	T	2	3	0	0	-	-	-
All others	T	2	5	3	-	-	-	1	4	1	3	5	5	<10	<10	<10
	100	100	100	100	NR	ND	NR	100	100	102	100	102	100	*	*	*
Sampling Date:	**September 1979**															
Station No.:	**1**	**2**	**3**	**4**	**5**	**6**	**8**	**9**	**11**	**10**	**12**	**14**	**16**	**17**	**19**	**20**
Baetis spp.	1	26	38	77	89	69	28	22	29	34	21	16	7	7	7	11
Ephemerella inermis	0	0	0	T	T	T	0	0	0	0	T	T	T	1	0	0
Hydropsyche sp.	T	0	0	0	2	3	19	24	47	14	43	49	58	45	29	54
Plecoptera	0	0	0	T	T	1	3	2	2	2	1	2	9	10	2	3
Chironomidae	71	32	37	9	3	3	30	36	20	44	32	27	19	26	45	17
Simultidae	17	42	24	13	4	23	19	14	T	5	1	T	T	3	4	2
Oligochaeta	11	0	T	T	0	0	0	0	0	0	T	0	0	0	0	T
All others	0	T	T	1	1	1	1	2	2	1	2	5	6	10	13	12
	100	100	99	100	99	100	100	100	100	100	100	99	99	102	100	99

Note: T = trace; less than 1 percent.
ND = no data
NR = no riffles
* =

Appendix 5. PERCENT SPECIES COMPOSITION, BY STATION, FOR BENTHIC MACROINVERTEBRATES IN RIFFLES IN THE SAN JUAN RIVER (concluded)

Sampling Date:	November 1979															
Station No.:	1	2	3	4	5	6	8	9	11	10	12	14	16	17	19	20
Baetis spp.	1	51	66	66	35	21	45	39	22	33	7	7	6	14	10	6
Ephemerella inermis	0	T	1	15	26	26	9	5	2	5	2	9	11	7	4	3
Hydropsyche sp.	0	0	T	1	10	12	4	9	16	15	4	12	18	10	11	2
Plecoptera	0	T	T	1	7	7	4	4	2	3	1	4	8	9	2	4
Chironomidae	46	5	3	4	11	25	21	31	51	37	30	61	51	43	43	54
Simultidae	26	43	29	10	8	5	1	6	T	3	T	T	3	10	23	15
Oligochaeta	27	T	T	2	1	T	15	4	T	3	56	2	1	T	0	5
All others	T	T	1	1	3	3	1	2	6	1	T	7	2	7	7	12
	100	99	100	100	101	99	100	100	99	100	100	102	100	100	100	101

Sampling Date:	April 1980															
Station No.:	1	2	3	4	5	6	8	9	11	10	12	14	16	17	19	20
Baetis spp.	4	52	29	33	22	33	83	51	11	16	16	15	7	1	0	0
Ephemerella inermis	T	2	17	19	57	20	4	7	70	47	23	50	12	3	65	3
Hydropsyche sp.	0	0	T	T	4	21	1	19	1	12	17	3	22	1	3	0
Plecoptera	0	T	1	1	8	12	6	8	5	8	6	3	4	1	11	3
Chironomidae	33	28	8	8	5	9	6	12	9	15	24	26	53	94	16	84
Simultidae	59	17	45	35	2	1	0	0	T	0	0	0	0	0	0	1
Oligochaeta	4	1	T	T	T	T	0	T	T	0	8	2	T	T	0	0
All others	T	T	1	3	1	4	1	3	4	3	7	1	1	1	7	9
	100	100	101	99	99	100	101	100	100	101	101	100	99	101	102	100

Source: Holden et al. 1980.

Note: T = trace; less than 1 percent.
ND = no data
NR = no riffles

Appendix 6

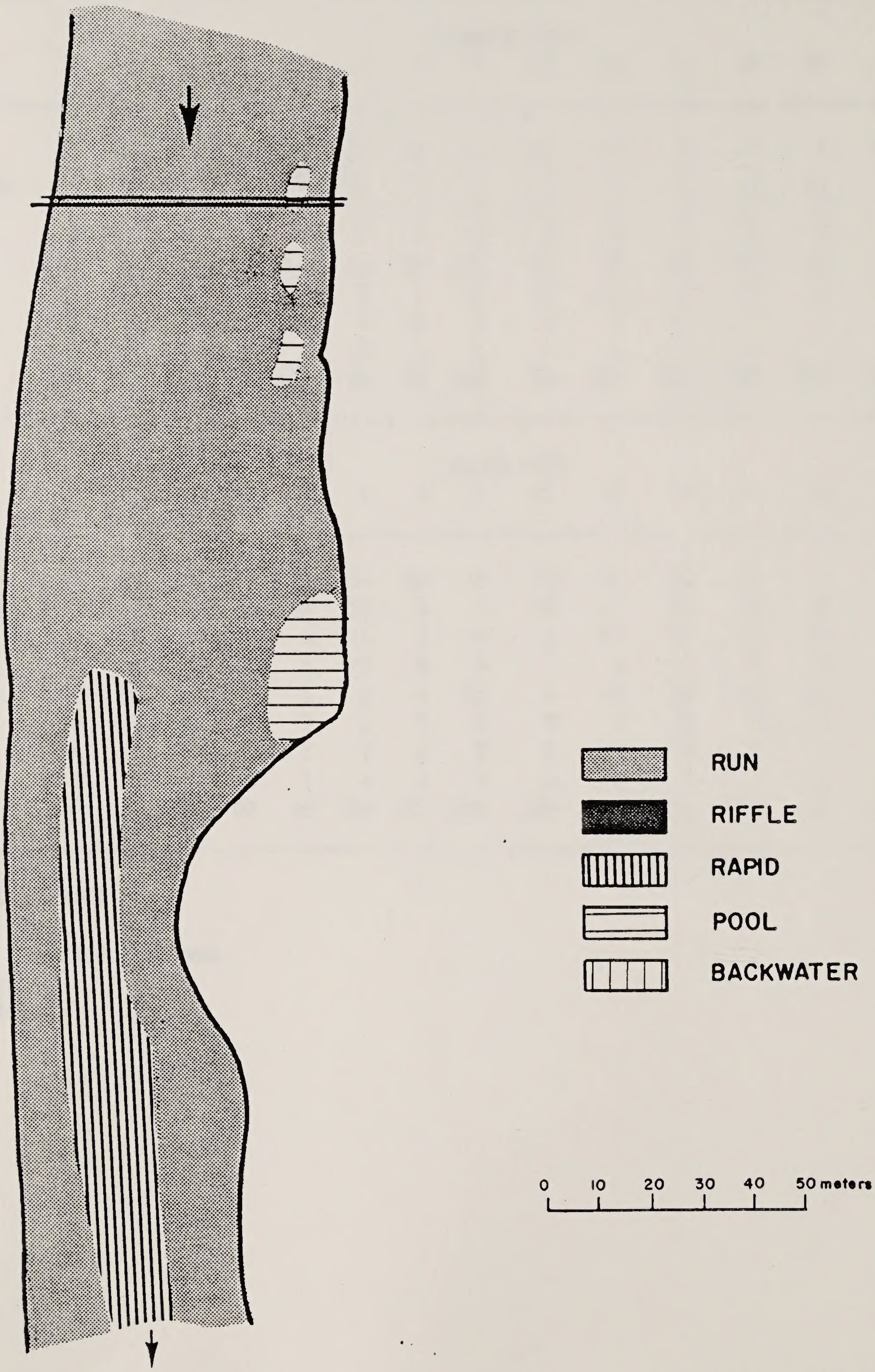


Figure A6-1. HABITAT TYPES AT THE PROPOSED FARMINGTON 1 INTAKE STATION (P1)

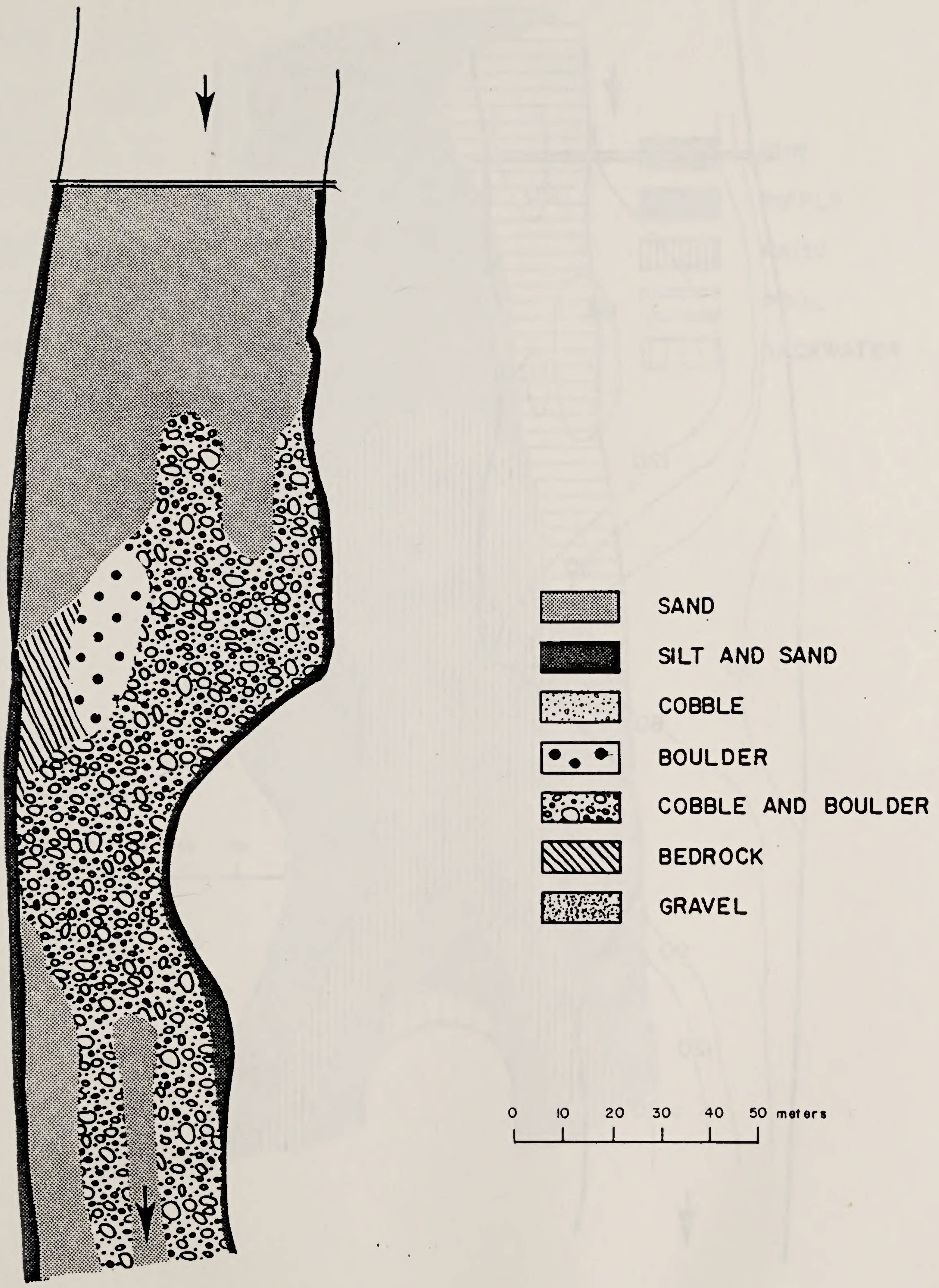


Figure A6-2. SUBSTRATE TYPES AT THE PROPOSED FARMINGTON 1 INTAKE STATION (P1)

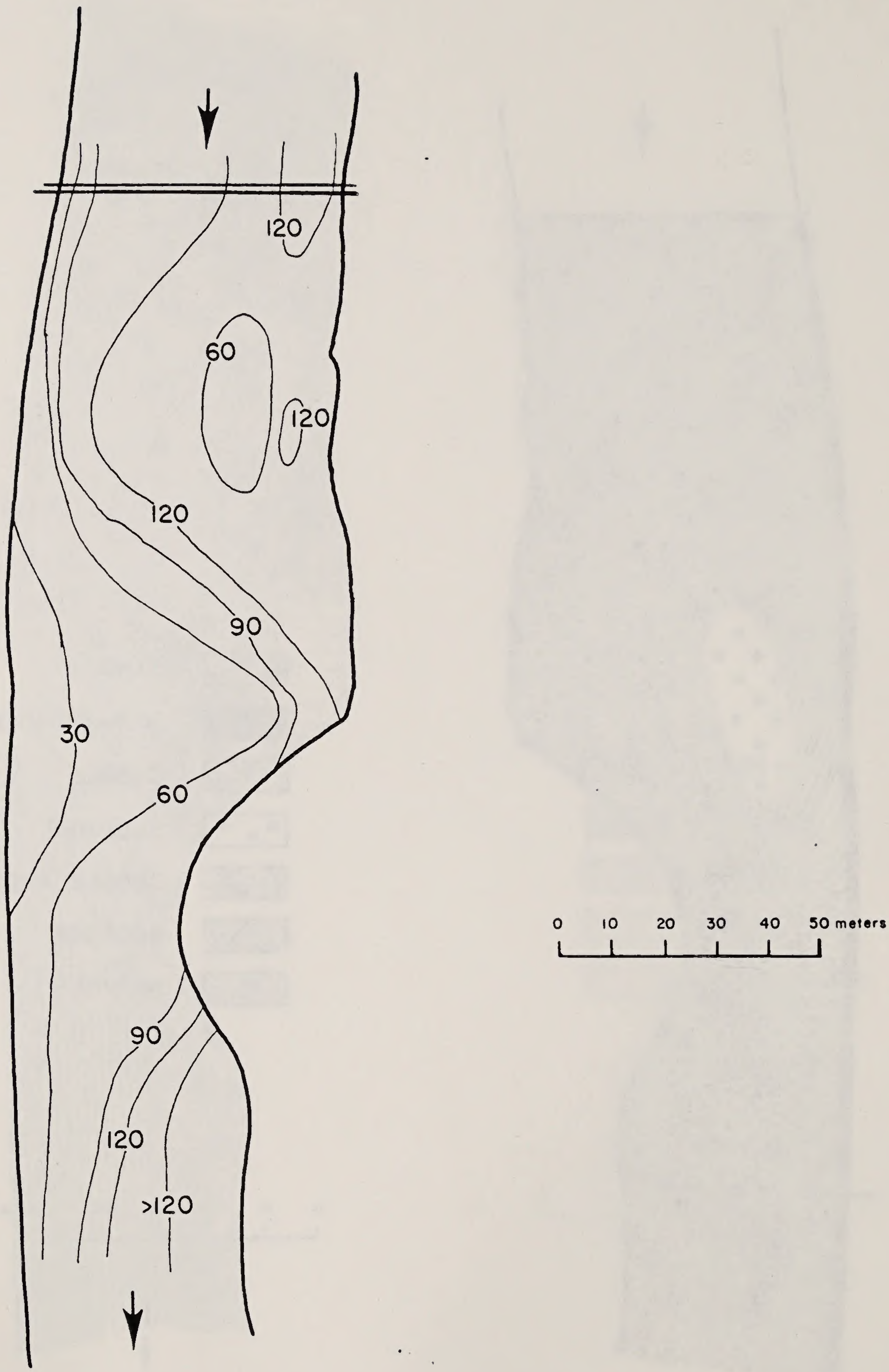


Figure A6-3. DEPTH CONTOURS OF THE PROPOSED FARMINGTON 1 INTAKE STATION (P1)

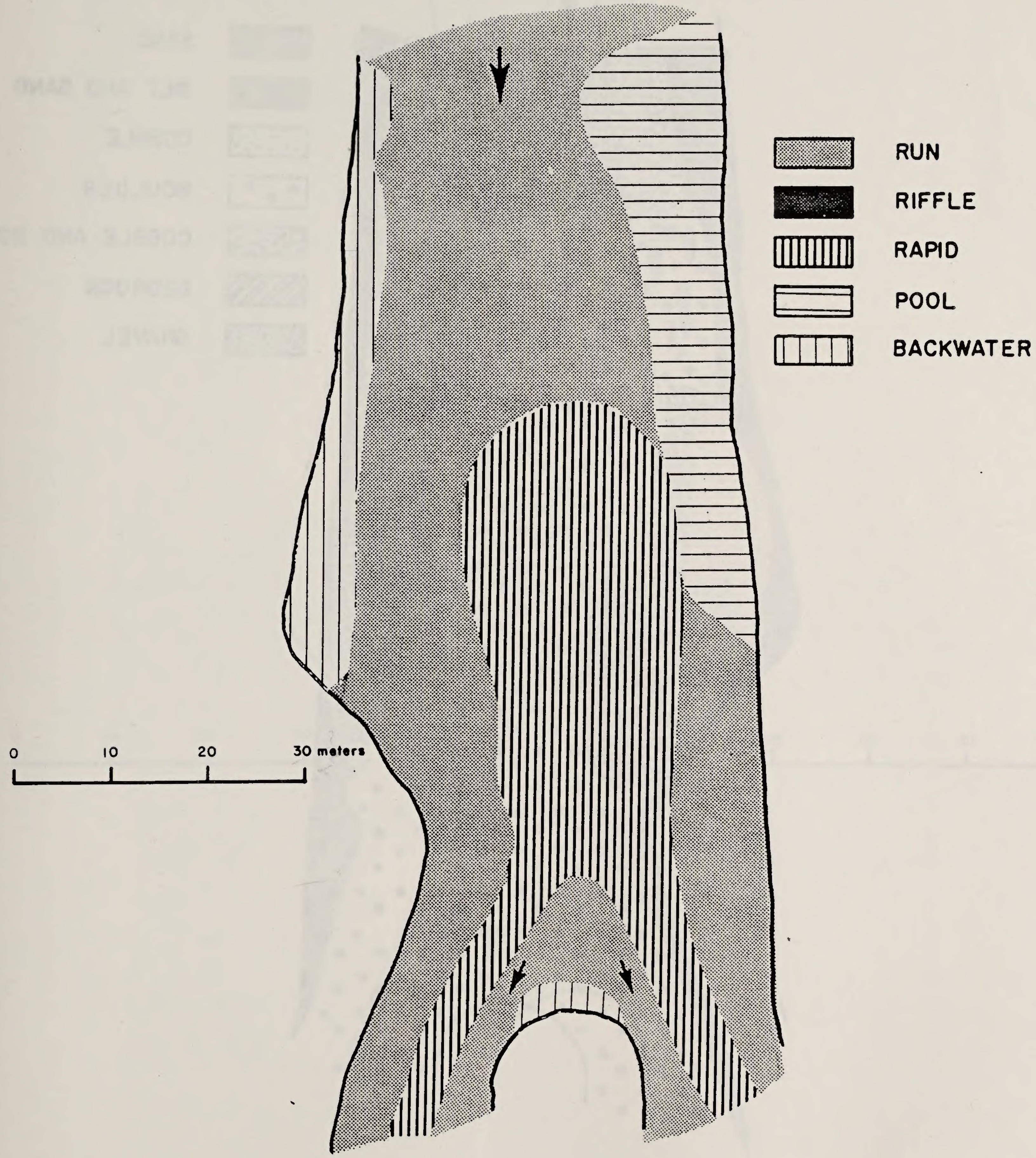


Figure A6-4. HABITAT TYPES AT THE PROPOSED FARMINGTON 2 INTAKE STATION (P1)

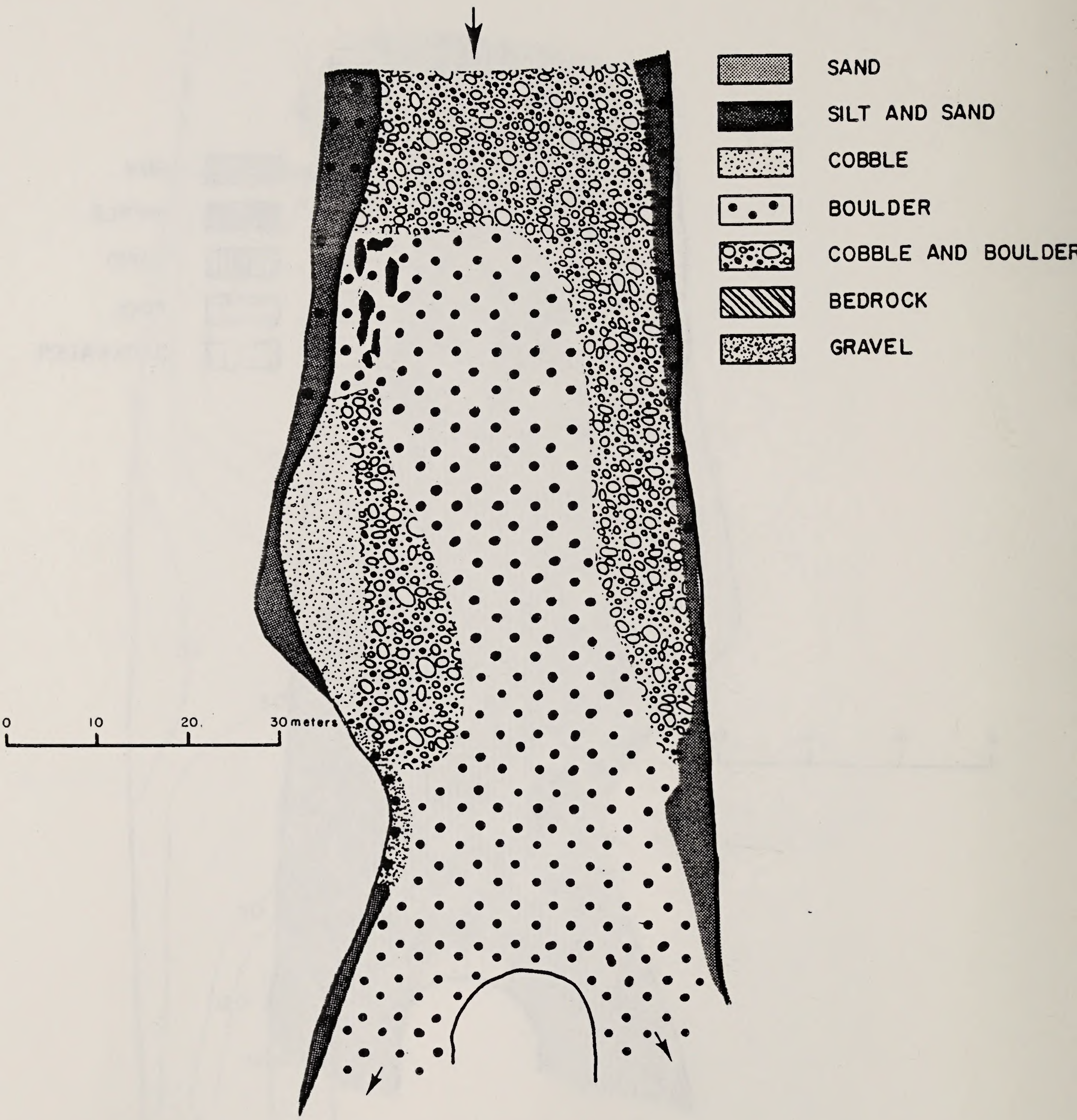


Figure A6-5. SUBSTRATE TYPES AT THE PROPOSED FARMINGTON 2 INTAKE STATION (P2)

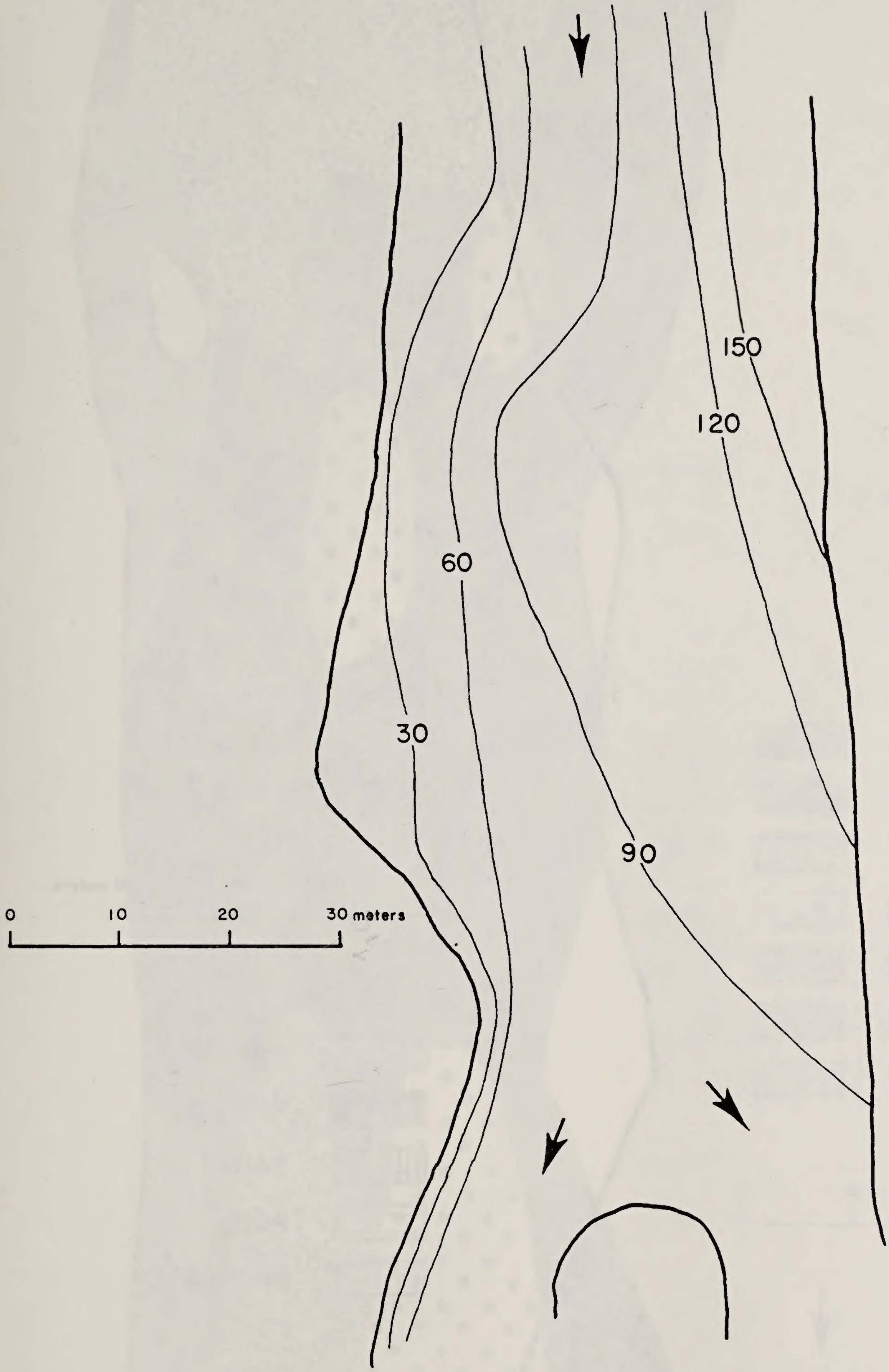


Figure A6-6. DEPTH CONTOURS AT THE PROPOSED FARMINGTON 2 INTAKE STATION (P1)

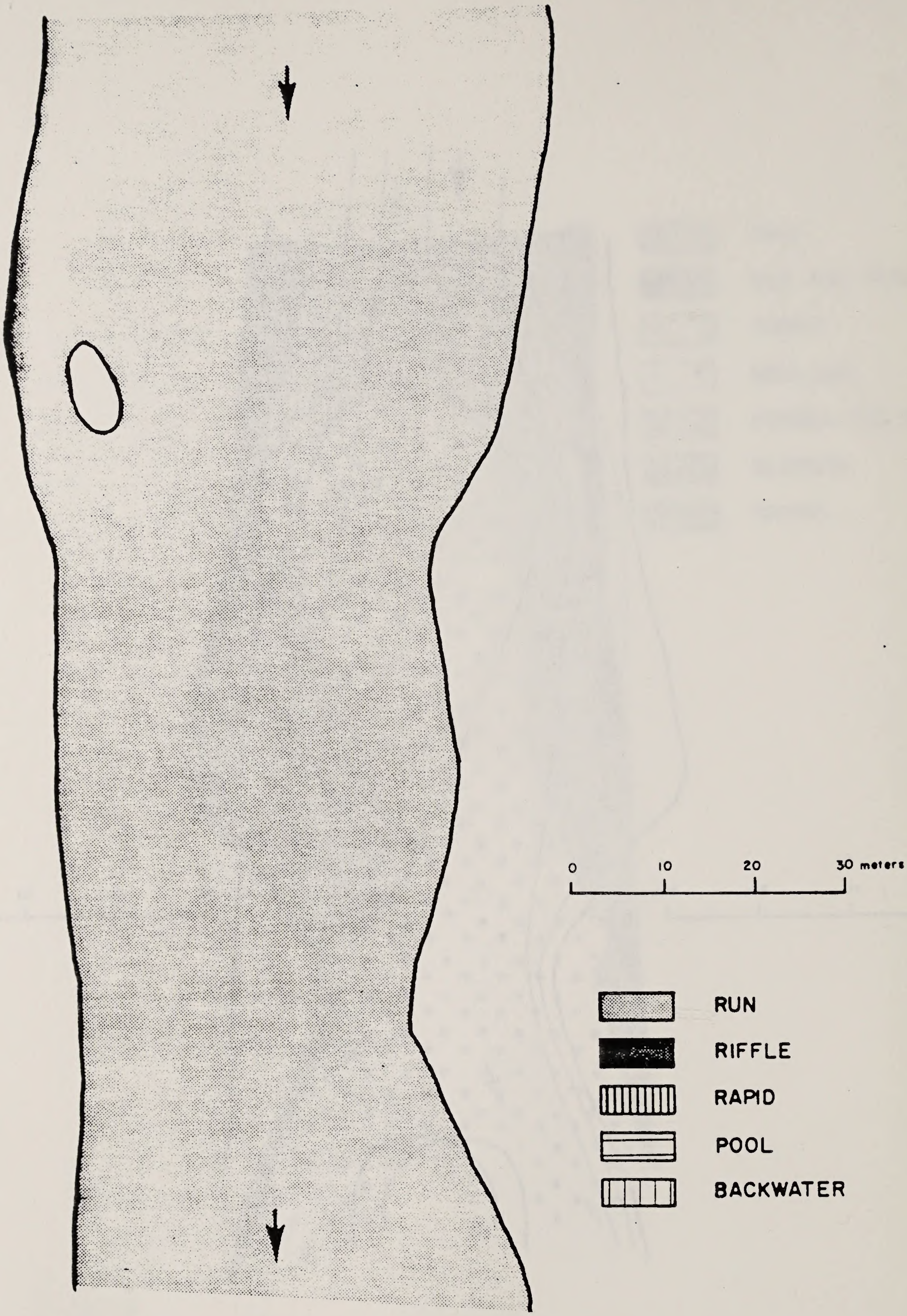


Figure A6-7. HABITAT TYPES AT THE PROPOSED FARMINGTON 3 INTAKE STATION (P1)

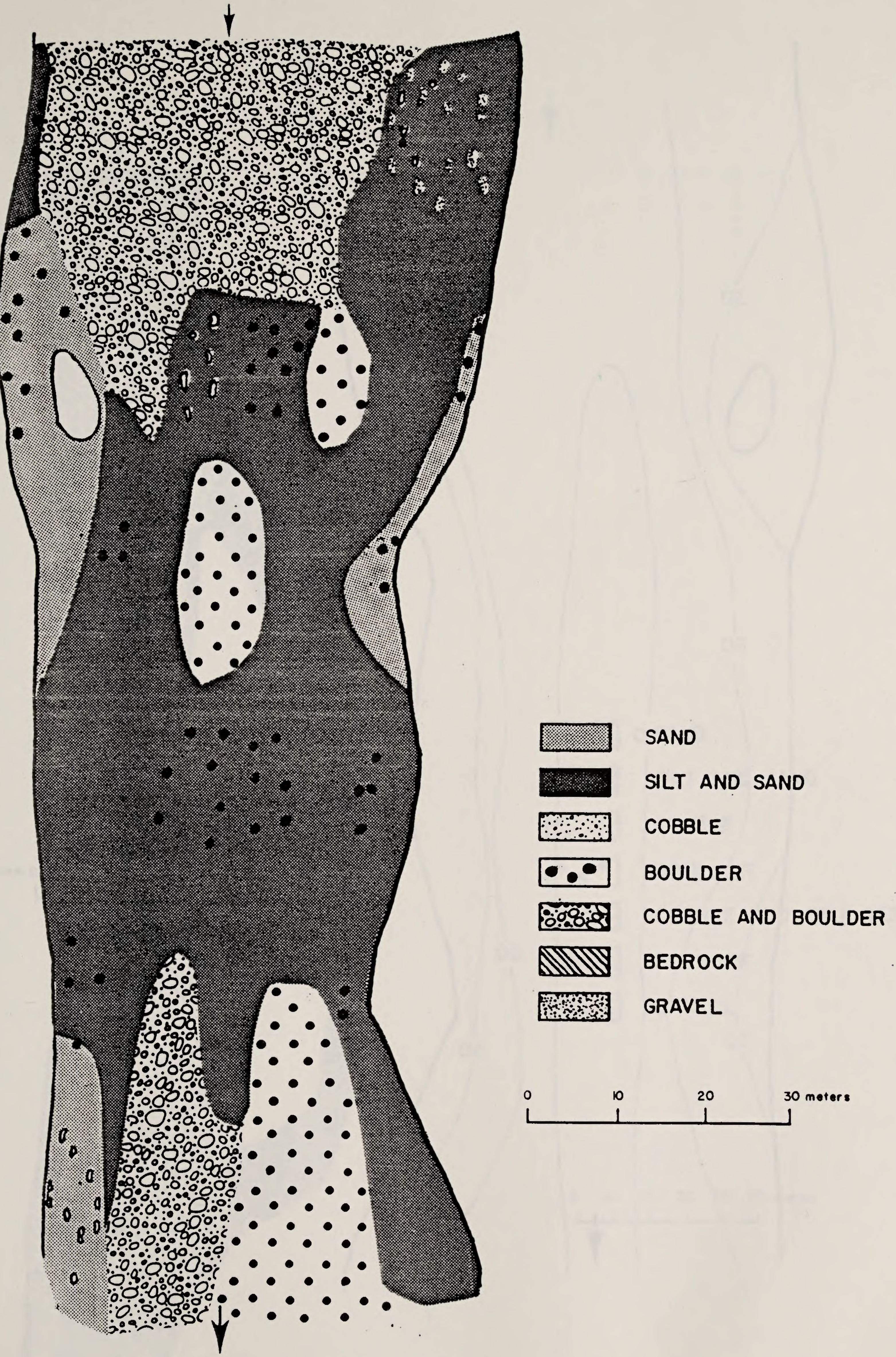


Figure A6-8. SUBSTRATE TYPES AT THE PROPOSED FARMINGTON 3 INTAKE STATION (P1)

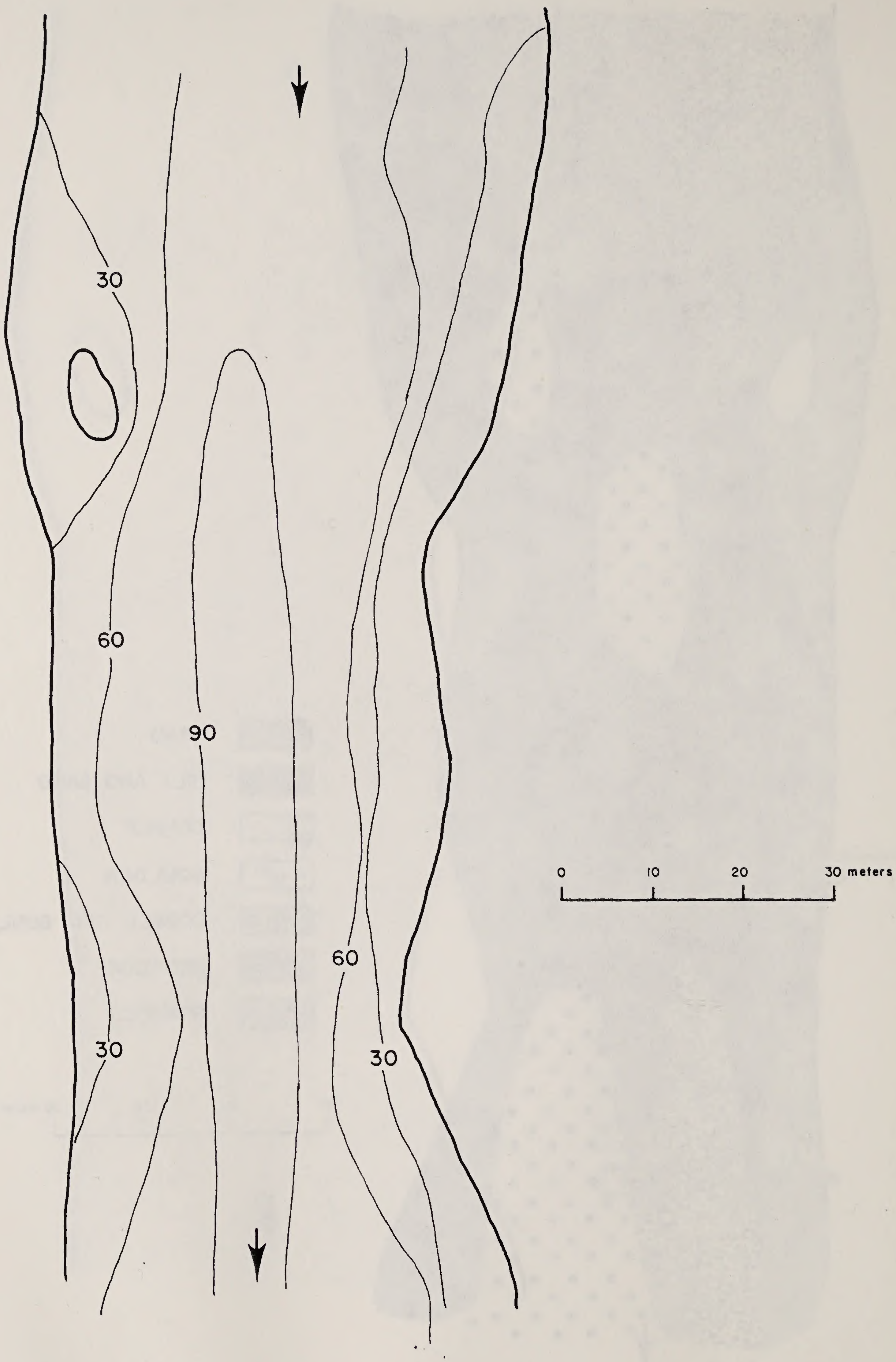


Figure A6-9. DEPTH CONTOURS AT THE PROPOSED FARMINGTON 3 INTAKE STATION (P1)

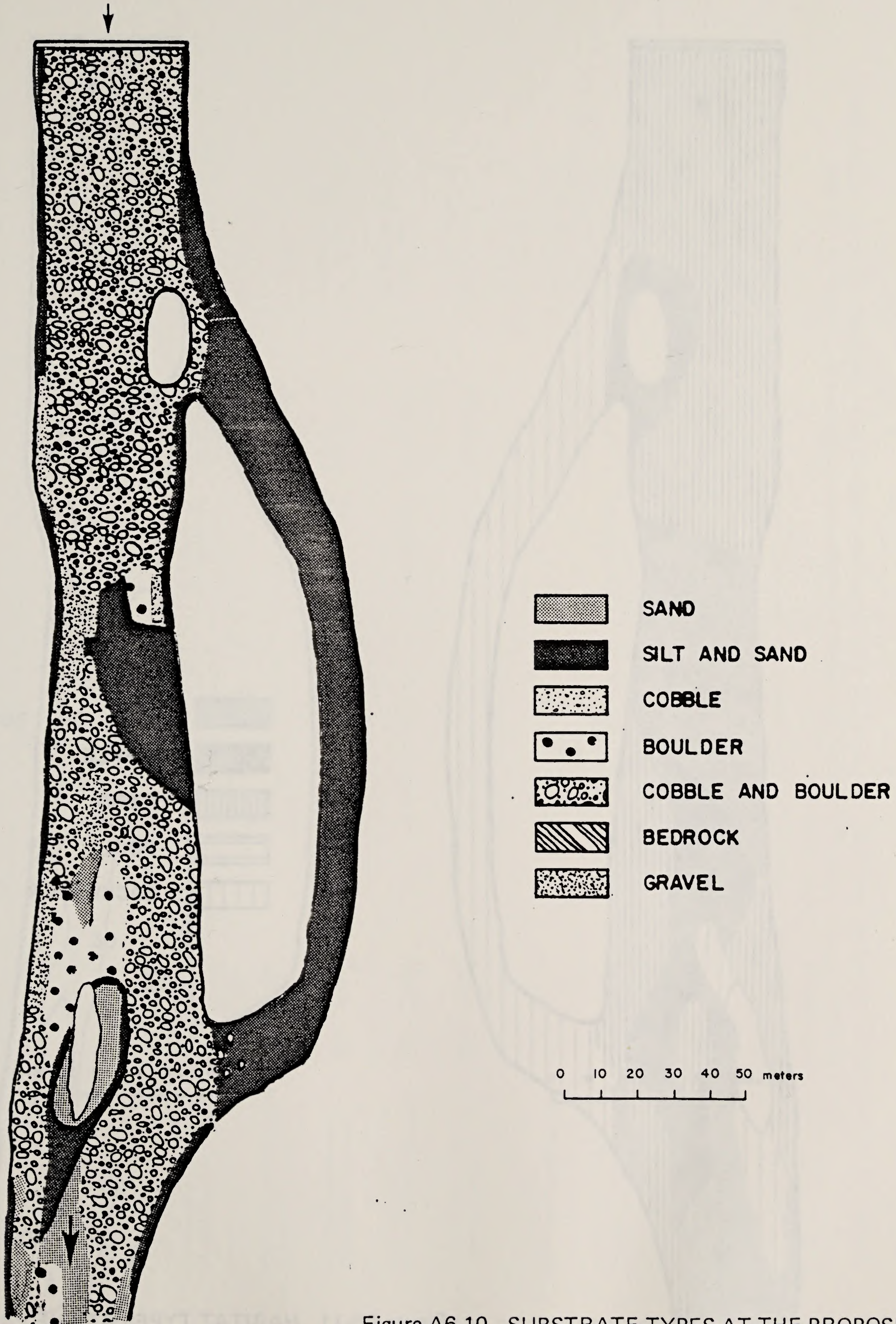


Figure A6-10. SUBSTRATE TYPES AT THE PROPOSED BLOOMFIELD INTAKE STATION (P2—P3)

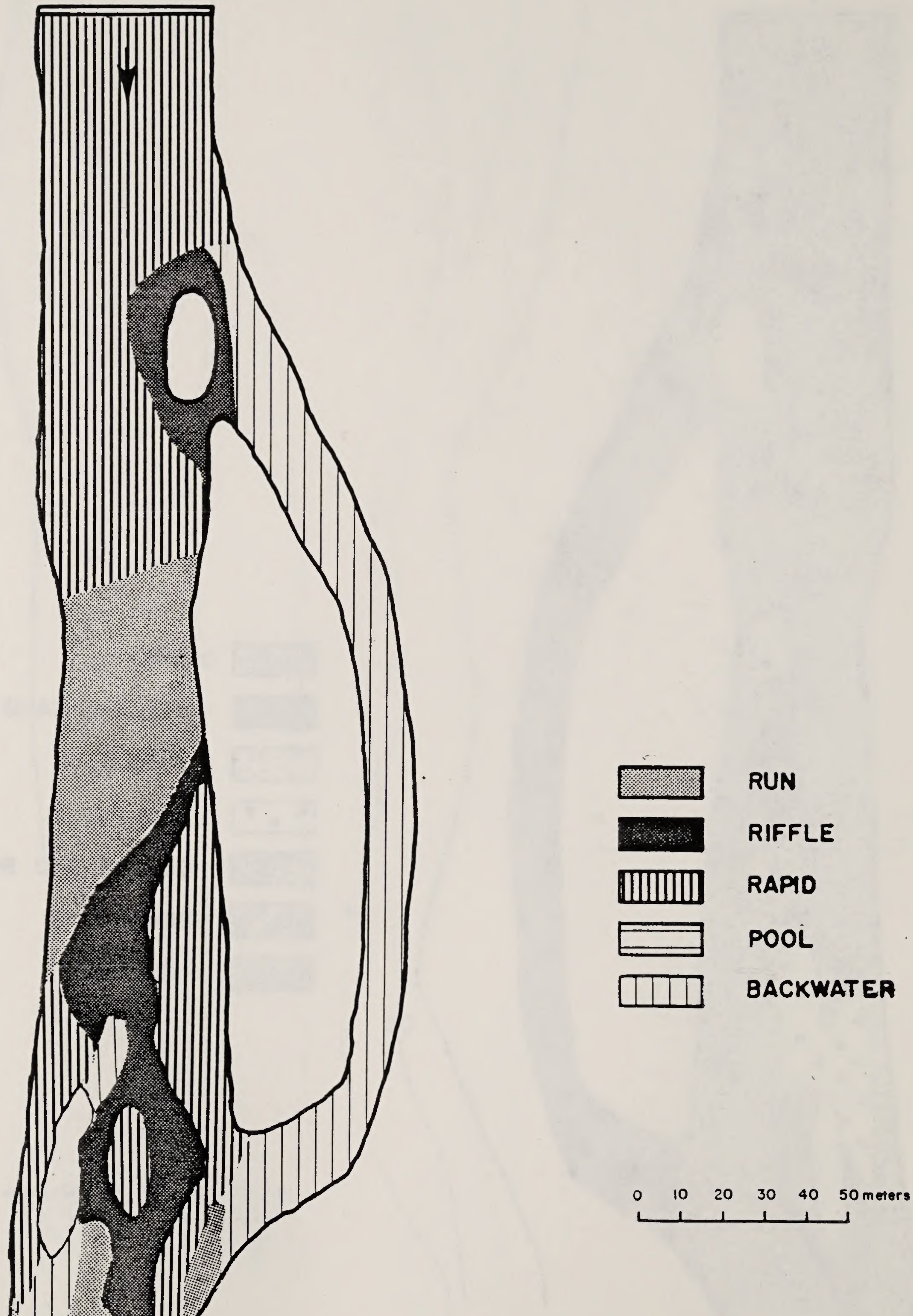


Figure A6-11. HABITAT TYPES AT THE PROPOSED BLOOMFIELD INTAKE STATION (P2–P3)

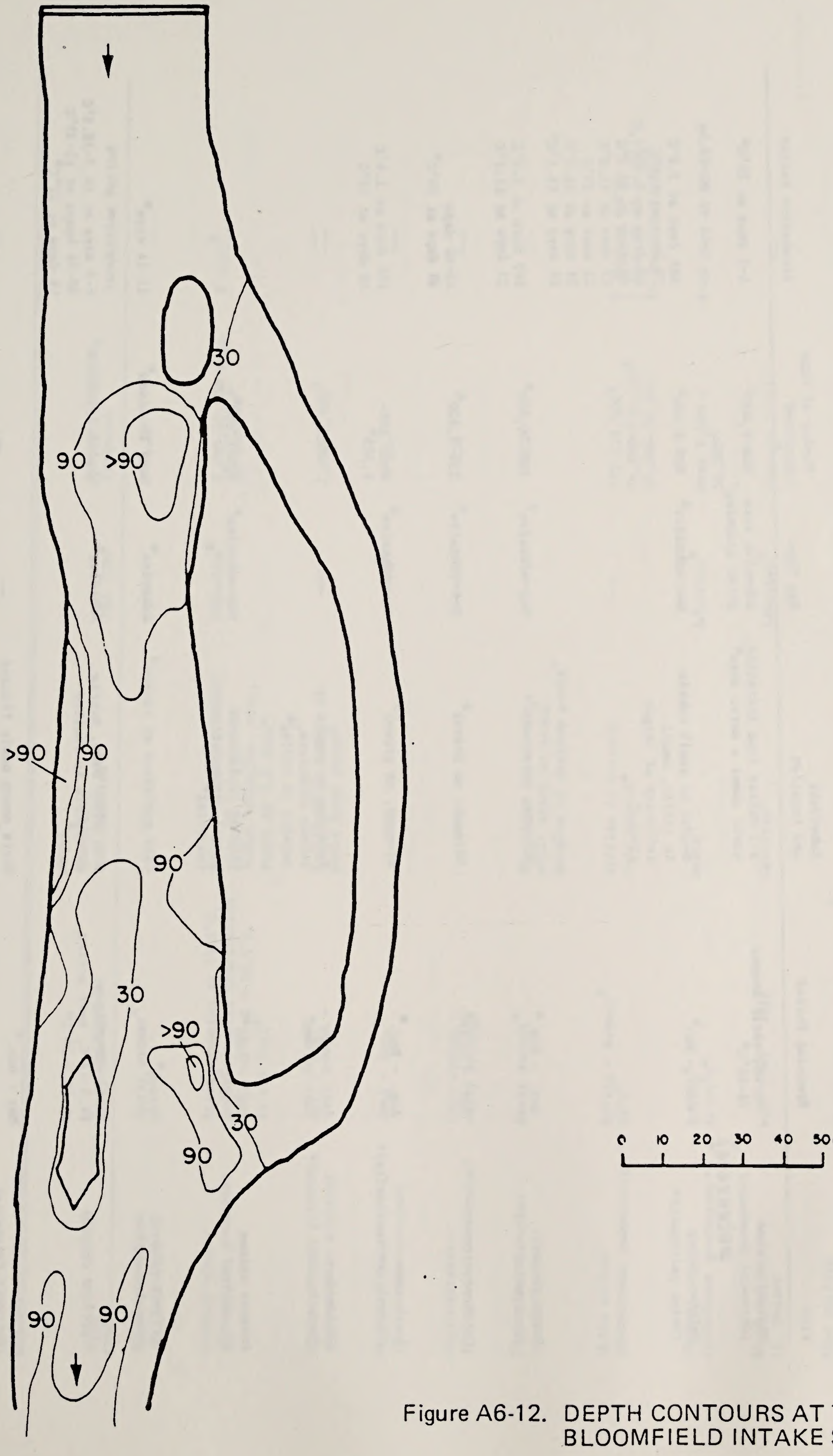


Figure A6-12. DEPTH CONTOURS AT THE PROPOSED BLOOMFIELD INTAKE STATION (P2—P3)

Appendix 7 **Reported spawning periods, substrate preferences, egg types, number of eggs produced and incubation periods of fishes ~~(excluding endangered species)~~ reported in the San Juan River (*game fish)**

Fish	Spawning Period	Substrate and Location	Egg Type	Number of Eggs Produced	Incubation Period
Threadfin shad (*Dorosoma* ~~[illegible]~~ *petenense*)	Spring-early summer 24-26°C[a]	2-3 meters from shoreline, water about a meter deep[c]	adhesive soon after spawning[a]	800-9,000[e]	4-5 days at 20°C[a]
Rainbow trout (*Salmo gairdneri*)*	Feb. - May[b]	Gravel or small rubble in riffle, small tributary of larger rivers[a]	Non-adhesive[a]	909-8,406[a]	101 days at 3.2°C 75 days at 4.8°C 44 days at 7.5°C 29 days at 10.3°C 27 days at 11.5°C 25 days at 12°C 21 days at 14.5°C 18 days at 15.5°C[a]
Brown trout (*S. trutta*)*	Oct. - Feb.[a]	Streams, in a redd[a]	Non-adhesive[a]	200-20,000[a]	165 days at 1.5°C 33 days at 11.2°C
Cutthroat trout (*S. clarki*)*	Apr. - July[a]	Streams, on gravel[a]	Non-adhesive[a]	226-4,420[a]	28-40 days 30 days at 10°C[a]
Brook trout (*Salvelinus fontinalis*)*	Aug. - Dec.[a]	Streams, on gravel[a]	Non-adhesive[a]	Mean 106-4,765[a]	142 days at 1.6°C 28 days at 15°C
Coho salmon (*Oncorhynchus kisutch*)*	late summer - late autumn[e]	Redd dug in gravel or rubble substrate, usually in riffle[a]	---	---	---
Kokanee salmon (*O. nerka*)*	Aug. - Feb.[a] 7-12°C[a]	Streams or lakes on gravel, wave action essential[a]	Non-adhesive[a]	300-1,500[a]	---
Northern pike (*Esox lucius*)*	Spring[a]	Eggs scattered at random[a]	Adhesive[a]	Many thousand[a]	12-14 days[a]
Carp (*Cyprinus carpio*)	Start spawning at 14.5-17°C, most active at 18.5-20°C[a]	Over plant beds, debris and rubble in shallow water[a]	Adhesive[a]	56,463-2,208,000[a]	4-8 days at 16.7-18.4°C 50-76 hours at 11-32°C <4 days at 22°C[a]
Red shiner (*Notropis lutrensis*)	May - Oct.[a]	Nests among newly flooded weeds[a]	---	---	---

Appendix 7 (continued)

Fish	Spawning Period	Substrate and Location	Egg Type	Number of Eggs Produced	Incubation Period
Bluntnose shiner (*N. heterolepis*)	Early summer[c]	---	---	---	---
Fathead minnow (*Pimephales promelas*)	Start spawning at 15.6°C, continue until temperature drops to 15.6 - 18.4°C in the fall[a]	Eggs attached to underside of lily pads, rocks, shingles, etc., depth at 2.5 feet[a]	Adhesive[a]	8,000-10,000 eggs in ovaries[a]	5 days[b]
Plains minnow (*Hybognathus placita*)	Apr. - Aug.[a]	Scattered in calm water near shore[a]	---	2,000-6,600[a]	---
Speckled dace (*Rhinicthys osculus*)	June - Aug.[a]	---	---	---	---
Bluehead sucker (*Catostomus discobolus*)	Late winter - early spring[a]	---	---	---	---
Flannelmouth sucker (*C. latipinnis*)	Early summer[a]	Shoreline adjacent to swift areas or along margins of shallow pools[a]	---	---	---
White sucker (*Catostomus commersoni*)	Spring - summer[a] 10°C[d]	Riffles in streams over gravel[a]	---	775-111,000[a] 36,000-139,000[d] 20,000-50,000	5 days at 18°C 7 days at 15.5-16.1°C 11 days at 13.6°C[a]
Channel catfish (*Ictalurus punctatus*)*	Spring[e] 21-24°C[a]	Nests[a]	Adhesive[a]	Mean 1,600 - 34,500[a]	9-10 days at 60-65°F[g]
Black bullhead (*I. melas*)	Late June - July[a]	Cavities[a]	Adhesive[e]	Average 3,283 - 3,845[g]	---
Blue catfish (*I. furcatus*)*	Similar to channel catfish[h]	---	---	---	---
Plains killifish (*Fundulus zebrinus*)	Apr. - May[e]	Sand-small rubble bottoms in water less than 10 cm deep[e]	---	---	---

Appendix 7 (concluded)

Fish	Spawning Period	Substrate and Location	Egg Type	Number of Eggs Produced	Incubation Period
Mosquitofish *(Gambusia affinis)*	May - Sept.[a]	Livebearers	---	1-315[a]	Average 24 days[a]
Largemouth bass *(Micropterus salmoides)**	Apr. - June 18°C or higher[e]	Nests[e]	Non-Adhesive[f]	2,000-25,000[e]	3-6 days[e]
Green sunfish *(Lepomis cyanellus)*	---	Nesting in hot, shallow pools of streams, over sand, gravel or bedrock[e]	---	---	---
Bluegill *(L. macrochirus)**	Apr. - May 20°C[e]	Nests[e]	---	2,360-49,000[e]	1.5-3 days
White crappie *(Pomoxis annularis)**	Spring - early summer[e] 15.6°C[f]	Nests near cover such as submerged brush or rock[e]	---	13,000-642,000[f]	93 hrs. at 14.4°C[f]
Black crappie *(P. nigromaculatus)**	March - July 14.4-17.8°C[f]	A depression is excavated in open water, over mud, sand or gravel bottom[e]	---	11,000-188,000[f]	57.5 hrs. at 18.3°C[f]
Mottled sculpin *(Cottus bairdi)*	Feb. - June[g]	Crevice or under rocks[g]	Adhesive[g]	Clusters of 20 to 150[g]	20-30 days at 50-60°F

a. Carlander (1969)
b. Baxter and Simon (1970)
c. Eddy and Underhill (1976)
d. Scott and Crossman (1973)
e. Minckley 1973
f. Carlander 1977
g. Wydoski and Whitney 1979
h. Koster 1957

Appendix 8

SPECIAL STATUS SPECIES IN COLORADO

STATE OF COLORADO
Richard D. Lamm, Governor
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WILDLIFE

Jack R. Grieb, Director
6060 Broadway
Denver, Colorado 80216 (825-1192)

September 8, 1982

Mr. Marvin LeNoue, Chief
Division of Resources
U. S. Bureau of Land Management
Box 1449
Santa Fe, NM 87501

Dear Mr. LeNoue:

Please accept my apologies for the late answer to your letter regarding state endangered species to be affected by the PSC of New Mexico's Steam Generating Station near Farmington. Your letter was passed through several channels before reaching my desk.

A check of our records indicates <u>no</u> state endangered wildlife would be affected by the proposal. The state endangered plant list is still in preparation and does not carry the force of law anyway.

Cordially,

Allen F. Whitaker
Wildlife Program Specialist

ag

GLOSSARY

Benthic macroinvertebrate - an animal that can be seen with the naked eye, does not have a backbone, and lives in or on the bottom of a body of water.

Biological diversity - the variety of plants or animals; the more diverse a system is, the more kinds of plants and/or animals it contains.

Biological production - the quantity of organic matter produced by a living system (i.e., by an organism, a group of organisms, or an ecosystem). Two types of production are recognized: primary production is the quantity of organic matter produced by green plants through photosynthesis; secondary production is the quantity of animal material produced.

Biological productivity - the rate of production of organic matter by living organisms (i.e., the amount per unit time).

Biota - the plant and animal life in an area.

Blue-green algae - microscopic aquatic plants that belong to the phylum Cyanophyta.

Blue List - "early warning list," presented in American Birds. Species on the list have recently given indications of noncyclical population declines or range contractions, either locally or widespread.

Caddisfly - the adults are slender insects with four wings, sometimes with hairlike scales which give them a mothlike appearance. The larvae live in water and often build cases of sand, small pebbles, leaves, etc.

Diatom - microscopic aquatic plants that belong to the phylum Bacillariophyta.

Endangered species - any species that is in danger of extinction throughout all or a significant portion of its range (PL 93-20-5, Endangered Species Act 1973).

Ephemeral stream - a stream that flows only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice, and which has a channel bottom that is always above the local water table.

Fugitive dust - particulate matter composed of soil that is uncontaminated by pollutants resulting from industrial activity.

Group I - species whose prospects of survival or recruitment in the state of New Mexico are in jeopardy.

Group II - species whose prospects of survival or recruitment within the state of New Mexico may become in jeopardy in the foreseeable future.

Intake - the place at which a liquid (primarily water) is taken into a pipe, channel, etc.

Intermittent stream - (a) a stream or reach of a stream that drains a watershed of at least 1 square mile, or (b) a stream or reach of a stream that is below the local water table for at least some part of the year and obtains its flow from both surface runoff and ground-water discharge.

Larva - an immature stage for an animal, intermediate between the egg and the adult. The larva is different in appearance from the adult.

Mayfly - also known as shad fly, salmon fly, and June bug. The adults are sluggish insects with slender filaments at the tail end of the body and have large triangular wings. The immature mayfly lives in the water, while the adult lives on land. The adult may live for only a few days, while the immature stage may last for several years.

Perennial stream - a stream or part of a stream that flows continuously during all of the calendar year as a result of ground-water discharge or surface runoff. The term does not include intermittent stream or ephemeral stream.

Periphyton - microscopic organisms that are attached to objects under water.

Petroglyph - figures, symbols, or scenes pecked or etched in rock.

Phytoplankton - microscopic plant life suspended in the water of aquatic habitats.

Plankton - microscopic aquatic plants or animals.

Raptor - predatory bird, such as the eagle, hawk, and owl.

Reproductive potential - the potential number of offspring that could be produced.

Riparian - relating to or living on the bank of a river or stream.

Substrate - soil, organic, and/or rock materials found on the bottom of aquatic habitat.

Threatened species - any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (PL 93-205, Endangered Species Act 1973).

Turbid - muddy or cloudy from having the sediment stirred up and suspended in the water column.

Unique and/or highly valued species - (1) recreationally or commercially important species (generally game species); (2) species characterized by uncertain or declining population status; (3) rare species; and (4) those species expected to be sensitive to project activities and as a result may not be capable of sustaining current populations.

Vascular plants - plants that have specialized tissues that move water and food throughout the plant.

Zooplankton - small microscopic animals suspended in the water of aquatic habitats.

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