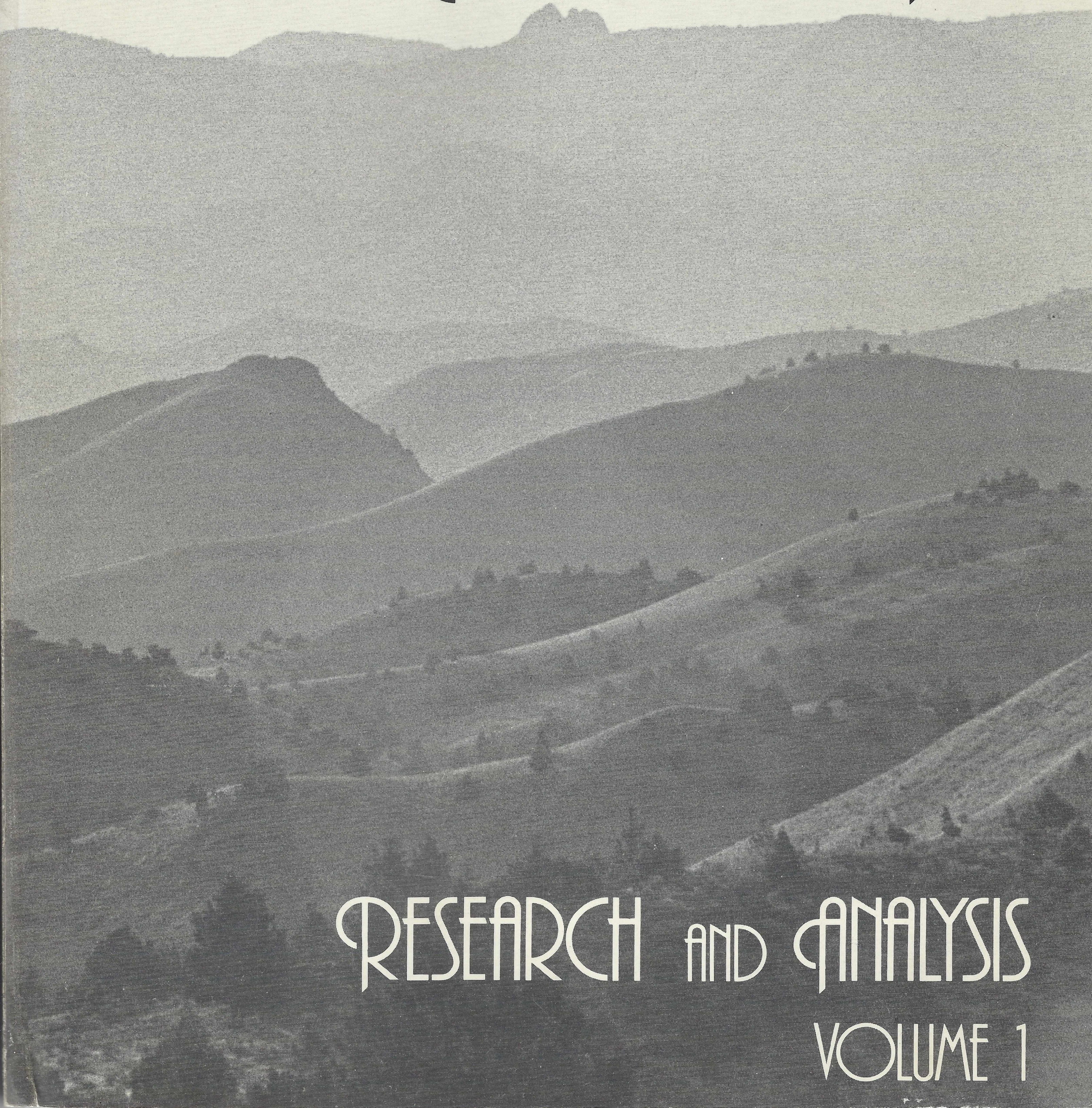
CITY OF RAJNEESHPURAM
COMPREHENSIVE PLAN



RESEARCH AND ANALYSIS
VOLUME 1

CITY OF RAJNEESHPURAM
COMPREHENSIVE PLAN

RESEARCH AND ANALYSIS
VOLUME 1

1982

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"Now the greatest challenge is how to maintain the balance of nature, how to maintain ecological harmony. It was never there before, it is a new problem.

"We have lived on this earth for millions of years. Slowly, slowly we had been growing more and more expert technologically, but we had not yet been able to destroy the natural balance; we were yet a very small force on the earth.

"Now for the first time our energy is bigger, far bigger, than the earth's energy to keep its balance. Man has become so powerful that he can destroy the natural balance.

"The modern mind has been too aggressive against nature, and it has created the ecological crisis. Our whole approach is wrong, it is destructive. We only take from the earth, and we never give anything back. We only exploit nature; we only go on taking, and all the resources are being spent.

"But things have now gone to the extreme. Either man has to drop his aggressive attitude or man has to get ready to say goodbye to this planet."

Bhagwan Shree Rajneesh

RAJNEESHPURAM CITY COUNCIL

September 7, 1982

Dear Residents and Friends of Rajneeshpuram,

Today, the City Council of Rajneeshpuram has adopted this Comprehensive Plan as the official guide for its future development. Written in three volumes, it provides a thorough description and analysis of the present, outlines broad goals and policies for the future, and details a code of standards by which we will build our new City.

Born out of the same love and commitment that created the City itself, the Plan evolved in a few short months into a document that is truly comprehensive - bringing all aspects of community life together into one integrated vision. Recognizing the interrelated nature of the community's economic base, its facilities and services, and its natural environment, the Plan provides a wholistic design for the City's development. The adoption of the Plan initiates an experiment in a balanced way of living - people uniting modern technological efficiency with respect for nature and each other.

The City Council recognizes and applauds the community-wide effort that went into this Plan. Also, the Council thanks all the federal, state, county and private agencies for their review and comments on earlier drafts.

On May 18, 1982, the City of Rajneeshpuram was incorporated. On August 10, the first City Council was elected. Now, we ask you to join us in celebrating the adoption of this Plan and taking the next major step toward making our vision real.

With love,

Rajneeshpuram City Council

CITY OF RAJNEESHPURAM, OREGON

ORDINANCE NO. 82-07

AN ORDINANCE ADOPTING A COMPREHENSIVE PLAN FOR THE CITY OF RAJNEESHPURAM; AND DECLARING AN EMERGENCY.

WHEREAS, a comprehensive plan establishing long-range goals and policies for future development, based on findings of fact, is necessary for the health, safety and general welfare of its citizens, and the orderly, efficient and economical growth of Rajneeshpuram and its surroundings; and

WHEREAS, Chapter 197 of the Oregon Revised Statutes requires that a properly prepared, coordinated comprehensive plan for Rajneeshpuram and the surrounding area be formulated and adopted; and

WHEREAS, a series of three public hearings has been held by the Rajneeshpuram City Council to provide adequate opportunity to allow and encourage all interested persons to appear and be heard on the proposed Comprehensive Plan; and

WHEREAS, the City has received extensive input from citizens and residents of the surrounding area and from the Committee for Citizen Involvement on the proposed Comprehensive Plan; and

WHEREAS, the City has received extensive input from coordinating agencies on the proposed Comprehensive Plan;

The City of Rajneeshpuram ordains as follows:

Section 1. "Research and Analysis" and "Land Use Plan."

The Rajneeshpuram "Research and Analysis," Volume 1 of the Comprehensive Plan, and "Land Use Plan," Volume 2 of the Comprehensive Plan, as presented to the Council on this day, are adopted as set out in the documents attached and by reference made a part of this Ordinance.

Section 2. Publication.

The Community Development Director is authorized and directed to prepare for the Council a final publication of the "Research and Analysis" and "Land Use Plan." The final publication will be recorded with the City Recorder and shall be the official document of this adoption Ordinance.

Section 3. Emergency.

As it is necessary for the peace, health and safety of the people of Rajneeshpuram that a complete comprehensive plan be adopted immediately to allow the provision of essential housing, medical services, governmental services and commercial services, an emergency is declared to exist and this Ordinance shall become effective upon its passage by the Council and signing by the Mayor.

PASSED: By 5-0 vote of the City Council this 7th day of September, 1982.

ma sat prabodhi
City Recorder, City of Rajneeshpuram

APPROVED: This 7th day of September, 1982.

Swami Krishna Deva
Mayor, City of Rajneeshpuram

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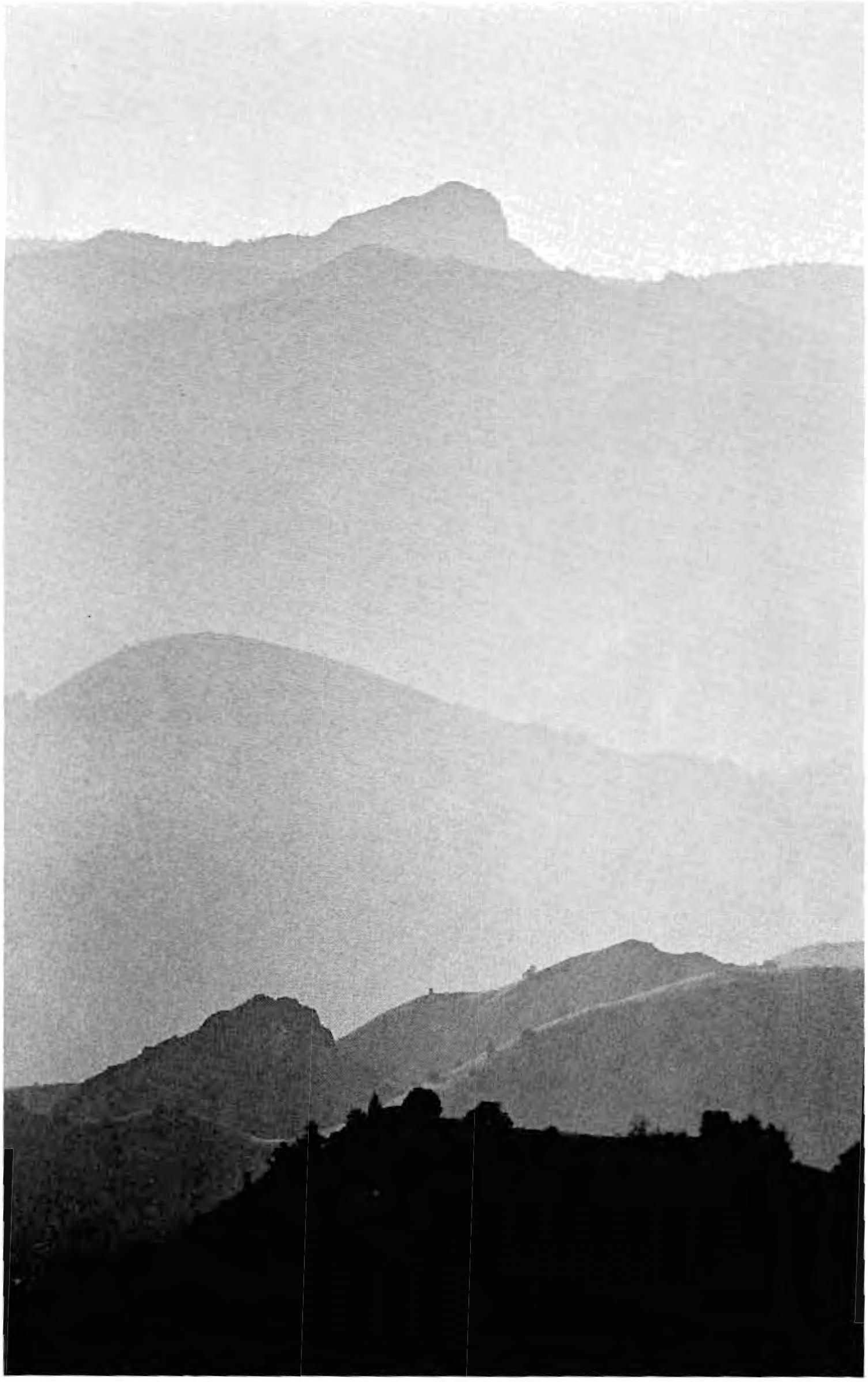

INTRODUCTION

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INTRODUCTION TO THE CITY OF RAJNEESHPURAM COMPREHENSIVE PLAN

On May 18, 1982, an unusual and historic event took place in Wasco County, Oregon. Citizens voted to incorporate an entirely new city in a rural, sparsely populated region of the Pacific Northwest. The residents incorporated Rajneeshpuram in the spirit of freedom in which this country was founded and in which it still lives and prospers. It is this spirit that has always granted enterprising individuals and groups the freedom to explore new horizons in terms of religious expression, social harmony and human, economic and technical progress.

On August 10, 1982, the next step was taken. The citizens of Rajneeshpuram elected five city council members to represent them. The council will adopt laws, guidelines and plans that are responsible to the citizens and in keeping with state and federal laws.

The creation of a new rural community in a ranch area of central Oregon requires a large continuing investment and the purchase of enormous quantities of equipment, goods and services from the surrounding communities and the state. To build a city from the ground up requires people who are willing to exert tremendous effort and resources toward a common objective. A momentum is needed in the beginning in order to build the necessary basic infrastructure and to provide for and meet the needs for housing, services and facilities. These services and facilities will be required so the City can become a functioning viable unit that will attract people and support them in a contemporary standard of living. This is especially true in an isolated area such as Rajneeshpuram, where there are no nearby services and facilities presently available.

The City of Rajneeshpuram currently has a single landowner involved in creating a communal settlement based upon the religious teachings of Bhagwan Shree Rajneesh. In the first year this group of people invested approximately 30 million dollars of which 27 million dollars were spent in Oregon with 700 companies. Within five years of Rajneeshpuram's inception, an estimated 150 million dollars in investments will have been made in the City and in the agricultural and other economic activities associated with it.

The objective is to create a rural community that will support diverse agricultural activities and have a broad economic base involving other chosen industries. The objective also encompasses a sensitive awareness of the ecology and the use of innovative technology to enhance the environment and live in harmony with nature while maintaining a high standard of living. The people presently living in Rajneeshpuram are dedicated to a cooperative effort to achieve these objectives. They are willing to build the components of the City, as evidenced in the phenomenal growth that has already taken place within and surrounding it.

The religious and economic structure of the settlement is organized under three corporations. Rajneesh Foundation International is a nonprofit tax-exempt corporation that was incorporated in New Jersey under the name of Chidvilas Rajneesh Meditation Center in February 1978. Its purpose is to promote the religious teachings of Bhagwan Shree Rajneesh. This corporation forms the legal arm of the religion of Rajneeshism, whose members are called Rajneeshees. It will build religious facilities within the City and carry out religious activities.

Rajneesh Investment Corporation is a for-profit, taxable corporation. It was incorporated in Oregon in November 1981 as a fully-owned subsidiary of Rajneesh Foundation International. Its purpose is "to engage in any lawful activities permitted under ORS Chapter 57." Rajneesh Investment Corporations presently owns all the land within the City.

Rajneesh Neo-Sannyas International Commune is a cooperative incorporated in Oregon in December 1981. Its members will include on their individual tax returns their proportionate share of the commune's taxable income.

The purpose of the commune is that of a religious community whose life is, in every respect, guided by the religious teachings of Bhagwan Shree Rajneesh and whose members have a common treasury and work to support the community. The commune leases the land within the City from Rajneesh Investment Corporation and, in conjunction with Rajneesh Investment Corporation, is the principal developer within the City, and within the farm called Rancho Rajneesh (formerly the Muddy Ranch) that surrounds the City. (The owners of Rancho Rajneesh have renamed the roads and many of the geographical sites on the land, and these new names are used throughout this Plan. Please see the Glossary at the end of this volume for a list of the new names.)

Located east of the Cascade Mountains in central Oregon, the new City of Rajneeshpuram encompasses 2,135.5 acres in three areas joined by Tao Road. The City is wholly within the boundaries of the 64,229-acre Rancho Rajneesh, which is owned by

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Rajneesh Investment Corporation and operated by Rajneesh Neo-Sannyas International Commune.

The land was first organized as a ranch in 1882, just 100 years ago. At its peak, 30,000 cattle and sheep grazed on 110,000 acres. In 1971 the property was sold; since then, it has changed hands four times. Sparse and rugged canyon country, it has been overgrazed and left to erode. The original orchard burned, two dams failed in a 1964 storm, and most of the potentially grazable land was overgrazed and neglected, leaving sagebrush, juniper trees, medusahead and cheatgrass to take over.

The intent is to reverse this downhill trend by fully restoring the agricultural capabilities of the ranch. These capabilities will form the agricultural base for the City of Rajneeshpuram. The step of incorporation was taken in order to form a viable base, socially and economically, for the work force that will convert this neglected land into fully productive acres. The City itself will be sited on predominantly non-agricultural land.

With incorporation comes the responsibility and the opportunity to prepare a comprehensive plan. From the beginning of this planning process, the Land Conservation and Development Commission's 14 Statewide Planning Goals have been used as a guide for design and planning. Rajneeshpuram is one of the first cities in Oregon with the resources, the desire and the opportunity to achieve and surpass these ambitious statewide goals. For example, conservation of natural resources will be approached not only from the viewpoint of minimizing the degradation of the environment, but also in the positive sense of working with nature to help it grow and heal itself.

Rajneeshpuram will be a practical and realistic demonstration of the interrelationship and interdependency of humankind with the total environment.

HISTORY 1981-1982

The 64,229-acre Big Muddy Ranch in Wasco and Jefferson Counties was purchased in July 1981 by Chidvilas Rajneesh Meditation Center for the purpose of starting a cooperative farm. Though large, the ranch at that time had few assets. There were two farm dwellings in the Jesus Grove area and two more elsewhere on the ranch, with remnants of old abandoned homesteads scattered in various canyons. The county road was a one-lane dirt road with some very tight curves and was virtually impassable during winter. Water came from a well dug in a frog pond and sewage was piped directly into the Kabir and Farid Creeks. Communication facilities consisted of a static-filled, seven-party telephone line and the electrical supply was a single phase line to the ranch house. Agricultural fields had been taken over by juniper trees and sagebrush. The land was so overgrazed that none of the previous four owners had found it profitable to raise cattle or sheep and the ranch had been abandoned to non-use and left in the hands of speculators.

During the year since the purchase, residents of the Rajneesh community have completed the following major projects:

- cleared and planted 1,400 of cropland;
- cleared an additional 700 acres for later planting;
- built irrigation lines to serve 135 acres of fields next to the Radha River;
- planted 3,500 fruit and nut trees and 2,500 shade and ornamental trees;
- planted 50 acres of vegetables;
- built a Class A dairy barn for a beginning herd of Holstein cows;
- set up 54 double-wide mobile homes to house ranch workers;
- drilled 24 wells for domestic water;
- built more than 20,000 linear feet or drainfields;
- installed 12 miles of 3-phase high tension electric power lines;
- built six and a half miles of roads and substantially improved 25 miles of county and private roads;
- built six small greenhouses and started construction of an 88,000-square-foot state-of-the-art solar greenhouse;
- crushed 75,000 yards of rock for roads, drainfields, surfacing and concrete;
- built a 10,000-square-foot cafeteria and bakery;

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- built a 4,000-square-foot vehicle maintenance barn;
- built a 10,000-square-foot administration building;
- constructed a four-and-a-half-mile potable water system of 8" and 10" main lines and a 125,000 gallon reservoir;
- constructed a 3.9-million-gallon sewage lagoon with a lift station to pump effluent 200' in elevation to the lagoon;
- installed telephone-using carrier equipment with five outside lines plus a 100'-tall FM radio repeater station on a ridge 3900 feet in elevation;
- built a 48' x 28' indoor solar heated swimming pool and a solar hot water system for the cafeteria;
- built a 40' x 80' building to house emergency vehicles and purchased two ambulances and a pumper fire truck;
- built an emergency medical facility with X-ray; EKG and laboratory capability;
- established a school;
- provided extensive temporary facilities for an estimated 5,000 visitors for a worldwide religious festival that was held July 3 - 7, 1982.

To put this work in perspective, this is an average of almost one major accomplishment every two weeks, carried out largely by people who were initially unfamiliar with this kind of work.

By October 1981, it had become apparent that essential services were required that could not be provided under the Exclusive Farm Use Zoning existing on the land at that time or on appropriately zoned land in nearby cities such as Antelope. The residents, therefore, petitioned Wasco County for permission to incorporate 2,135 acres of land into a city. A hearing was held on November 4, 1981 and the Wasco County Court ordered that an election be held on May 18, 1982 to determine if the residents wished to incorporate. An election was held and the citizens voted the City of Rajneeshpuram into existence. The City had a population of 186 residents as of July 1982.

JUSTIFICATION OF INCORPORATION

The City of Rajneeshpuram was incorporated by its residents to provide essential services for themselves and the surrounding area as well as to provide a stable and diverse economic base with year-round employment opportunities.

The two towns closest to Rajneeshpuram are Antelope which is 18 miles away, and Shaniko which is 28 miles distant. Both of these communities have limited services. Each has a post office and one general store. Neither provides sufficient services for a population of several hundred residents, much less for the projected population of Rajneeshpuram. In addition, citizens of Antelope have strongly stated that they wish Antelope to remain a quiet retirement community. Shaniko, even further away, must be reached via a steep winding road which is not always passable in winter. Hence, the necessary services were being sought in Madras (53 miles), Bend (93 miles), The Dalles (83 miles) and Portland (185 miles). Any development also requires a 186 mile round-trip to The Dalles for building permits and planning coordination. The same is true for inspectors coming to Rajneeshpuram. This is time-consuming and costly.

With incorporation many services can be provided at Rajneeshpuram, such as agricultural products and processed foods, clothing, furniture, vehicle and machinery repair, fuel distribution, educational, social and cultural programs, recreational areas and facilities, guest and visitor facilities, fire and emergency protection and safety and medical services. By providing these services locally, reduced transportation will greatly reduce energy consumption while assuring safety and convenience to the residents of Rajneeshpuram. Neighboring inhabitants also would benefit from some of the services such as vehicle repair, construction and professional services, and especially medical and emergency assistance. Certain goods, services, supplies and equipment, such as farm machinery, vehicle repair parts, construction materials, supplementary foodstuffs, fuel, tools, equipment, and legal, technical and medical assistance will continue to be sought in Wasco County and elsewhere in Oregon.

The City of Rajneeshpuram will provide an environment to ensure a stable and diverse economy and year-round employment opportunities. The previous owners of Rancho Rajneesh were unable to continue to farm the ranch for profit, because it is not able to support agricultural enterprises which are traditional for central Oregon, such as cattle and sheep grazing, and dryland farming. This is not the fault of recent owners, but rather the "mining-mentality" existing earlier this century where assets were taken from the land with no thought of replacement.

Today the situation is different. Labor intensive agriculture in an area of such limited real agricultural land becomes not only possible but also the obvious choice. Similarly, it makes sense to process the raw agricultural products at Rajneeshpuram rather than sell them and buy processed foods. In volume, the processing of cheese, butter, yogurt, tofu, jams, bread and pastries as well as frozen, canned and dried fruits and vegetables, become profitable. However, agricultural activities alone do not adequately reflect the range of skills available among the residents. Also, they do not provide as profitable or as stable an economic base as a more diverse economy.

A municipality can provide the land use opportunities for the potential development of various light industries such as metal working, clothing, cabinetmaking and crafts. In addition, various commercial establishments can be created as outlets for items produced locally such as audio and video products, religious printed material and food products. Facilities will also be required for commercial scale processing of food products for the comfort of ever increasing number of tourists and visitors; and for community services such as schools, health care, recreational buildings, social, cultural and entertainment needs as well as for a variety of housing types to shelter residents, visitors and tourists in an appropriate manner.

ORGANIZATION OF THE PLAN

The plan is divided into three related volumes, each following from the other. The first volume is entitled "Research and Analysis", the second "Land Use Plan", and the third "Development Code".

Volume 1 contains a detailed study of the Rajneeshpuram planning process, citizen involvement, natural resources, socio-economic issues, land use requirements, services and facilities, energy resource needs, renewable energy sources and conservation. Through this analysis environmental, social and economic issues have been identified.

Based on an analysis of the findings within Volume 1, goals, policies, and implementation strategies are developed in

Volume 2 that give form and shape to the decisions made about land use issues. Volume 3 contains definitive standards and regulations that are implementing measures for the policy framework contained in Volume 2.

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PLANNING

citizen involvement
planning process
intergovernmental coordination

0.27

I. PLANNING

1. CITIZEN INVOLVEMENT

Since July 1981 when Rancho Rajneesh was acquired, residents have been involved in all aspects of planning.

The siting of the first homes is a case in point. All of the state's land use goals were considered. Consultants in the fields of water research, soils engineering and watershed restoration were chosen, and weekly meetings were held where approximately 30 people discussed site locations for new facilities. Eventually, the houses were sited on terraces above the cultivable fields, and oriented for maximum solar access during the winter months.

The formation of the City itself was based on citizen participation. Registered voters signed the petition asking Wasco County to grant an election for incorporation and attended a hearing held in The Dalles on November 4, 1981. As new residents came to the community, they were quickly brought into the ongoing planning processes. When the ballot measure came to a vote on May 18, 1982, it was unanimous. On May 26, 1982, the County Court proclaimed the new City. Several methods have been used to familiarize the citizens with current events, state planning laws and other relevant items. Newspaper clippings are posted on bulletin boards at the communal dining hall. A weekly newsletter is issued by the Community Planning Department. Newcomers are supplied with a summary of past events and encouraged to ask questions. There is a tradition of "the Sunday Evening News," in which the activities of the week are presented in broadcast form in the cafeteria after dinner, followed by questions and/or discussion. More generally, the communal dining arrangements also contribute to personal conversations about the planning process. The community has a high level of education, so ideas are readily shared and discussed.

The Sunday night discussions and the newsletters have been used to inform people about the progress of applications for conditional use permits, utility systems and the zone change and plan amendment for Gautam the Buddha Grove at Dry Creek. In the winter and early spring of 1982 this zone change was presented at two residents' meetings in nearby Antelope.

Plans are well publicized at Rajneeshpuram. The plan itself, as well as photographs of the area, have been posted in the community dining hall for all the residents to review. Independently produced television shows covering the planning and building process at Rancho Rajneesh have been shown on video at the dining hall. As this information flows into the community, the residents feed back their responses and reactions to the planning team.

During the spring of 1982, when the Comprehensive Plan was being drafted, a more formalized program for citizen involvement evolved around "work teams", which are one of the major communication systems among residents. Each team has a coordinator who directs its activities and facilitates inter-team communication. At the weekly meeting of team coordinators the community plans and objectives are discussed and developed. These meetings are followed by smaller work team meetings where the coordinators pass on new information to every member of the community.

The team coordinators developed the idea of an Interim Committee for Citizen Involvement, and each work team was asked to locate interested people to serve on the citizens committee. Sign-up sheets were posted in each department. From the list of all interested persons, nine men and women, who represented a cross section of ages, neighborhoods, and job types, were chosen by the team coordinators. They received official notification of their selection as members of the ICCI. This list along with photographs of the committee members was posted at the cafeteria so citizens would become familiar with the composition of the ICCI.

The first task of the ICCI was to decide how to fulfill their role in the planning process, beginning with discussion of various methods for involving Rajneeshpuram's citizens. The ICCI voted to have at least one meeting each month to keep pace with the preparation of the Comprehensive Plan. In the following weeks they adopted a program and a set of goals and policies. To implement the policies they sponsored a series of town hall meetings designed to inform citizens and discuss issues related to the Preliminary Comprehensive Plan. In addition, the ICCI has assisted the planning staff in the creation and distribution of questionnaires, one on recreation, the other on vocational skills. Through their efforts 66% of the questionnaires were returned within three weeks, yielding detailed information about citizen priorities.

The strong voter turnout for the incorporation election, the large return on the questionnaires and the high attendance rate at the town hall meetings indicate the unusual level of interest in City planning among the City's residents.

The election of the City Council on August 10, 1982 raised the need to create a formal Committee for Citizen Involvement (CCI). At the first City Council meeting, on August 12, 1982, an ordinance was adopted creating a Citizen Involvement Program. Applications for membership of the CCI were publicly solicited and received by the City Council. After reviewing each application, the City Council met on August 16, 1982 and selected 15 people representing a cross section of geographic locations and work sectors to serve on the CCI. (The names of the 15 people appear below.) The first meeting of the CCI was held on the evening of August 16, with 13 members present.

The CCI has been very active and has quickly become involved in the planning process. The primary activities of the Committee are: to educate the citizens about the Comprehensive Plan, land issues and the interpretation of technical reports; to inform and involve interested citizens in the development and revision of the Preliminary Comprehensive Plan; to collect, organize and summarize citizen opinions and feelings on the critical issues; and to present citizen opinion to the City Council and ensure official follow-up.

MEMBERS OF COMMITTEE FOR CITIZEN INVOLVEMENT

Ma Sat Prabodhi - Chairperson

Swami Deva Allen

Ma Yoga Asha

Ma Prem Atta

Swami Anand Harp

Ma Prem Idama

Swami Prem Kabir

Ma Anand Puja

Ma Deva Barkha - Secretary/Treasurer

Ma Prem Sadhano

Swami Antar Samira

Swami Deva Sangeet

Ma Sanghamitra

Ma Sudipo

Ma Deva Waduda

I. PLANNING

2. PLANNING PROCESS

The City of Rajneeshpuram has an unquestionably distinctive planning opportunity centered around a single landowner, and a social and cultural structure that offers a model of cooperative living. These aspects are discussed in detail in subsequent sections; what is important here is the influence the community has on the form and function of the planning process.

The basic steps followed in the preparation of the Comprehensive Plan are familiar and follow established planning practices. What is different is the quality and quantity of input from the community, which has shaped the Plan. This arises from the common interests of the people living in Rajneeshpuram and the decision/resolution processes that are born out of the cooperative spirit of the community. It is important to understand that the usual "problems" resulting from inflexible attitudes or opinions do not come into play. Instead, the shared goals of the community, which are reflected in the Plan, are embraced by all and what may appear as "conflicts" do not arise from differing values or personal ambitions but instead from a desire to find the better answer. Lengthy democratic discussions, reminiscent of New England town meetings, lead to resolutions that are supported by all participants. However, this does not mean a consensus in every case; there are simply many avenues available to accomplish a goal and the common interests allow one to be selected and followed.

The steps in the planning process for Rajneeshpuram follow, and a diagrammatic illustration of the steps is found in Figure 1 on page 8.

STEP 1

A data base is developed describing in quantitative and qualitative terms the present social, economic and environmental conditions that affect land use.

STEP 2

These conditions are analyzed to identify situations that raise spatial and locational issues as well as concerns to be addressed through the goals and policies process. Projections and estimates of the land areas needed to accommodate the range of contemplated uses are prepared.

STEP 3

Growth and development issues are identified from the analyses in Step 2. They are addressed by preparing broad goals and specific policies and strategies to effectuate solutions.

STEP 4

Using the projections and estimates developed in Step 2 and the goals, policies and strategies of Step 3, alternative conceptual land use plans are developed. The distinctive economic function of each Planning Area (Gautam the Buddha Grove, Desiderata Canyon and Jesus Grove), along with their plysical characteristics and the aims of Oregon's Statewide Planning Goals, are considered in allocating land uses and densities. For the Comprehensive Plan, a preliminary land use plan was prepared that incorporated the best features of the alternative concepts. As a new town unencumbered with the tasks of sorting out conflicting land uses or accommodating special interests, Rajneeshpuram selected a modified "policy plan" process as most suited to the local situation. Buildable lands were divided into related topographical areas. These areas were termed "Designated Planning Areas" or DPAs for which land use designations would be established in the plan. For example, a DPA may be given the land use classification "Industrial." Then within that particular DPA the principal use might be an industrial park, but it could also embrace some related uses.

This process gives a flavor or character to each DPA that becomes a concept for its future development. These concept uses grew out of the characteristics of the land, topography, views, analysis of nuisance factors, economic function, development economics and citizen input. This DPA approach promotes flexible and innovative design solutions and is compatible with the spirit of total community involvement in the planning process. It is representative of "piecemeal development" described by Christopher Alexander in his book, The Oregon Experiment, in which development is shown to arise out of the conditions that exist at any one time and place.

STEP 5

The use of DPAs establishes a process that assures growth in an orderly fashion through coordination between initial and future phases of development. Development occurs only when essential services are in place or provided for; for example, when a developer submits a "Concept Plan" detailing the provision of services.

Concept plans will provide the general alignments for essential services such as water, sewer, roads, electricity and communications for the entire DPA. This will guide orderly, sequential development of subsequent phases. In addition, each Concept Plan will identify buildable and non-buildable land, drainage, and natural and cultural features,and address each of these factors according to the policies of the City.

Other implementation strategies are familiar. They include development guidelines and specific codes related to the community's infrastructure. Zoning maps of the City's three Planning Areas are provided. Standards are set forth to ensure that the policies, goals and strategies of the Plan will be implemented.

STEP 6

As any planning document purports to represent a future state, it contains the inherent problem of dealing with unforeseen change. Conditions, values, laws and information all change through time. To recognize this and accommodate it, a plan review will be required every five years, or sooner if warranted. This update will include, at a minimum, the following:

- The collection and incorporation of new or updated base data and other information about the community.

- A review of original projections, assumptions and conclusions.

- A review of the relevance of the original goals.

- A review of the policies implemented to date to determine their effectiveness in achieving the goals.

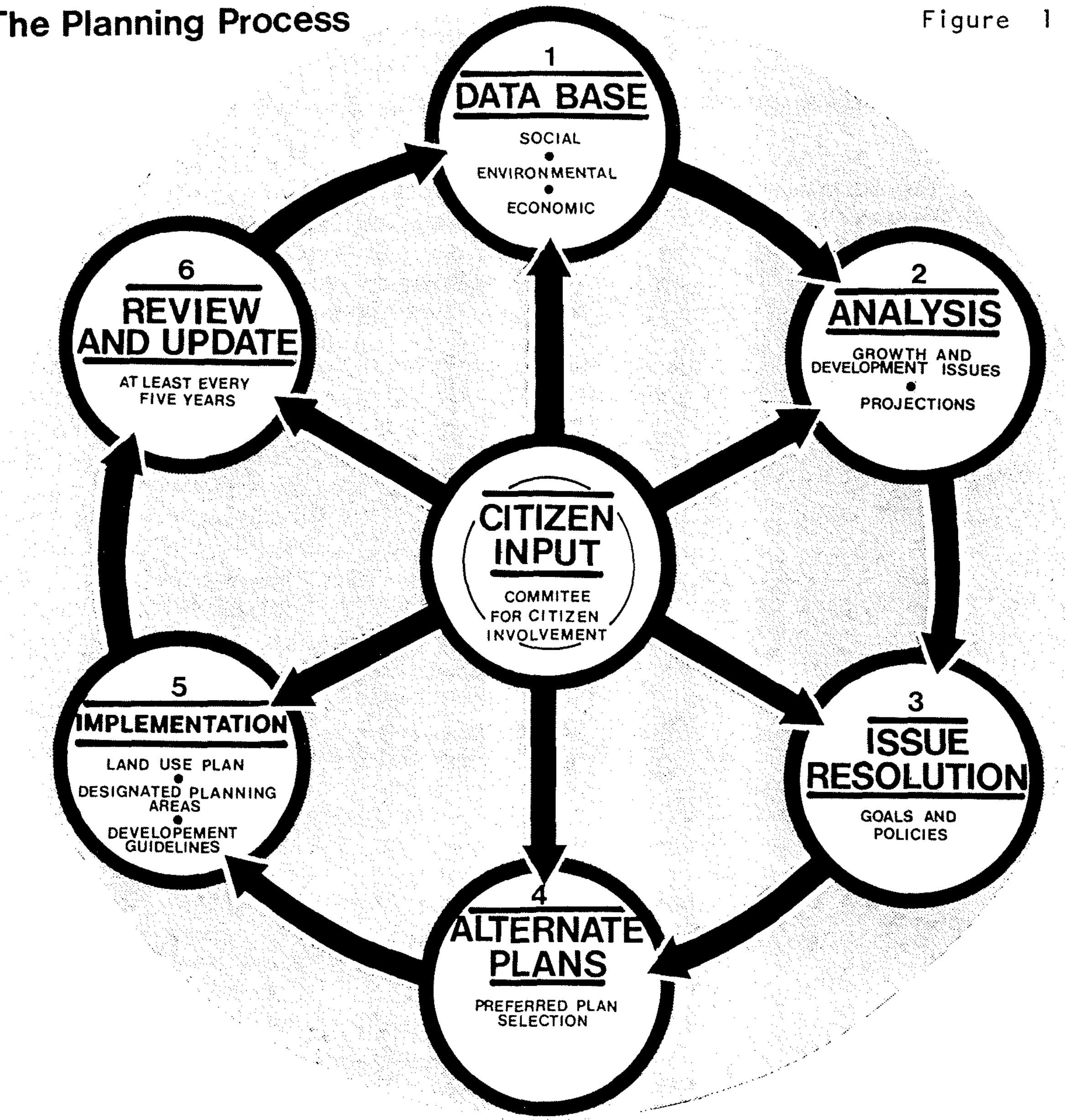
- The development of appropriate amendments to the overall Plan, if needed.

- The adoption of amendments to the Comprehensive Plan, if needed,after holding public hearings with the City Council.

In addition to the major update, the Community Development Director shall establish a land use designation monitoring program and report to council annually on the state of Plan implementation. This annual report will state whether the land use designations are achieving their primary functions and if not, make recommendations to the Council to correct the situation.

As development occurs, refinement of development standards and other implementation tools will be instituted or improved on as part of the ongoing process of implementing the Plan. (See Figure 1 below for illustration of these Steps.)

The Planning Process Figure 1



THE PLANNING AREA

When first considering the "Planning Area" for the City of Rajneeshpuram, it was recognized that the area should extend beyond the City limits. Both the geography of the terrain and the existence of a single landowner in and immediately around the City made Rancho Rajneesh a natural "Planning Area," as the following examples illustrate:

- a cooperative watershed management agreement has been entered into between the City and leaseholders of the Ranch, which assures the City of access to the surrounding watershed;
- mutual agreements also exist for the location of water and sanitation systems outside the City limits on Ranch land.

In addition, a school which is currently in the planning steps will be located outside City limits on Rancho Rajneesh. Also, the local fire district (Rajneeshpuram Rural Fire Protection District) serves both the City and parts of the Ranch. Therefore, the "Planning Area", as referred to in this Plan, is taken to encompass the City and Rancho Rajneesh.

I. PLANNING

3. INTERGOVERNMENTAL AGENCY COORDINATION

In order to coordinate the planning efforts in the development of the Comprehensive Plan, the Rajneeshpuram planning team created a well organized and comprehensive communication system with a variety of agencies and interested parties. Throughout this coordination process, the City planning team has worked in close cooperation with the Committee for Citizen Involvement (CCI). Several members of the CCI were major reviewers and rewriters of sections of the Plan.

Upon completion of the Preliminary Draft of the Plan, approximately 80 copies were distributed to the coordinating agencies. After a two-week period, all the major agencies were contacted by telephone and asked for any comments and/or recommended changes they might have. The feedback was complimentary with many useful suggestions, including a major reorganizational suggestion that was immediately adopted. Other specific recommendations were quickly incorporated into the Plan and two sets of revisions, including text and maps, were subsequently sent out to the coordinating agencies.

In the last phase of the coordination process, a series of three public hearings was held to receive input from anyone wishing to make a contribution, a comment or a suggestion. In addition to being published in the newspapers, a copy of the notice was sent to each of the agencies and a telephone call was made a week in advance to invite representatives from the agencies to attend. During the hearings there were reports from members of the CCI and several of the agencies. Again, the response from the public indicated that the Plan is a most sufficient document to aid the Council and the Community Development Director in making land use decisions that will allow the creation of this unique city in central Oregon: Rajneeshpuram.

The following is a list of the coordinating agencies involved in the preparation of this Comprehensive Plan:

FEDERAL AGENCIES	City
Agricultural Stabilization and Conservation Service	Portland
Army Corps of Engineers	Portland
Bonneville Power Administration	Portland

Department of Forestry	Prineville
Department of Housing and Urban Development	Portland
Department of the Interior - Bureau of Land Management	Portland
Department of the Interior - Bureau of Land Management	Prineville
Department of the Interior - Fish and Wildlife Service	Portland
Environmental Protection Agency	Seattle
Soil Conservation Service	The Dalles
Soil Conservation Service	Madras
Soil Conservation Service	Portland

STATE AGENCIES

County Fair Commission	Salem
Department of Agriculture	Bend
Department of Agriculture	Salem
Department of Commerce	The Dalles
Department of Commerce	Salem
Department of Commerce - Building Codes Division	Pendleton
Department of Economic Development	Bend
Department of Economic Development	Portland
Department of Economic Development	Salem
Department of Energy	Salem
Department of Environmental Quality	Bend
Department of Environmental Quality	Portland
Department of Fish and Wildlife	The Dalles
Department of Fish and Wildlife	Portland
Department of Fish and Wildlife	Prineville
Department of Forestry	Salem
Department of Forestry - West Central District	Prineville
Department of Geology and Mineral Industries	Portland
Department of Human Resources - Health Division	Portland
Department of Land Conservation and Development	Salem

Department of Revenue	Salem
Department of Transportation	Salem
Department of Transportation - Parks and Recreation Division	Bend
Department of Transportation - Parks and Recreation Division - Scenic Waterways Program	Salem
Emergency Services Division	Salem
Historic Preservation Office	Salem
Housing Division	Salem
Land Board - Division of State Lands	Salem
Land Conservation and Development Commission	Bend
Land Conservation and Development Commission	Salem
Office of the State Fire Marshal	Bend
Oregon State University - Natural Area Preserves Advisory Committee	Corvallis
Oregon State University Extension Service - Jefferson County Office	Madras
Oregon State University Extension Service - Wasco County Office	The Dalles
Public Utility Commissioner	Salem
Real Estate Division	Salem
Soil and Water Conservation Commission	Salem
Water Resources Department	Bend
Water Resources Department	Canyon City
Water Resources Department	Salem
Wheat Commission	Pendleton

COUNTY AGENCIES

Jefferson County Commissioner	Madras
Jefferson County Court	Madras
Jefferson County Planning Office	Madras
Jefferson County Roadmaster	Madras
Jefferson County Sanitarian	Madras
Jefferson County Sheriff's Department	Madras
Jefferson County Court	Moro

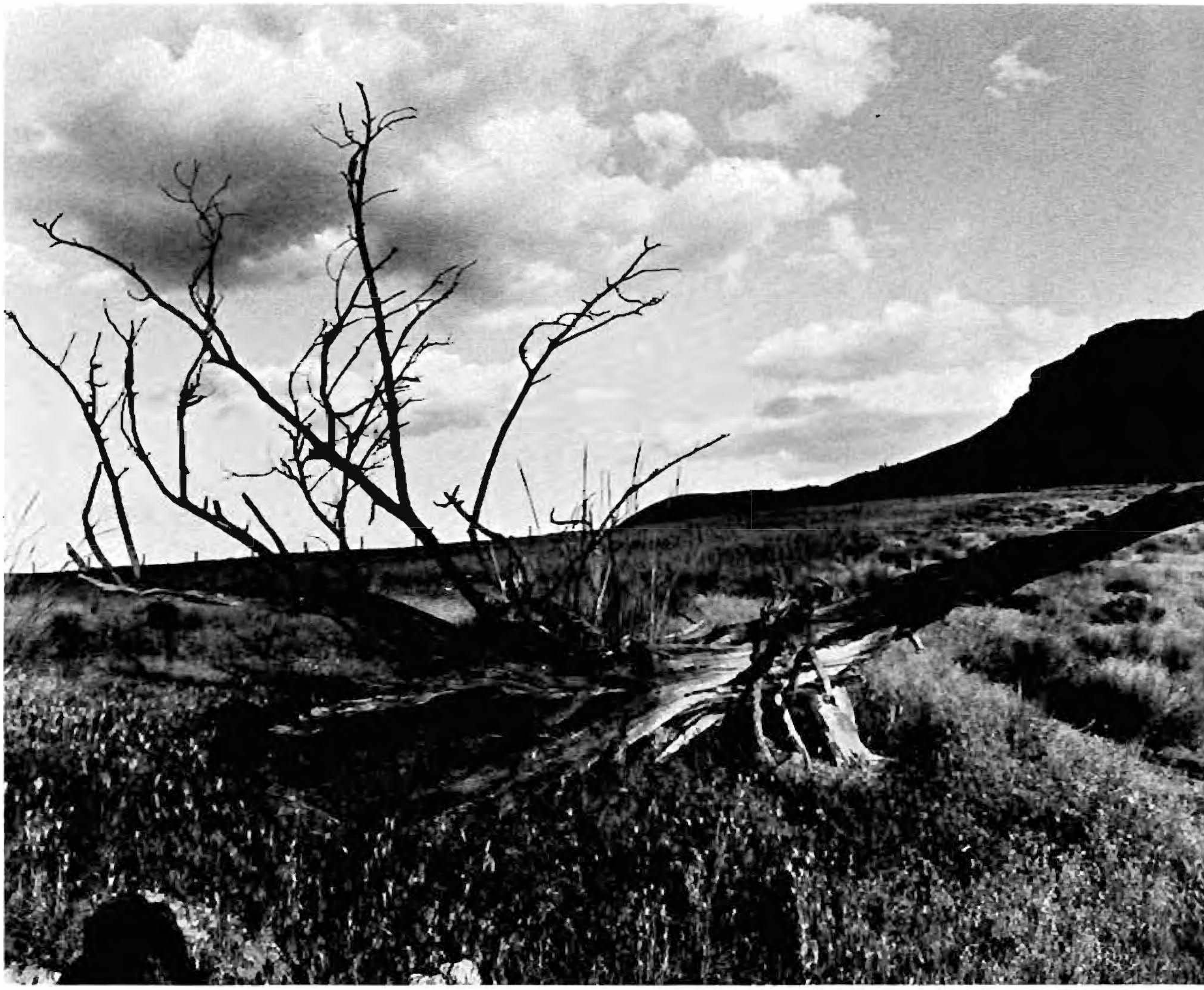
Wasco County Commissioner	The Dalles
Wasco County Court	The Dalles
Wasco County Planning Office	The Dalles
Wasco County Roadmaster	The Dalles
Wasco County Sheriff's Department	The Dalles
Wasco County Soil and Water Conservation District	The Dalles
Wasco County Watermaster	The Dalles
Wasco Rural Fire Protection District	The Dalles
Wasco-Sherman Public Health Department	The Dalles
Wheeler County Court	Fossil

MUNICIPAL AND DISTRICT

City of Antelope	Antelope
City of Maupin	Maupin
City of Shaniko	Shaniko
Rajneeshpuram Rural Fire Protection District	Rajneeshpuram
School District #84	Maupin
School District #505	Antelope

NONGOVERNMENTAL

Association of Oregon Industries	Salem
Committee for Citizen Involvement	Rajneeshpuram
League of Oregon Cities	Salem
Mid-Columbia Council of Governments	The Dalles
Mid-Columbia Economic Development District	The Dalles
Oregon Business Planning Council	Salem
Rajneesh Foundation International	Rajneeshpuram
Rajneesh Investment Corporation	Rajneeshpuram
Rajneesh Neo-Sannyas International Commune	Rajneeshpuram
State Home Builders	Salem
Wasco Electric Cooperative, Inc.	The Dalles



SETTING AND NATURAL ENVIRONMENT

14.2

II. SETTING AND NATURAL ENVIRONMENT

INTRODUCTION

Few cities have an opportunity similar to that facing the new City of Rajneeshpuram - to be born from a conceptual base and to grow from its very inception guided by a rationally developed plan. The magnitude of this opportunity is balanced by the equal responsibility attached to the decision-making process, particularly as this relates to the potential influence of development on the primary and interrelated resources of the natural environment: air, water and land. A basic task of land planning is to determine the City's capacity to sustain itself and grow on its own natural resource base. Where this base proves deficient and unobtainable without adversely affecting the balance of other systems, it becomes necessary to limit growth and development. To aid in making the rational choice, Rajneeshpuram planners are fortunate in being able to benefit from the most recent understandings and technologies emerging from the study of man's use and misues of the natural environment.

The following section describes the natural environment of which Rajneeshpuram is to become only one part - a part which, through rational planning, it is hoped will maintain a balance in the total natural environment.

II. SETTING AND NATURAL ENVIRONMENT

1. SETTING AND CLIMATE

The City of Rajneeshpuram is located in Central Oregon east of the Cascade Mountain Range, between the Deschutes - Umatilla Plateau and the Blue Mountains north of the Ochoco Mountains. It lies north of the Wasco County/Jefferson County line and west of the Radha River/Wheeler County line. (See Maps 1 and 2 on next pages.) From the center of Jesus Grove (a part of Rajneeshpuram) it is 18 miles by road northwest to the town of Antelope. Rajneeshpuram includes portions of Township 8 South and Ranges 18 and 19 East W.M.

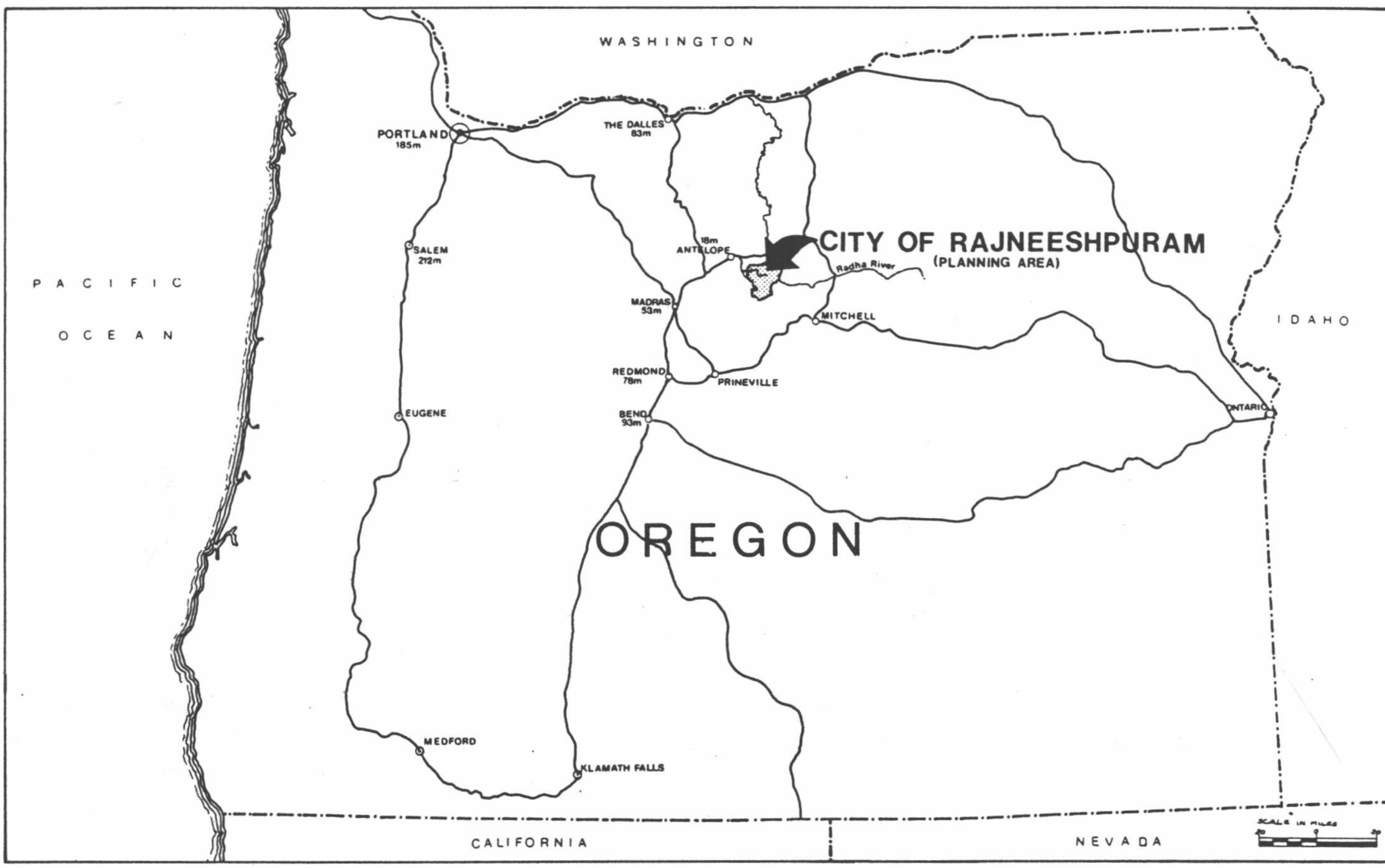
The surroundings of the City slope downward from the 4,000-foot northwestern and 4,700-foot southwestern drainage divides to an elevation of 1,400 feet at the Radha River. This area includes a wide variety of land forms, but is dominated by gentle slopes in the higher parts and by steep canyons with alternating cliffs and rounded forms as well as valley flats and alluvial fans in the lower parts. The land is drained by three major creeks: the Kabir, Farid and Buddha Creeks, all of which flow to the Radha River.

The hills are sparsley covered with juniper and sagebrush, and there are many patches of bare rock and soil. There is little vegetation remaining that is useful for grazing. The area's usefulness as a sheep and cattle ranch has declined with the depletion of its grasslands. It is, however, an area of exceptional natural beauty, and reportedly has, in the past, been used as the setting for several Hollywood movies. Within the area surrounding Rajneeshpuram there are 14,890 acres of federal land leased from the Bureau of Land Management (BLM) in addition to Rancho Rajneesh and some smaller ranches. A county road winds diagonally through Rancho Rajneesh from Siddhappa Road through the old ranch headquarters towards the town of Mitchell. This road connects the three sections of the City, each of which has its own unique topography and character.

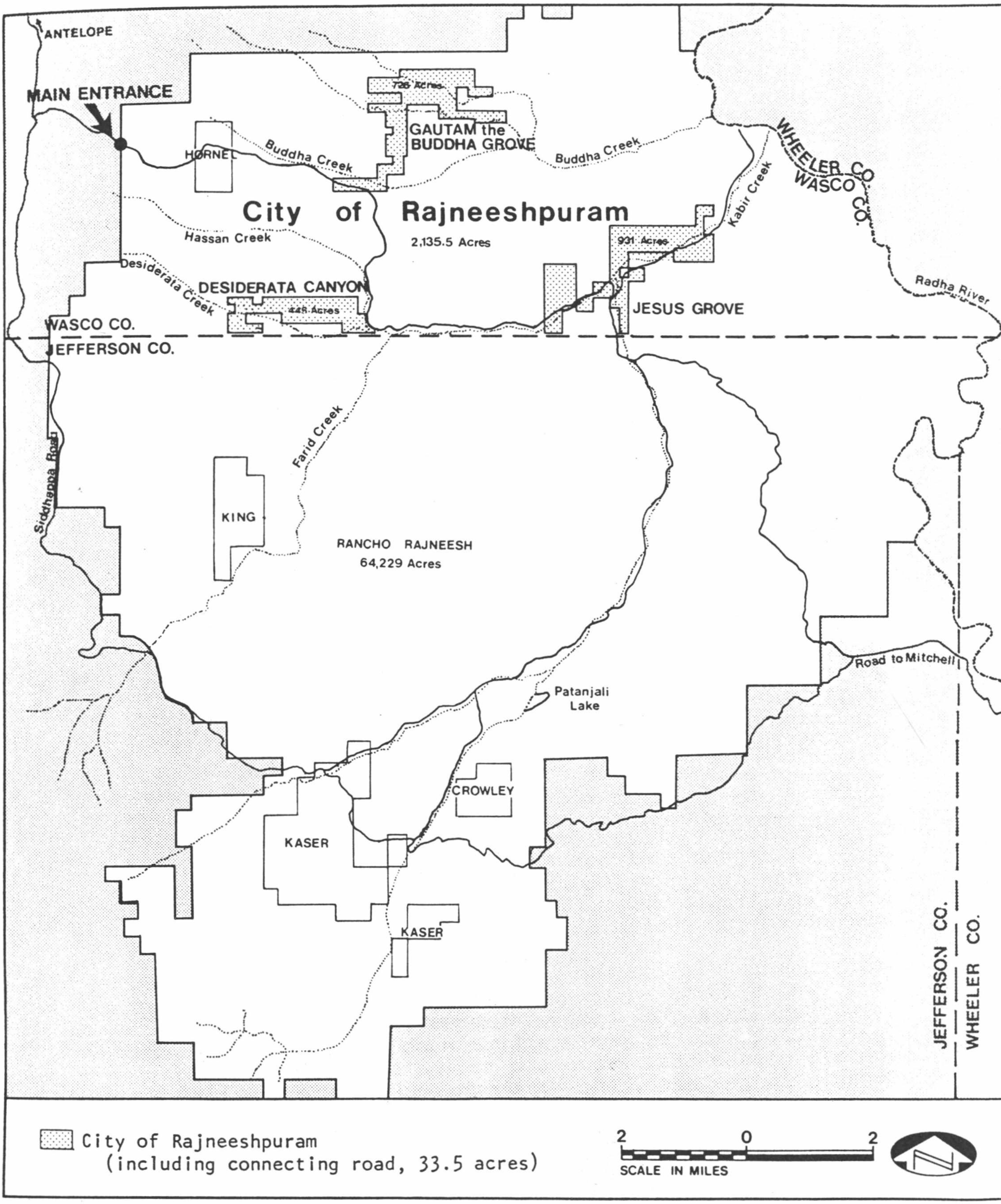
The area of the City called Gautam the Buddha Grove is located north of the other sections, high at the head of Buddha Creek. It consists of a series of rolling hills and east-west-oriented valleys that are protected from northwesterly winds by a shoulder of hills. The relatively gentle topography offers a variable terrain on which the

STATE OF OREGON - State Location Map

Map 1



Ref: USDT State Highway System Map (12/31/81)


ANTELOPE
MAIN ENTRANCE
HORNET
Buddha Creek
726 Acres
GAUTAM the BUDDHA GROVE
Buddha Creek
City of Rajneeshpuram
2,135.5 Acres
Hassan Creek
Desiderata Creek
DESIDERATA CANYON
448 Acres
931 Acres
Kabir Creek
JESUS GROVE
WHEELER CO.
WASCO CO.
Radha River
WASCO CO.
JEFFERSON CO.
Farid Creek
Siddhappa Road
KING
RANCHO RAJNEESH
64,229 Acres
Road to Mitchell
Patanjali Lake
CROWLEY
KASER
KASER
JEFFERSON CO.
WHEELER CO.
City of Rajneeshpuram
(including connecting road, 33.5 acres)
2 0 2
SCALE IN MILES
N

City can take advantage of a wide variety of views and orientations without dominating the landscape. To the east, the City overlooks a magnificent vista including the hills bordering the Radha River Canyon and several ranges of mountains that recede into the distance. It is an area that lends itself naturally to imaginative and topographically oriented planning. The area lies between 2,000 and 3,000 feet in elevation.

The Desiderata Canyon area opens up to the right at the point where the county road finishes its long, steep descent from the Rancho Rajneesh entrance. It is a beautiful canyon, thickly populated with juniper. The area on which the City is to be built consists mainly of south-facing, undulating slopes adjacent to Desiderata Creek. Elevations in this area range from approximately 2,000 feet at the creek bed to 2,800 feet in the northwest portion. The area is rich in wildlife and probably will be the most peaceful and secluded portion of the City.

Jesus Grove, the third and final portion of the City, centers around the confluence of Farid Creek and Kabir Creek. The buildings of the old Muddy Ranch are located there. They include the main ranch house and several barns and sheds that were constructed at the turn of the century. New residential buildings have been built in this area, mostly on gentle slopes that rise above the flood plain. Elevations in this portion of the City range from 1,500 feet to 2,000 feet.

CLIMATE

Climate, along with its fundamental weather patterns, influences all aspects of human enterprise. Communities have flourished or diminished in importance on the basis of their ability to understand the weather's influence or to respond to its subtle shifts.

Rajneeshpuram is located in central Oregon's high plateau area, which forms a part of the large structural depression lying between higher mountain zones to the east and west. The Cascades to the west capture much of the moisture from the air masses that reach the region from the Pacific Ocean. In the east, the Northern Rockies protect the region from the cold air masses that form in the MacKenzie River Valley of Canada and surge southward across the Great Plains on their way to the Gulf of Mexico and the Atlantic Ocean. The nearest climatological station to

Rajneeshpuram is in Antelope. It lies at an elevation of 2,680 feet above mean sea level. This corresponds to an average elevation of the Gautam the Buddha Grove area of Rajneeshpuram, whereas the Desiderata area and the Jesus Grove area have a lower elevation. Before air masses coming from the southwest, west or northwest reach the City, they have to cross a mountain range of 3,600-4,000 feet. This means that the climate of the City will be on an average somewhat drier and warmer than that of Antelope, and the climate of the surrounding mountain ranges, which provide the water, will be cooler and wetter. The weather records on the area surrounding Rajneeshpuram up to now provide data only for six months; therefore no exact statements can be made about the differences between Rajneeshpuram and Antelope.

The climate of Antelope is that of a continental highland with warm, dry summers and cool, moist winters. The mean annual temperature recorded is 48.4°F, with an average maximum of 63°F and an average minimum of 35°F. The highest temperature recorded is 109°F and the lowest is -27°F. Extremes of temperature most often occur when a continental air mass dominates the area with an east wind. The diurnal temperature variation in summer is higher than the annual (above 36°F). During the period from October to April, frost is common; May and September have some days with nightfrost; June, July and August are practically frost-free. Antelope has an average of 130 days without killing frost, 125 days with freeze-thaw cycles (frost days) and 10 days during which the temperature does not rise above 32°F (ice-days). Minimum temperatures average in the mid-twenties during the coldest winter months, but during isolated cold spells they may drop below 0°F. In summer, maximum temperatures may exceed 100°F. Even when temperatures are high during the day, they drop sufficiently to provide cool nights throughout the summer months.

Sunshine and cloud cover values vary through the year. At least nine months of the year are not significantly cloudy. In summer, a clear or hazy sky is the rule. In winter, several days in a row may be cloudy. Solar radiation reaches its maximum value in July.

The average annual precipitation at Antelope is 12.97 inches (maximum 18.3 inches in 1948, minimum 7.0 inches in 1939). The average snowfall is 22.4 inches, which is equal to approximately 2.24 inches of rain. Heaviest amounts of precipitation fall from November to January, although May is another rainy month. Precipitation is predominantly light rain and snow in winter. However, this may occasionally change into heavy downpours during late spring. Summer thunderstorms also can contain downpours and are sometimes accompanied by hail. These events are significant enough to require proper flood control construction and management measures.

Relative humidities during the warmer months are quite low: the afternoon average during the months of July and August is approximately 20%, thus materially reducing the discomfort otherwise associated with the few abnormally high temperatures that do occur. The annual evaporation of a class A evaporation pan (as used by the U.S. Weather Bureau) is approximately 50 inches (interpolated); 80% of that occurs during the months of May through October.

The Walter and Lieth climatogram (see Figure 2, next page) provides a clear picture of the distribution of temperature and precipitation throughout the year. In addition, it demonstrates the moisture limitations to plant growth. When a scale of 50 F versus 0.8 inches precipitation is used, it shows that the four months of June through September are arid; i.e., they have more evaporation than precipitation. The scale of 50 F versus 1.2 inches delineates the "dry" months. These are the months during which plants will grow but will suffer from water deficiency, causing low productivity. The situation is even worse in dry years, when the precipitation is below the average; this may lead to as many as seven arid months. The potential for longer dry periods means that dryland crop production will be marginal in many years and that irrigation of most crops is a must.

In the Lauer and Creutzburg classification of climate, the delineation between semi-arid and semi-humid (i.e. subhumid) zones lies at a maximum of five humid months. Applied to the results of the climatogram, this means that the climate of Antelope is subhumid, and close to semi-arid. The area surrounding Rajneeshpuram that is above 2,600 feet is presumably subhumid with only occasional semi-arid years. The area below 2,600 feet is semi-arid with occasional subhumid years.

According to the Koeppen and Trewartha (1968) classification, Antelope has a Dsb climate; i.e., a subhumid, cool temperature (microthermal), continental highland climate with warm summers and cool winters (Db) and a drought in summer (s). This climate is found in the upper parts of

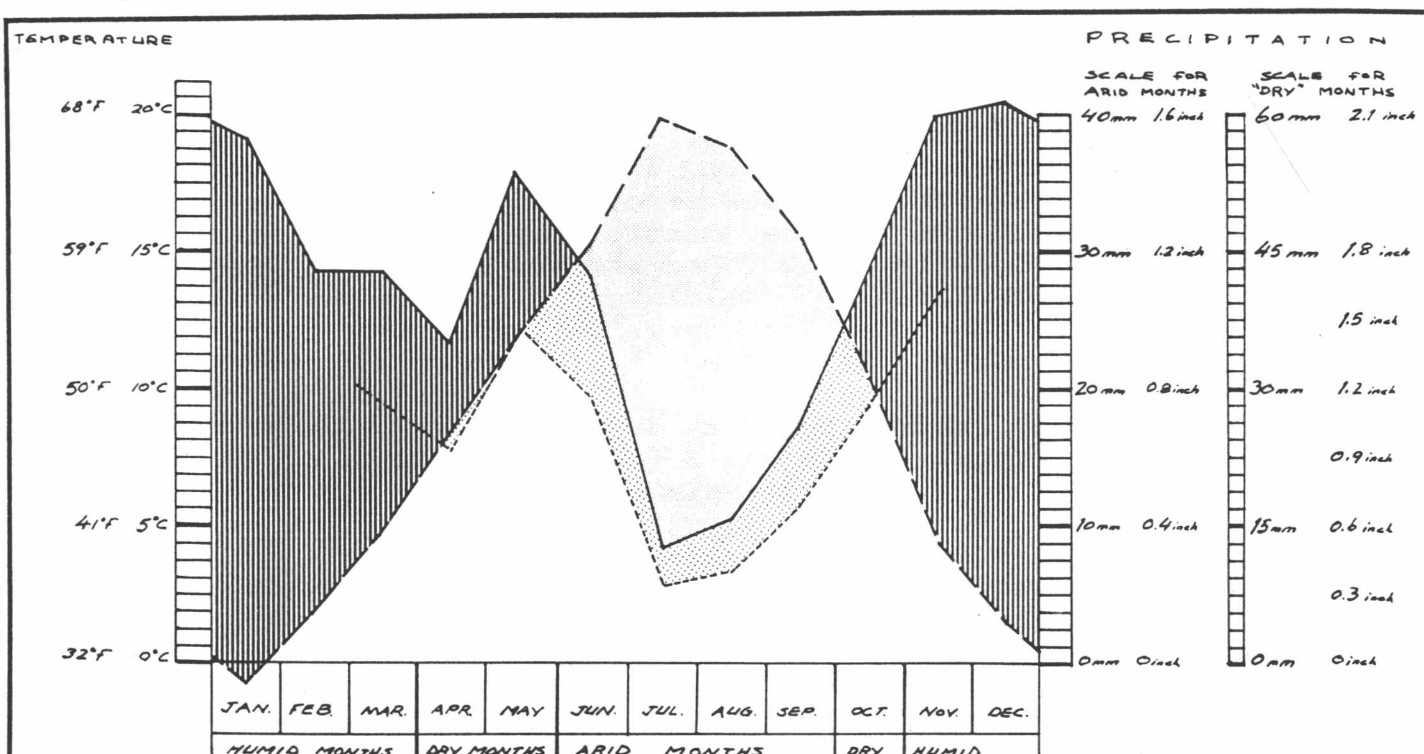
Rajneeshpuram and the surrounding area. The lower parts have a BSk climate, i.e., a cold (k), semi-arid (P) steppe (S) climate.

According to the Thornthwaite (1931) classification, Antelope has a CC'd climate. This is a subhumid (C) microthermal (C') grassland climate with drought all year round (d). This climate is found in the upper parts of Rajneeshpuram and the surrounding area. The lower parts have a DC'd climate. This is a semi-arid (D), microthermal (C') steppe climate with drought throughout the year. The water supplies in winter are not efficient for plants because of the frost; that is why the winter surplus is not counted.

According to the Thornthwaite (1948) classification, which is the most sophisticated classification so far available, the entire area of Rajneeshpuram has a $C_1C'_2d$ climate. This is a dry subhumid (C_1), microthermal (C'_2) climate with a little moisture surplus (d) in winter. (For details of the definition and calculation of climate formulas, see Appendix 3.)

Climatogram of Antelope

Figure 2



Average Temperature 48.4°F
Annual Precipitation 12.8 inches
Elevation 2,680 feet
Length of Record 30 years

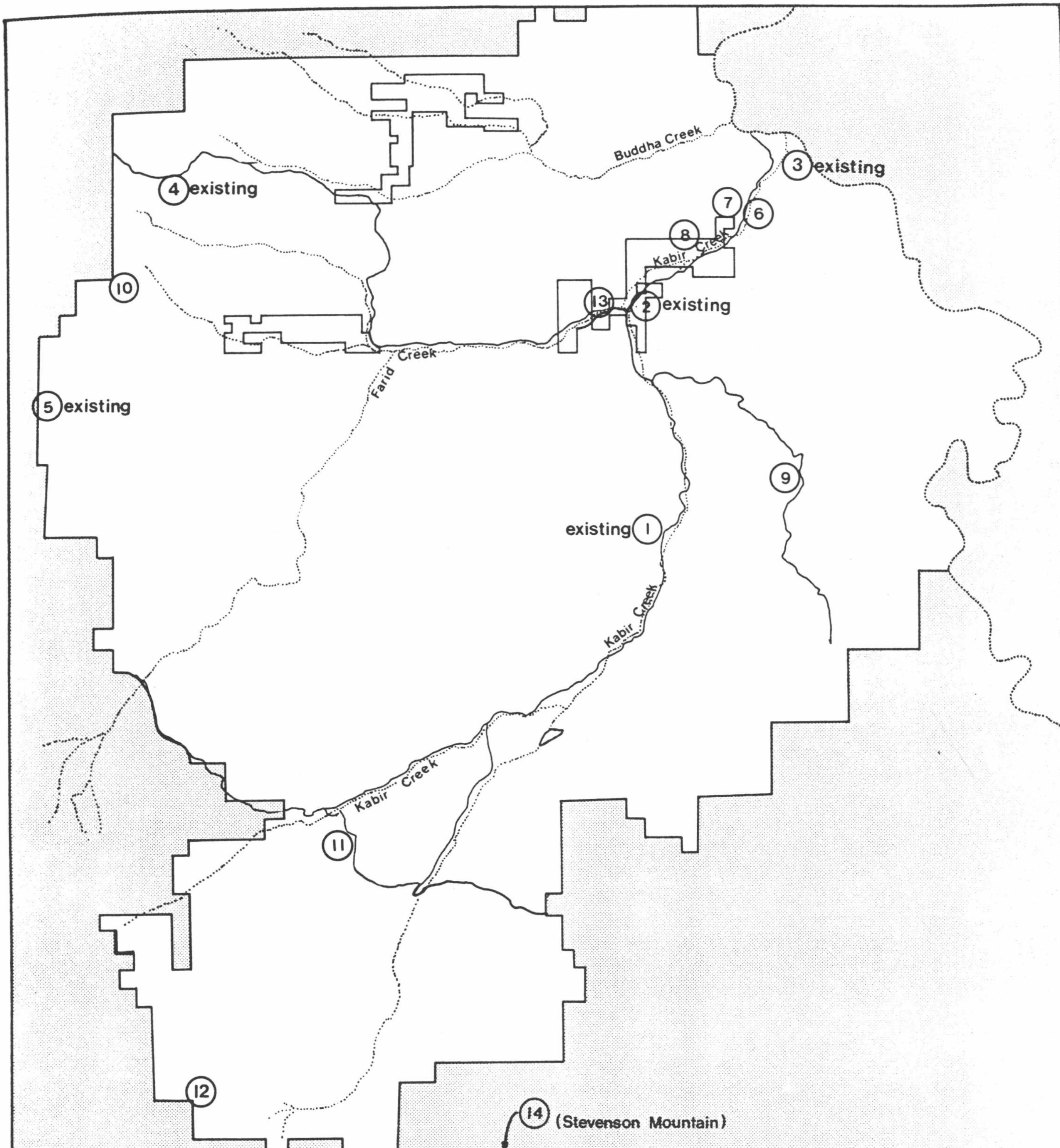
Humid
Dry
Arid

Ref: Climatological Handbook Columbia Basin States Volume I and II - Pacific N.W. River Basins Commission

Siginificant local variations in climatic conditions occur because of widely varying topography such as mountains, broad valleys, ridges and narrow canyons. The wind, rain and snow tend to follow major valleys. There is a funnel effect in canyons: the wind accelerates through these narrow channels. It has been observed from November to April that the snow and rain come mainly from the southwest, down from the higher elevations, along and controlled by the main valleys, especially along Suzuki, Farid and parts of Kabir creeks. Generally, it has been observed that the higher elevations of the City, Gautam the Buddha Grove and Desiderata Canyon, receive more precipitation and are cooler than Jesus Grove, which is located at a lower elevation and in a wind-and-rain shadow created by a ridge that lies to the west. On the other hand, there are occasional periods of inversion during the winter. Temperatures in the Radha River Basin then tend to be several degrees lower than in the higher City areas.

Incumbent in the developmental process for Rajneeshpuram has been the recognition of the need for securing and maintaining weather information to permit adequate planning for transportation, communication and drainage systems, shelter, water availability, marketing services, tourism and emergency services. For the past six months, weather data have been gathered and maintained from 14 weather stations in and around Rajneeshpuram. (See Map 3, next page.) All are equipped with precipitation measurement devices and thermohydrographs (recording instruments for the measurement of temperature and humidity), and one station records barometric pressure as well. Although not associated with established weather station sites, an evaporation tank has been maintained at the Jesus Grove sewage lagoon site for one month to provide information on surface evaporation rates. The weather stations are serviced on a weekly basis. All weather data are collected and stored in the community record system at Rajneeshpuram. The climate monitoring program in Volume 2 gives the details of the planned extension of the weather stations and their equipment.

Directly related to certain weather factors is the measurement of surface water flow and groundwater supplies that affect the City's water supply. This aspect is addressed elsewhere in this Plan; see the chapter entitled "Setting and Natural Environment: Water."



Station 2 Main Station
Station 10 Hygrothermograph, Darograph, snow and rain recorder
Station 1, 3, 4 Hygrothermograph, rain and snow gauge
Station 5, 9, 11, 12 Rain and snow gauge
Station 6, 7, 8 Max-Min Thermometer
Station 13 Temperature and wind speed
Arterial Road
Creeks/River

2 0 2
SCALE IN MILES

II. SETTING AND NATURAL ENVIRONMENT

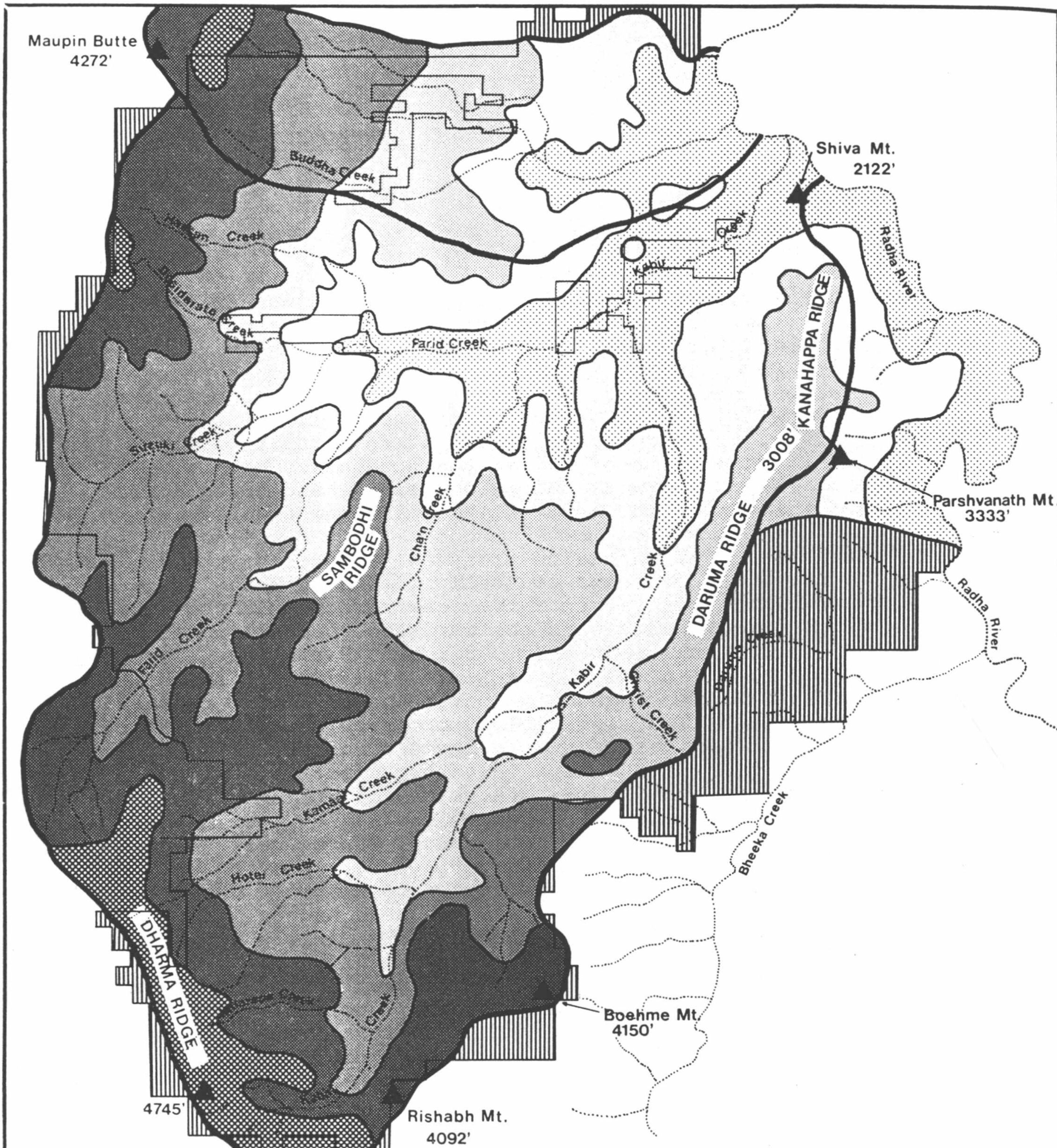
2. LAND

DRAINAGE AND TOPOGRAPHY

The natural boundary of the area in which Rajneeshpuram is located is the drainage divide of the catchment of Gautam the Buddha Creek, Farid Creek and Kabir Creek. With an arc of high mountains to the west, south and southeast, its shape is that of a large amphitheater. The area is open to the northeast and east, where the above-mentioned creeks flow into the Radha River, which comprises the eastern boundary of the catchment. The mouths of Gautam the Buddha and Kabir creeks lie only one mile apart. The main drainage and topographic features are shown on Map 4 on the following page.

The high circle of mountains starts at Francis Mountain (4,274 feet) and proceeds southerly to Dharma Ridge (which rises to 4,745 feet), then curves eastward to Rishabh Mountain (4,092 feet), then northeastwards to Boehme Mountain (4,150 feet), Daruma Ridge (3,008 feet), Parshvanath Mountain (3,333 feet) and Kanahappa Ridge (3,157 feet) to Shiva Mountain (2,122 feet) and the confluence of Kabir Creek and the Radha River. Two significant topographic divides separate the catchment and drainage into three broad systems. North of a ridge trending in a general easterly direction between Gautam the Buddha and Kabir creeks the drainage is all through Gautam the Buddha Creek to the Radha River. East of the divide formed by the Daruma Ridge, Parthvanath Mountain and Kanahappa Ridge, the drainage is mostly eastwards direct to the Radha River via short, steep tributaries. Bheeka Creek, which flows along the southeastern boundary of Rancho Rajneesh to the Radha River, is the only sizable creek in this drainage system. Between these two divides, about 100 square miles of land drains either directly or through Farid Creek to Kabir Creek. Ultimately, all runoff flows into the Radha River. The area has numerous springs. Most, like the creeks, are seasonal but a few are perennial (e.g. Vimalkirti Springs). Generally, the creeks and springs are dry from July to November.

The topography of the area surrounding Rajneeshpuram can be termed mountainous highland. The hills and mountains have different shapes due to their different rock composition. The following land forms have been observed:



Boundaries of Major Watershed Areas
Drainage Area to Neighboring Properties
4,000 foot elevations
3,500 - 4,000 foot elevations
3,000 - 3,500 foot elevations
2,500 - 3,000 foot elevations
2,000 - 2,500 foot elevations
1,500 - 2,000 foot elevations

2 0 2
SCALE IN MILES

- dome-like forms with low-angled convex summits and steep convex slopes;

- table-like plateaus and cuestas with partially stepped steep concave slopes and almost vertical sections in hard rocks; irregularly shaped mountains with many rock outcrops on straight steep slopes;

- hilly to gently undulating sections with a generally flat but irregular surface.

The valleys show the following forms:

- V-shaped narrow valleys with steep convex slopes or canyons with almost vertical slopes. These forms have high gradients, a stepped longitudinal profile, and no or only a narrow valley floor.

- flat-floored, broad valleys with steep convex to low-angled concave slopes; the valleys commonly contain valley-fill alluvium of Holocene age, which is dissected down to 10 to 15 feet by the meandering river, thus forming vertical undercut slopes and a river terrace above. These young incisions are called arroyos. They contain a low waterbed, a high waterbed, and a terrace-like high flood bed.

- side valleys that often widen and have alluvial fans at the places where tributary streams drain to the main river. The alluvial fans in places force the river to shift to the opposite side of the main valley. The mentioned valley fill and these fans are the only really flat areas in the local area.

GEOLOGICAL HISTORY

A study of the geological processes that have been building and altering the land since ancient times will give a better understanding of the present landscape and of the character, potential and limitations of the land surrounding Rajneeshpuram. The following is a reconstruction of the events leading to the present land form:

The area, as we now see it, began forming during the Cretaceous Period, more than 60 million years ago. Thousands of feet and sediment were deposited in shallow marine seas and deltas. The seas withdrew and a long period of erosion followed. The slaty rocks (Muddy Ranch Phyllite) and conglomerates found in the steep smooth-surfaced hills surrounding the Jesus Grove area represent the rocks formed during the Cretaceous Period.

Since this time, eastern Oregon has been a land of volcanoes, mountain building and erosion. Around 50 million years ago (during the Eocene Epoch of the Tertiary Period), the region was a huge inland basin with shallow slopes above broad flood plains and numerous lakes. The next 10 million years saw intense volcanic activity from widely scattered centers that resulted in the accumulation in places of more than 5,000 feet of lavas and pyroclastic rocks of various composition, interlayered with lacustrine and fluvial deposits.

This thick sequence of rocks, now called the Clarno Formation, occupies most of the ranch. Geologists have divided the Formation into upper (younger) Clarno and lower (older) Clarno rocks. The events that led to this division are significant in that they have greatly affected the nature and shape of the land ever since.

The lower Clarno rocks, which represent the bulk of the Clarno formation, were formed mainly from airborne ash and ash flows falling into water. Reworking by the water has formed thick deposits of soft tuffaceous sediments, mudflows and claystones. Well preserved abundant plant fossils found in Clarno rocks in the region indicate a subtropical, humid forest environment. Palms, figs, avocados, pecans, walnuts, and oaks were growing. Fish, tapir, rhinoceros, crocodile and horse remains have also been found. Interbedded with these sediments are some local lava flows that have rapid lateral and vertical variation in composition.

A long period of volcanic quiescience followed, during which a red soil horizon of variable thickness formed in the subtropical humid forest conditions. This ancient red soil (called Saprolite), rich in petrified wood, is now exposed on the surface in numerous places on the ranch.

A brief but intense period of crustal compression from the northwest-southeast directions then happened. The lower Clarno rocks were uplifted, gently folded along northeasterly trending fold axes, and down-tilted in the same northeasterly direction. This folding and tilting has shaped the direction of the rivers and led to the amphitheater landform existing today.

A brief, highly variable period of volcanic activity then occurred in a few localized areas. The rocks are mainly lava flows, breccias and domes with some interbedded tuffs and ash deposits. In places such as Desiderata Canyon and Gautam the Buddha Grove, these upper Clarno deposits are represented only by a thin andesitic lava flow with or without an overlying thin red saprolite soil horizon. Numerous volcanic vent plugs, dikes and irregular bodies have intruded into the Clarno formation rocks. These intrusions stand out today as near-vertical, high, resistant peaks.

The present day greasy, crumbly clayey appearance of the Clarno rocks can be attributed to alteration that took place during and after deposition. Physical alteration was caused by lava flow movement brecciation and by the shrink cracking (jointing) that happens as lavas cool. Faulting, folding and crushing were caused by subsequent earth movement. Chemical alteration was caused by lava head and chemical effects, by hydrothermal solutions and by erosion. Alteration products are generally clays (mostly bentonitic swelling types), calcite and oxidation minerals. Tuff beds lost their original ash fragmental texture and now appear as claystones.

As a result of all this alteration, the rocks today are characterized by numerous calcite and quartz veinlets; by red, blue and green discoloration and coatings, and by the in-fillings of gas-formed cavities by silica minerals that rock hounds collect as agates, jaspers, crystals and thunder eggs. The soils are characterized by the ubiquitous swelling clays that develop the typical popcorn-like appearance.

The next major geologic event commenced some 36 to 40 million years ago with eruptions of a widespread welded rhyolite ash flow. These eruptions were in the form of what is known as nuee ardente or "glowing avalanche." Dense clouds of incandescent volcanic glass flowed rapidly, horizontally, in a gaseous, viscous state. The heat of the ashy glass welded the deposit together. Uneroded remnants of these eruptions exist in the northwest parts of the ranch. A lengthy period (perhaps 15-20 million years) of mainly silica-rich volcanism followed, which deposited the rocks now known as the John Day Formation (Oligocene-Miocene). Rhyolitic ash was blown eastward into what is called the John Day Basin from erupting volcanoes centered in and east of the Cascade Mountains. The John Day Formation consists of about 4,000 feet of mostly interbedded rhyolite flows, domes, welded ash flow sheets, ash fall deposits, water-laid tuffs, and intrusives. The Clarno and John Day beds in the region are world famous for an abundance of fossilized bones, leaves and petrified wood. Archaic large mammals such as the titanotheres, and small ancestors of modern mammals such as the four-toed forest horse Eohippus, which was the size of a fox terrier, roamed subtropical forests during the Eocene Epoch. Many important links in the evolutionary chain of mammals have been found in the John Day fossil beds. For example, the three-toed horse Mesohippus, which was a forest dweller the size of a sheep, had teeth for browsing instead of grazing. Only a few scattered leaf fossils have been found in proposed City areas but developers and residents will be alert for finds that may add to the scientific knowledge of the region.

Again, a long period of volcanic quiescence followed, accompanied by extensive erosion and removal of much of the John Day rocks. About middle Miocene time (perhaps 15-18 million years ago) extensive horizontal basalt lava flows (Columbia River Group) covered the entire region. These columnar jointed flows, in some places several hundred feet thick, form the present Deschutes-Umatilla plateau extending from near Antelope towards The Dalles. The present landscape of the northwestern parts of the Gautam the Buddha Creek catchment is greatly influenced by regional major landslide activity that probably originated during the Pleistocene (generally considered to have occurred in the past one million years) when the climate was much wetter than today. Huge blocks (as big as three miles by 1.5 miles) of the more competent Columbia River basalt (and in places John Day welded ash-flow sheets) slid over softer, less competent tuffaceous clayey layers of the John Day and Clarno formations. The huge landslide movements broke up the sliding masses and crushed and gouged the underlying rocks, rendering the slide areas more susceptible to erosion. These areas today are distinguished by subdued undulating topography with chaotic masses of angular blocks and unsorted mixtures of basalt and tuffaceous debris.

Since this time the only significant volcanic activity has been the deposition of several feet of ash and pumice which may have come from the Mazama eruption (Crater Lake, near Bend) some 6000 years ago. Small areas of uneroded sandy remnants of this deposit are found in several places in Rajneeshpuram.

GEOLOGICAL INFLUENCES OF LANDFORMS

Landforms throughout the area can be seen to reflect the local geology. The extreme lateral and vertical variation in rock type, hardness, secondary alteration and structure has resulted in irregular local changes in land form.

Lower Clarno formations contain generally soft clayey tuffs, ash deposits, claystones and red saprolite. These are more susceptible to erosion and have commonly formed broad valleys with rounded, smooth-surfaced hills. These features are well illustrated in Desiderata Canyon.

Upper Clarno rocks are typically hard lavas, which, being more resistant to weathering, have formed ridges, cappings and steep steps on slopes. Lava flows commonly have "breakaway" features; i.e., steep cliff edges with cooling joints and a broken, crumbly rock appearance. These features can also be seen in Desiderata Canyon in areas of steep slopes.

The ancient landslide area in Gautam the Buddha Grove and the surrounding area has its own peculiar land form: irregular but more subdued undulating hills, sag ponds, and chaotic blocks and piles of rock debris. This area has a "stepped plateau" appearance. Some of the buttes and protruding dominant peaks seen in the Jesus Grove area and throughout the ranch are ancient volcanic vent plugs, dikes and other vertical intrusives, and some are erosional remnants of lava flows. Devateertha Rock, a local scenic feature in Section 31 T8S R19E, is a vertical intrusive lava that displays near-perfect cooling joint columns.

The outstanding "hoodoo" type formations (nature's rock carvings) such as the balanced rocks that can be seen along the county road in Section 35 T85 R18E, are a result of irregular erosion of horizontal strata of varying hardness (in this locality, tuffs). This effect is common in climates where most rainfall is concentrated during a short period of the year. Weathering of lavas and hard tuffs commonly forms near-vertical cliffs that appear to protrude out of steep straight slopes. This feature can be seen at the entrance to Desiderata Canyon.

DESCRIPTION OF GEOLOGIC FORMATIONS (See Map 5, next page)

ALLUVIAL DEPOSITS

Unconsolidated silt, sand and gravel

LANDSLIDE DEBRIS

Chaotic masses of angular blocks: basalt and tuffaceous sedimentary rocks. Debris flows, talus piles.

JOHN DAY FORMATION

Tuff, tuffaceous sedimentary rocks, claystones, whitish, brown to green. Abundant plant fossils.

Welded ash flow sheet (welded tuff) brown to reddish. Typified by elongated collapsed pumice lenses of various colors; hard; glossy in places.

UPPER CLARNO FORMATION

Andesite flows and flow breccias. Minor rhyolite and rhyolitic tuff.

Rhyolite flows and domes - reddish-grey, brown and purple, flow banded.

LOWER CLARNO FORMATION

Saprolite - red to brown. Ancient soil horizon. Abundant petrified wood. (May also be present in places at base of John Day Formation and in Upper Clarno.)

Bedded yellow-brown tuffs, grey claystones, minor sandstones and conglomerates.

SLATE (Called Muddy Ranch Phyllite)

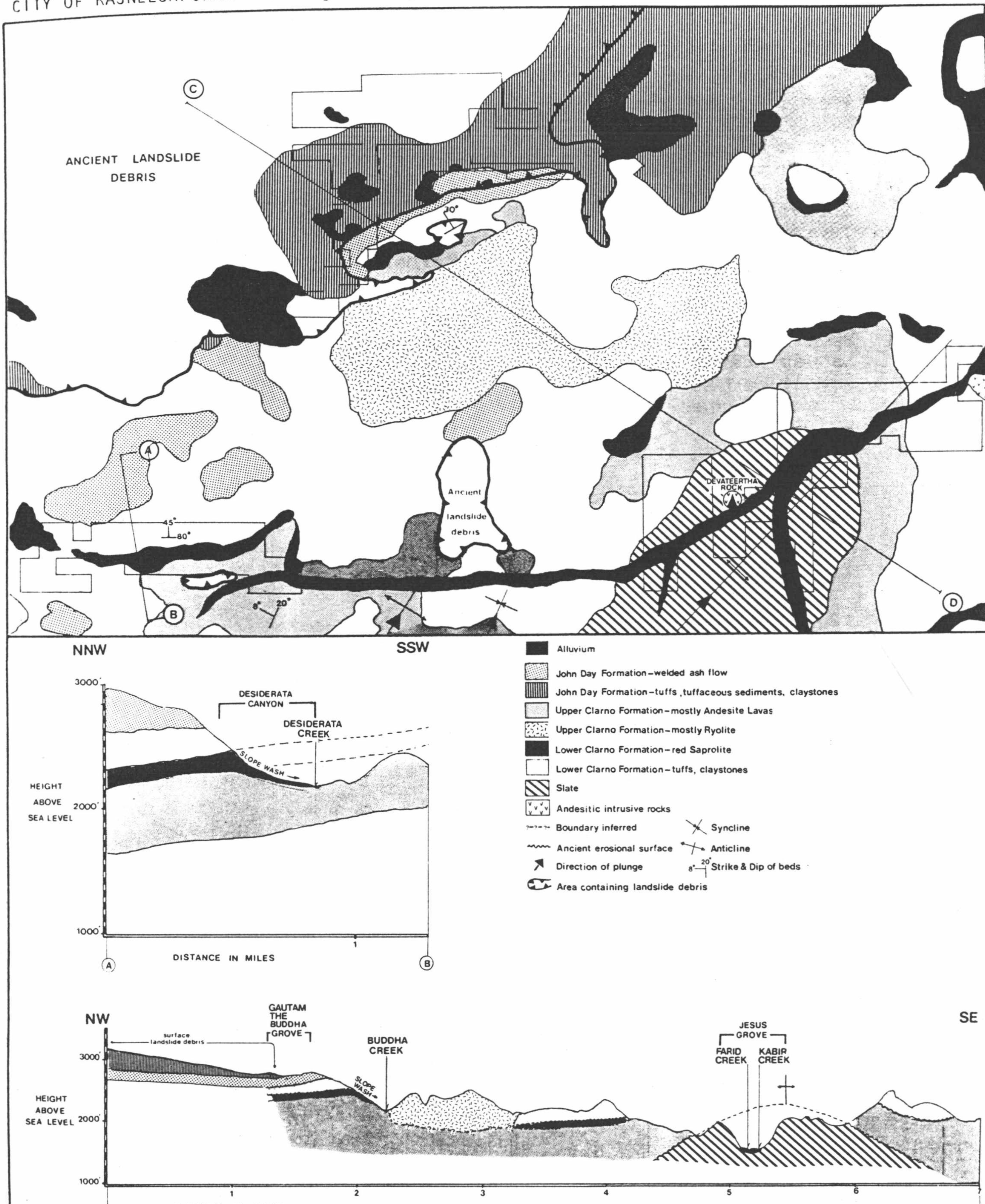
MAFIC INTRUSIVE ROCKS

Andesitic to basaltic composition. Age unknown.

(Modified after Robinson (1975) by field mapping, air photo interpretation, drilling and geotechnical investigations.)

CITY OF RAJNEESHPURAM - Geological Map/Cross Sections

Map 5



Ref: Partly after Robinson (1975)

PRESENT LANDSHAPING PROCESSES

The major geomorphological processes shaping the present landform are weathering, erosion, and the deposition of eroded material. These processes are universal but their local impact is influenced by a combination of changing factors including climate, geology, relief and land use. Land use is the main variable influence that can result in either a deceleration or an acceleration of the erosional processes.

Proper land use, in keeping with the natural environment, is dependent on an understanding of the natural processes acting on the land and the factors that influence the effect of these processes.

The following is a summary of the main influencing factors:

Climate

- Very low precipitation in summer but occasional high floods after thunderstorms and during the snow melting period;

- High evapotranspiration in summer causing a number of arid months that keep the rate of groundwater recharge low, dry the soil to a considerable depth and hinder vegetative growth;

- Strong frost action (a high number of freeze-thaw cycles) in winter causing the disintegration of rocks and several creep processes in the soils;

- High soil moisture content in spring (favoring creep processes).

Geology

- The cracked, broken and altered character of the rocks;

- The irregular distribution and variation in rock type;

- The interlayering of hard and soft formations;

- The high content of soft, easily erodable ash and clayey formations;

- The development of bentonitic clay soils that expand when wet and shrink when dry;

- The northeasterly down-tilting of the land;

- The effect of regional Pleistocene landslide activity;

- The existence of a highly erodable fill in the main valleys.

Relief

- High inclination of the valley bottoms, from approximately 4,000 feet in the high southwestern catchment to 1,300 feet at the Radha River in the northeast, causing a quick runoff;

- High inclination of slopes due to the rapid downcutting or undercutting of the rivers, causing several types of gravitational downslope movements such as rock fall, soil creep and soil flow.

Land Use

- Overgrazing, causing the deterioration of the vegetation, increased runoff, and the formation of cattle trails with the downhill trampling and compaction of soils;

- Construction-related installations such as roads and gravel pits, which can accelerate erosion and destabilize slopes if due care is not taken;

- Farming with the necessary clearance of vegetation and other obstacles that would hinder erosion;

- Off-road traffic, resulting in the disturbance of vegetation and soils by vehicles and machines.

The most important land-forming processes acting on the various landforms of the City and the ranch in general are:

Slopes

Gravitational processes such as rock fall and creep as well as unconcentrated slope generally are more important than rill and gully erosion. There are only a few slopes on which the latter type of soil erosion has taken place; one is beside Devateertha Rock.

Slopes having predominant rock fall are usually situated beneath steep, high rock outcrops. These slopes have a straight boulder-controlled slope with an angle of repose of approximately 35°, very sparse vegetation and a high infiltration capacity due to a thick mantle of coarse material. The debris transported downslope is released from the hard lava and other rock outcrops mainly by frost action. The slopes with predominant creep processes and unconcentrated slope wash are mostly convex. These slopes as in Jesus Grove, are developed on rocks such as slate, tuff and rhyolite. They are covered with either a thick weathering or a soil mantle, or with numerous layers of fine debris that thicken towards the foot of the slope. (This is the case within the slate area.) The soil on these slopes is generally very soft, porous, loose, permeable, and eroded in many places. The creep processes consist of downslope movements due to frost action (mainly by needle ice), oversaturation of the soil with water and consequent soil flow and downhill trampling by animals.

If, during heavy downpours, rills or small gullies are formed, they will be closed again by these creep processes if the surface material contains enough fines. This illustrates the very active erosional processes on these slopes. Slopes that are shaped entirely or in part out of the abundant bentonitic clay are also very profound. The clay expands and shrinks during wetting and drying. This process may lead to mass soil movement and causes a popcorny soil surface. The swelling may disrupt the grass cover, exposing the clay to wind and runoff. The clay becomes powdery when dry and is easily removed.

V-Shaped Valley Bottoms and Alluvial Fans

These landforms are very active, and flooding can take place during heavy downpours. This can be seen, for example, in the lower part of Cha'n Canyon where flood debris is suspended in juniper trees some 10 feet above the creekbed in places. The alluvial fans at the end of the tributaries are the result of flowing water and are generally not, or are only slightly, dissected. This means that they are still active and adequate drainage channels must be provided to protect house and road construction as well as farming. Another example of this situation can be seen at the new vineyard at Rabiya Barn, near the Jesus Grove area.

Valley Flats

These forms, some of which can be seen in Jesus Grove, are built up by a valley fill of 20 to 80 feet of well sorted and stratified unconsolidated sand, silt and loam with occasional layers and lenses of coarser debris above fluvial sand and gravel. The upper fine material is an alluvial flood plain deposit consisting mainly of the suspended load of the river, which did not transport much bedload at these times because of the dense grass cover of the entire land. The Mazama ash is found in the middle part of the sediment, showing that it is of Holocene age and was deposited until recently. The valley flats are very suitable for farming. They are, however, highly subject to erosion because the meandering creeks have incised arroyos 15-20 feet deep into the alluvium and are working actively at their undercut slopes where not protected by current erosion control measures. Thus the amount of arable land will continue to diminish if the erosion is not checked. According to field evidence in the area around Rajneeshpuram and to reports of past managers of the former Muddy Ranch, the incision of the arroyos is not older than 50 to 100 years and is the result of the desertification processes that turned large parts of the area from a lush grassland to a semi-desert. The main causes were overgrazing and the resulting destruction of vegetation and compaction of the soil by trampling animals. The arroyos of Kabir and Farid creeks are the most spectacular examples of the presently active processes of soil erosion (accelerated erosion, man-made erosion). In the tributaries, they are replaced by big gullies on the valley bottoms.

Another form of active erosion, seen for example near the Rajneesh Airstrip, is piping (subsurface wash). This kind of erosion works by means of sinkholes and subsurface pipes that carry the eroded material to the creek. It is also active in gullies in the Clarno clay beds.

The "Hazards" subchapter beginning on page 91 contains additional localized geotechnical descriptions of land conditions specifically within the City boundaries.

AGRICULTURAL LAND

In order to determine the specific soil conditions and the agricultural and range capability of the land within the City, detailed on-site investigations have been conducted by consulting experts. ASCS surveys are "not intended for site-specific evaluations...The findings of an on-site investigation takes precedence over the published report...." (George Green, ASCS) The following reports are available and can be viewed in the Rajneeshpuram planning office:

1. Preliminary Geotechnical Reports dated April 30 and June 14, 1982, by Century West Engineering Corporation. The prevailing soil and geologic conditions were determined by investigations that included:

   - review of pertinent published and unpublished maps and reports;

   - review of 1 inch = 1000 feet stereoscopic aerial photographs and enlargements to 1 inch = 400 feet, which were made especially for interpretive and planning purposes in February 1982;

   - geologic mapping of major soil and geologic units;

   - examination of 30 backhoe trenches in Gautam the Buddha Grove, 30 in Desiderata Canyon, and seven in Jesus Grove, all of which were logged and sampled for laboratory testing and the samples tested for soil classification, maximum density, optimum moisture content, grain size distribution, shear strength parameters, Atterberg limits, expansive potential in-place density and moisture content;

   - analysis of representative soils in Gautam the Buddha Grove for nitrogen, potassium, phosphorus, pH and organic matter to guide agricultural productivity evaluation and provide revegetation guidelines.

2. Agricultural Capability Report, March 24, 1982 by CES, Ltd. (Terrence M. Rahe)

   This report includes the results of preliminary field reconnaissance and two days of on-site investigation at Gautam the Buddha Grove. The objective of this field mapping was to increase the detail of the existing generalized Soil Conservation Service mapping so that a precise agricultural capability determination could be made. The 1982 1 inch = 1000 feet aerial photographs and enlargements to 1 inch = 400 feet of Gautam the Buddha Grove were available for additional ground control and precise delineation of soil units.

Basic soil criteria utilized in the establishment of soil delineations as well as the format and symbols used in this report are as outlined in the Soil Survey of Trout Creek - Shaniko Area, Oregon of 1970. In addition, appropriate Soils-5 sheets were consulted as necessary. (Single phase sheets are not yet available for this mapping area.) This mapping and the associated soils sheets were also discussed with the Trout Creek - Shaniko survey author, Mr. George Green of the USDA Soil Conservation Service Office, State Office, by Mr. Rahe. Samples were collected on-site, thawed and analyzed for texture and color. Texture was determined utilizing field texture technique in conjunction with hydrometer testing where necessary for verification. Color was determined utilizing the Munsell scale as described in soil taxonomy AH436, U.S. Dept. of Agriculture Soil Conservation Service. Estimates of stone content were also accomplished according to the AH436 handbook.

The map base utilized in field investigation and included with this report is a 1 inch = 660 feet topographic sheet (1066). Previously excavated geological test pits were utilized for location and soil profile information where possible. A survey line with location stakes also transected the property and assisted in the determination of the location and extent of soil bodies.

3. Range Suitability/Capability Analysis, February 20, 1982 by Agri-Tech (Glenn R. Adams)

   The City areas were field mapped to determine the current range conditions, range suitability and grazing capacity. The mapping was done using existing soil type designations developed by the Soil Conservation Service and described in the Soil Survey of Trout Creek-Shaniko Area. The soil survey lists certain range site descriptions for certain soil types. These are described in Range Site Handbook for the John Day Resource Area of Oregon. The general method used is described in the Soil Conservation Service's National Range Handbook. Aerial photograph enlargements at a scale of 1 inch = 400 feet, made in 1982, were used for accurate mapping control.

The following is a summary of the findings made by the geotechnical, agricultural capability and range capability investigations:

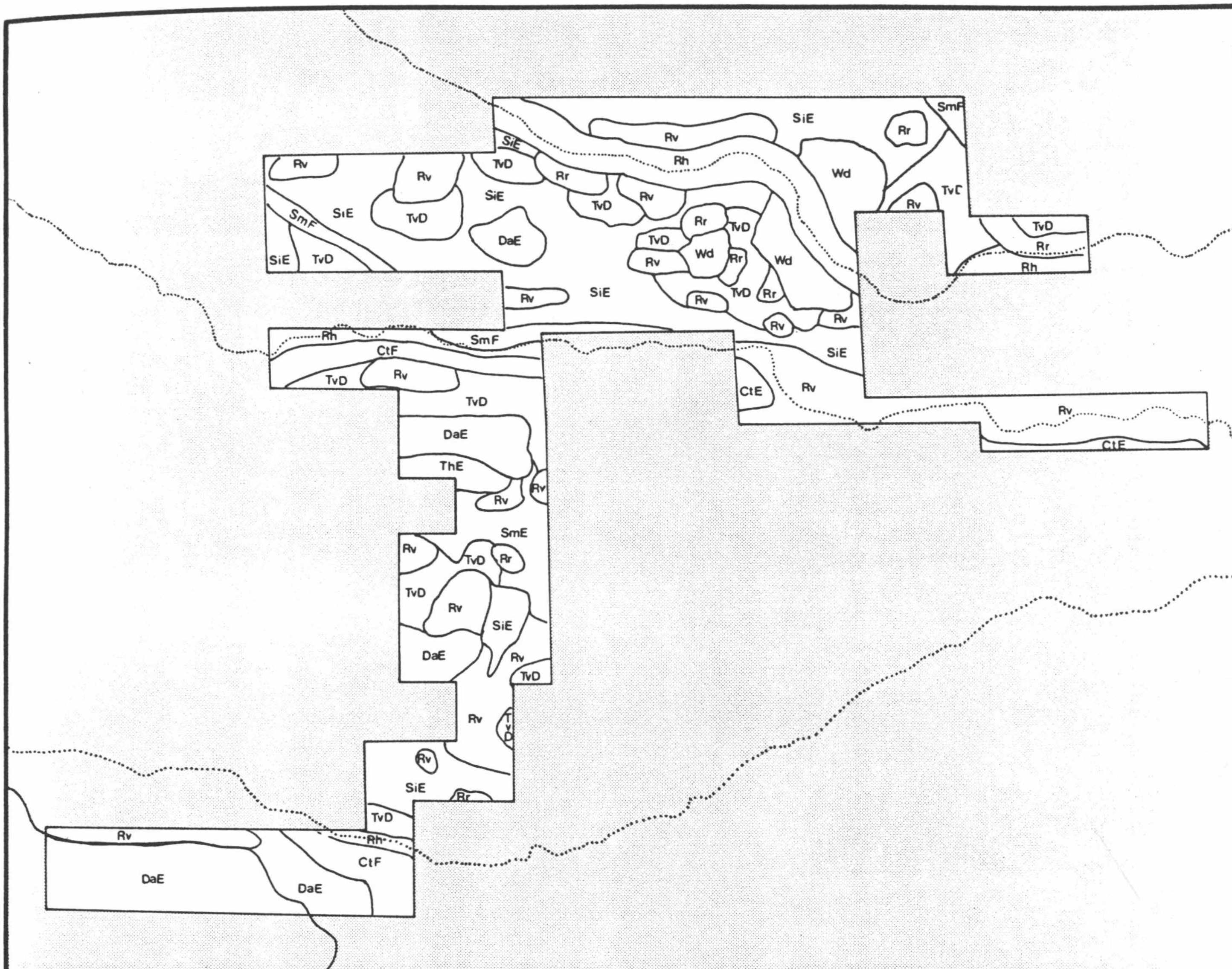
Gautam the Buddha Grove

Gautam the Buddha Grove was given special attention in the investigations because it is the largest of the three areas, the majority of the development will happen there, and the SCS soil survey contains soil complexes mapped together as one unit due to the regional mapping scale used (1 inch = 2,640 feet). The mapping done by CES, Ltd. was at a base scale of 1 inch = 660 feet. This has allowed much finer detail and the delineation of many soil bodies that are accepted as inclusions in the SCS mapping guidelines. In some areas, such as the Curant-Tub series, the individual soils are still not completely delineated because even the new base map is too small to demonstrate their relationship and extent.

The soil units mapped are shown in Map 6 on the next page. A full description of each unit mapped is given in the CES, Ltd. report. In general, the major units were identified as the Curant and Tub Silt Loam, Day Clay, Rock Outcrops, Rough Broken and Stony Land, Simas Series and Willowdale Loam. Included in the mapping is a series of symbols that represent a special condition found in Gautam the Buddha Grove. Several of the series are not normally found with stone cover. Rather than create numerous stony taxadjuncts for each series, the stony areas (more than 20% cover) have been outlined.

The CES, Ltd. report concluded that the area contains a very small portion of tillable soil. More soil is suited for range use, but adverse site conditions that include heavy stone cover in some areas, the presence of rock outcrops, shallow soils, steepness of slopes and the level of depletion due to erosion, severely limit its potential productivity.

The only soil that has potential for tilling is contained in about 30 acres mapped as Willowdale Loam (see Map 6 on the next page). It is a well-drained alluvial soil having an effective rooting depth of 40 to 60 inches. Included with this soil in mapping were areas of Rail Soils, medium-textured gravelly soils and Riverwash. The capability unit is IIW. The small pockets of Willowdale Loam are presently inaccessible and there is insufficient water available for irrigation.



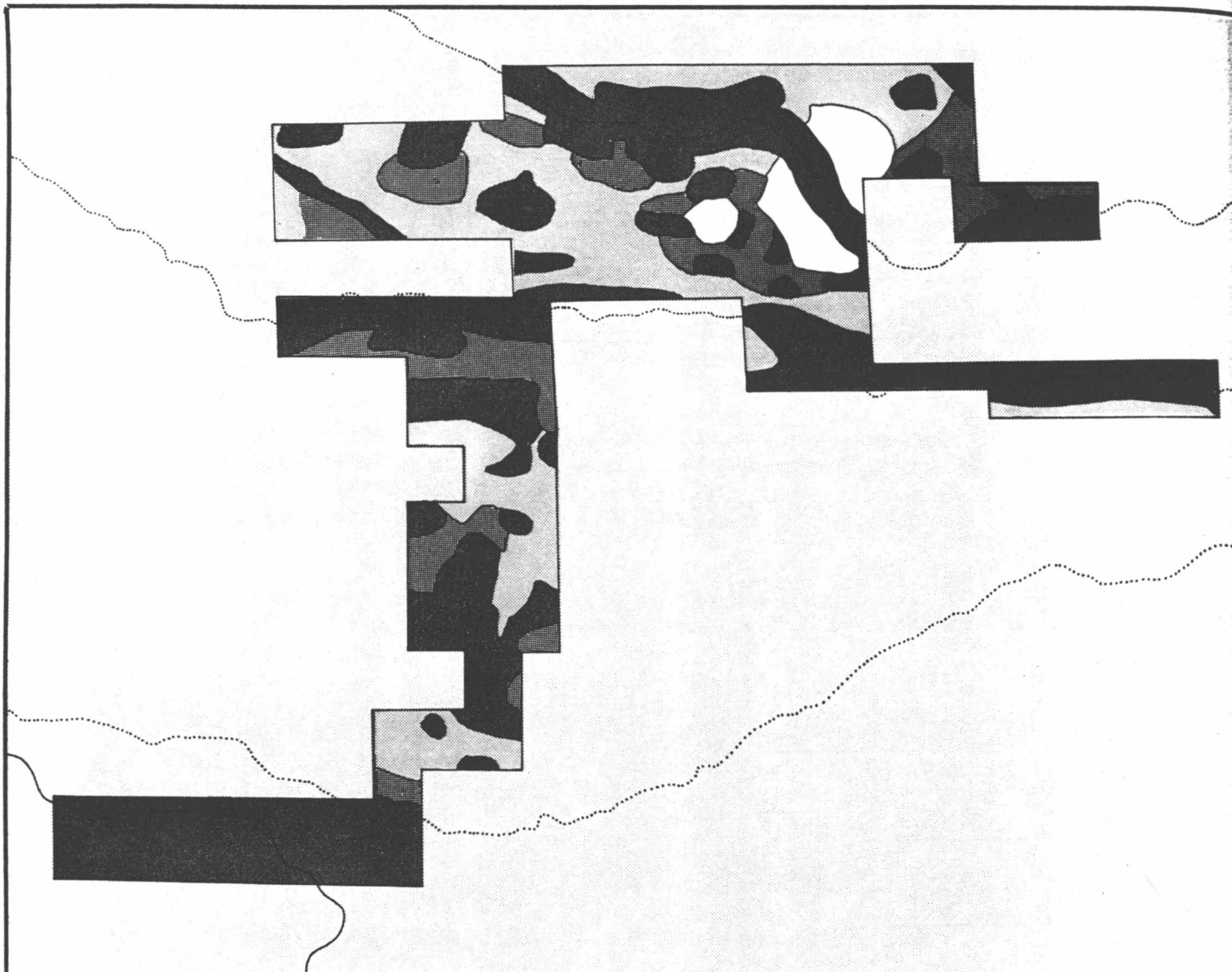
Map Unit	Symbol
Day Clay - Class VIIe	Da
Curant and Tub Silt Loams (40 - 70%) Slope - Class VIIe	CtF
Rock Outcrop - Rubble - Class VIIIs	Rr
Riverwash - Class VIIIw	Rh
Rough Broken and Stony Land - Class VIIs	Rv
Simas Very Stony Clay Loam - Class VIIs	Smf
Tub Very Stony Soils - Class VIIs	Tvd
Curant and Tub Silt Loams (8 - 40% Slope) - Class VIe	Cte
Simas Cobbly Silty Clay Loam - Class VIe	SiE
Simas Soils - Class VIe	SnE
Tub Cobbly Clay Loam - Class VIe	Te
Willowdale Loam - Class IIw - 1	Wd

Creeks

Note: Gautam the Buddha Grove is 34% of City Area

SCALE IN FEET 2000 0 2000

Ref: CES, Ltd. Soil Capability Report (3/24/82)



Class		% of Total
Capability Class VII and VIII	380 acres	18%
Capability Class VI (Very Stony)	104 acres	5%
Capability Class VI (Regular)	212 acres	10%
Capability Class II	30 acres	1%

Note: Gautam the Buddha Grove (726 acres) is 34% of Total City (2,135 acres)

Creeks

SCALE IN FEET
2000   0   2000

Ref: CES, Ltd. Soil Capability Report (3/24/82)

"In the following discussion it is important to distinguish between comments which refer to the capability class and those which refer to the soil productivity. These two terms are not interchangeable and an understanding of the discussion which follows is dependent upon separation of the two terms.

"Substantial deviation from the survey soil series descriptions are included in the following narrative. Deviations are noted where major physical characteristics which affect agricultural capability varied substantially from the characteristics as mapped. These characteristics include such soil parameters as soil texture, which includes the percent of stones, and slope. A major consideration in this mapping area was the number of rock outcrops which occur. The enclosed map attempts to locate the majority of these areas. Virtually every area on the property is dotted with significant numbers of rock outcrops. The characteristics on these areas are described below. Several soil series also exhibited surface stoniness beyond those normally associated with the series."

Several conditions that are unique to Gautam the Buddha Grove should be considered in evaluating the actual agricultural productivity. The Pleistocene landslides have covered much of the surface with basalt blocks and rubble. Erosion of these blocks has released individual cobbles, which are now widespread over the surface soils forming more than 90% cover in places. Again quoting from Mr. Rahe's report:

"Large numbers of rock outcrop, rubble land areas would reduce the overall productivity of this parcel substantially. It is possible to outline on the map those areas which constitute Rough Broken and Stoney Land. An effort has been made to outline those extensive areas which may have 20% coarse fragments or more on the surface. Virtually every south-facing slope has enough stone, cobble and gravel cover to further limit productivity. A large area to the south of the central ridge line and

Capability Classes

To compute the percentages of each soil capability class, the Gautam the Buddha Grove boundary was superimposed on the soil map (see Map 7, page 44). The breakdown is as follows:

Gautam the Buddha Grove Soils Distribution

Capability Class	Acres	% (rounded off)	
VII and VIII	380	52%	66%
VI with 20% stone cover	104	14%	
VI	212	29%	
II	30	4%	
TOTAL	726 acres		

The CES, Ltd. report says that, following SCS guidelines for agricultural capability, any spatial computation of Class VII land should include Class VI areas with 20% or greater stone cover. Sixty-six percent of the Class VI soils fall in this category. In assessing the actual agricultural productivity potential of the soils, the CES, Ltd. report has gone into a detailed discussion to point out that the agricultural productivity of the soil is severely limited. This discussion is repeated here in part:

> "Recent study on this subject (capability versus productivity) by Dr. Herb Huddelston, Extension Soil Scientist at Oregon State University, shows very poor agreement between capability unit and measured productivity. As a result, an entirely new system for measuring productivity has been devised for common soils in the Willamette Valley. A separate and unrelated project by the United States Department of Agriculture Soil Conservation Service at the national level is developing a productivity rating which it hopes will better reflect actual agricultural production value. These studies point to the importance and validity of looking at soil factors which affect the soil's actual productivity.

along the western limit of the project areas has a coarse fragment cover between 20-40%. The Soil Conservation Service utilizes a stone cover of 20% or greater, as a criterion for identifying Class VII lands in the Trout Creek - Shaniko Area. The areas of Class VII soil on Map B combined with the areas possessing stone symbols best represent the extent of soils possessing characteristics of Class VII soils.

"North-facing slopes in this area commonly have Loessal deposits of silt loam with few gravels and cobbles. Due to severe overgrazing and subsequent erosion the depth of these deposits has been substantially reduced. As a result, a lag deposit consisting of 20-70% coarse fragment cover was observed. This condition would substantially reduce observed agricultural productivity on north slope sites.

"Lag deposits of coarse fragments were also observed in the areas mapped as Day Clay. This was particularly evident in the southern portion of the study area. Day Clay is usually not recognized as having a coarse fraction in the surface layer. This condition makes management of the Day Clay even more difficult and lowers its potential productivity.

"Several areas adjacent to the two major drainageways in the northern part of the survey area had very steep slopes of greater than 70%. The horizontal extent was inadequate to allow their delineation. Their existence nonetheless lowers the management and production potential in these areas.

"In summary, this mapping area contains a very small portion of tillable soil. A larger amount of soil is suitable for range use but the extenuating conditions which include stone cover and such irreversible things as erosion, lower its actual productivity substantially. In addition, the persistent presence of rock outcrops, shallow soils, and rough broken and stony lands make the site difficult to manage and limit severely its potential productivity."

The Range Suitability/Capability Analysis also concluded that the range conditions are poor to very poor due to rocky condition, steep slopes, and overgrazing by sheep and cattle.

Under climax conditions, the vegetation would include the following species: blue bunch wheatgrass, Thurber needle-grass, Sandberg bluegrass, various forbs and a small percentage of gray rabbitbrush and big sagebrush on the south slopes; Idaho fescue, blue bunch wheatgrass, various forbs and a small percentage of wheatgrass and big sagebrush on the north slopes; giant wildrye, Idaho fescue, bluegrass, and various forbs along the stream bottoms.

The following is a summary from the Agri-Tech report (which also applies to Jesus Grove and Desiderata Canyon) outlining the succession of events caused by continued overgrazing as these relate to the present carrying capacity of the land:

> "Juniper encroachment - Prior to 1900, juniper was mostly confined to rocky south-facing slopes, ridges and dry canyons. Since 1934, the area dominated by juniper has increased by approximately 800%. Overgrazing by extremely large numbers of livestock from 1840 to 1920, followed by severe drought of the 1930's, brought about range deterioration. This overgrazing probably has continued until recently. The deteriorated condition provided space for juniper encroachment. As juniper occupies a site, opportunity for desirable forage species to reestablish themselves is severely decreased. The majority of the juniper is less than 90 years old.
>
> "Sagebrush/matchweed (snakeweed) - As noted in the Soil Conservation Service (SCS) range site guides, sagebrush in excess of 1-2% of the plant community is an indicator of deteriorating conditions. This was generally the case on many of the sites analyzed. It has little forage value and is an undesirable plant when existing more than only occasionally.
>
> "Cheatgrass/medusahead - On a large percentage of the sites, cheatgrass comprised the majority of the forage production. This is an annual species with very poor dependability, due to

its shallow root system and annual nature. It is an invader species that also indicates poor conditions if abundant. The period of time it is available is very short as it usually dries out early in the summer.

"The most undesirable invader annual grass species in this country is medusahead. All of the clay soil type and many of the loams are almost completely occupied by this annual grass. While it may look green during the summer, it is very unpalatable and nearly worthless as forage. The Gautam the Buddha Grove area is considered suitable when considering slope and soils, but presently it is covered by medusahead. This factor makes its grazeability questionable. The stocking rate is very low and the control of medusahead is difficult and costly. A "rule of thumb" in the Bureau of Land Management is to consider range with stocking rates of more than 32 acres per animal unit month (AUM) to be unsuitable until successfully reseeded. 607 acres or 84% of the Gautam the Buddha Grove area is in the 40 acres/AUM category and would probably be considered unsuitable by BLM standards. In all three areas, there are 754 acres with a stocking rate greater than 32 acres/AUM or 38%. If this 38% unsuitable is added to the 22% unsuitable (for steep slopes and rocky conditions), we have 60% of the total area that would be considered unsuitable at the present time.

"In summary, of the 1,995 acres analyzed, 22% is unsuitable due to rocky conditions and steep slopes; of the 78% suitable, 12% is in fair condition and 66% is in poor condition. In its present condition, the average stocking rate is 27 acres/AUM, and there are 76 AUM available or enough feed for 76 cows for one month.

"From this analysis and those done by BLM personnel, it is estimated that the average stocking rate on Rancho Rajneesh would be 25 acres/AUM. When considering the total range available (64,229 acres private + 14,890 Bureau of Land Management lease = 79,119 acres) at 79,119 acres, and applying this stocking rate, we have 3,156 animal unit months available from the Rancho

Rajneesh rangelands. If the proposed 1,995 acres were removed from range production, it would constitute a 2% loss to the grazing capacity."

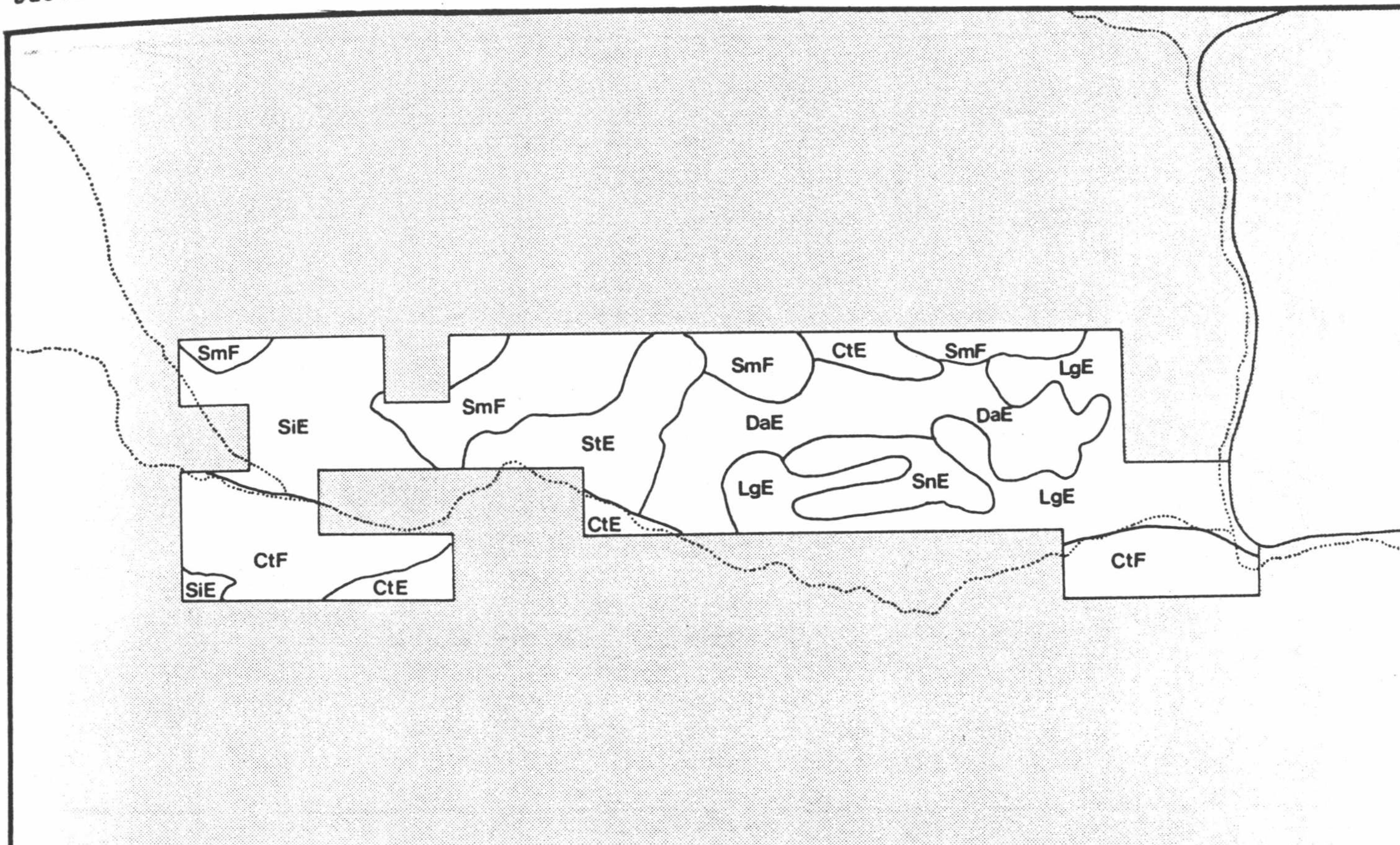
The Agri-Tech report sets out recommended procedures and estimated costs to rehabilitate the rangeland to a viable productive unit. Procedures for juniper and medusahead control include hand thinning, mechanical and chemical treatment and seeding at an estimated cost of $75/acre. Spring development would cost $1000/spring. In addition, considerable fence construction would be necessary. The areas of abundant rock cover, expansive clay soils and steep slopes are not suited to mechanical treatment. Improvement techniques would be limited to a proper livestock management with adequate rest and herbicide spraying where feasible.

In summary, 4.1% (30 acres) of Gautam the Buddha Grove is a potential agricultural resource. The commercial realization of this potential is dependent upon the City development for road access and for the supply of adequate water and labor for intensive agriculture.

The majority of the land, some 66% (484 acres out of a total of 726 acres) is considered Class VII and VIII. About 29% (212 acres) is Class VI capability. Current inventories show rangeland to be in poor to very poor condition. Expensive treatment methods would be required to restore the potential range productivity and extenuating conditions existing on the site will limit rehabilitation attempts. The carrying capacity for grazing on suitable lands in Gautam the Buddha Grove is severely limited.

Desiderata Canyon

The soils as mapped by the SCS are shown on Map 8, on the next page.They consist of Day Clay, Currant and Tub Silt Loams, Simas Very Stony Clay Loam, Simas Cobbly Silty Clay Loam, undifferentiated Simas soils, and Lithgow and Sorf soils. The capability class analysis is as follows:



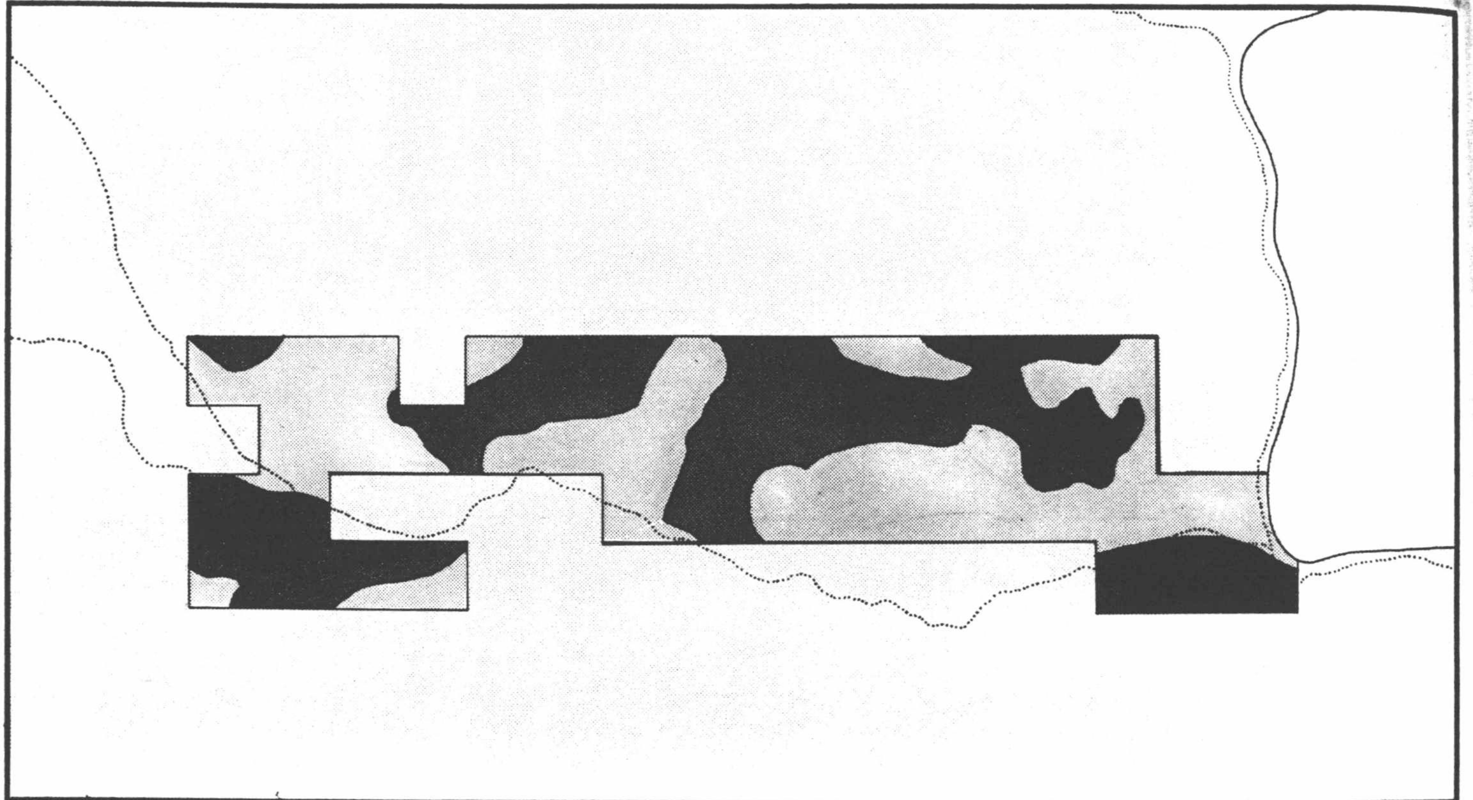
Map Unit	Symbol
Day Clay - Class VIIe	DaE
Curant and Tub Silt Loams (47 - 70% Slope) - Class VIIe	CtF
Simas Very Stony Clay Loam - Class VIIs	SmF
Curant and Tub Silt Loams (8 - 40% Slope) - Class VIe	CtE
Lithgow and Sorf Soils - Class VIe	LgE
Simas Cobbly Silty Clay Loam - Class VIe	SiE
Simas Soils - Class VIe	SnE

Creeks..........

SCALE IN FEET
2000 0 2000

Note: Desiderata Canyon is 21% of City Area

Ref: CES Ltd. Soil Capability Report (3/24/82)



Classes | | % of Total

Capability Class VII and VIII	222 acres	10%
Capability Class VI	223 acres	10%
Capability Class II through V	0 acres	0%

Note: Desiderata Canyon (445 acres) is 21% of Total City Acreage (2,135.5 acres)

Creeks

SCALE IN FEET
2000 0 2000

Ref: CES, Ltd. Capability Report (3/24/82)

DESIDERATA CANYON SOILS DISTRIBUTION
(see Map 9, page 52)

Capability Class	Acres	% (rounded off)
VII & VIII	222	50%
VI	223	50%
V and better	0	0
	TOTAL 445 acres	

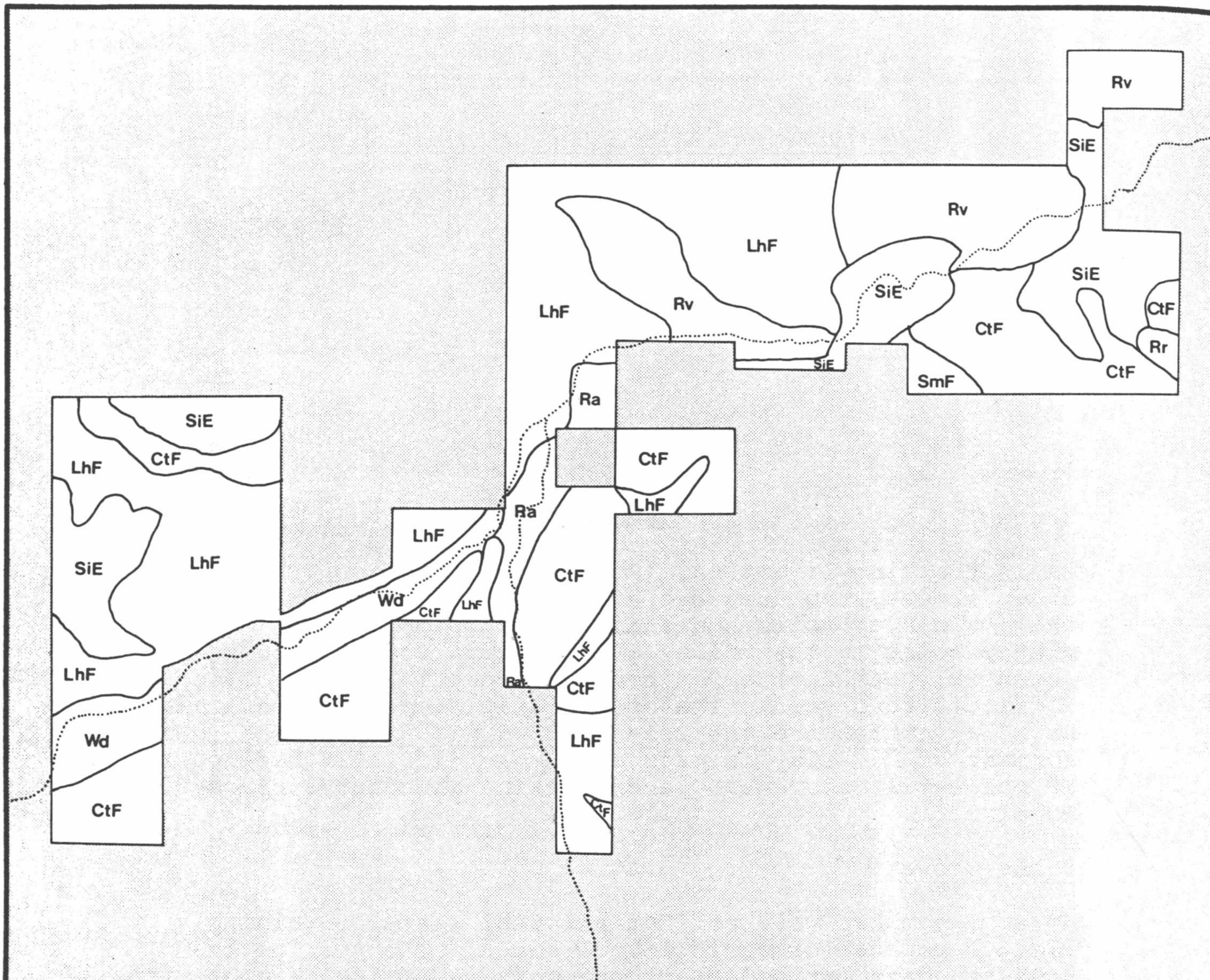
There is no tillable land in Desiderata Canyon, and rangeland evaluation indicates conditions close to marginal limits for supporting livestock. Apart from the high proportion of steep slopes, the area has excessive surface cobbles, shallow clayey soils and a high erosion potential. The clayey soils in the valley areas have a very high expansive potential, making them extremely susceptible to erosion and difficult to reseed. The most gentle slopes are in areas of Day Clay, which are entirely covered with medusahead. Management of Day Clay is made even more difficult because it is colluvial (slopewash) and contains abundant surface cobbles.

Jesus Grove

Jesus Grove has well defined alluvial flats containing a limited expanse of agricultural soils. The rest of the area is characterized by steep to near-vertical slopes, rock outcrops, rough broken and stony land, and stony, clayey soils.

Soils mapped by SCS, shown on Map 10 on the next page, are Curant and Tub Silt Loams, Lithgow Very Shaly Loams, Rock Outcrop, Rubble, Rough Broken and Stony Land, Simas Very Stony Clay Loam, Simas Cobbly Silty Clay, Rail Clay, and Willowdale Loam.

The capability class analysis is shown in graphic form on Map 11, page 55.



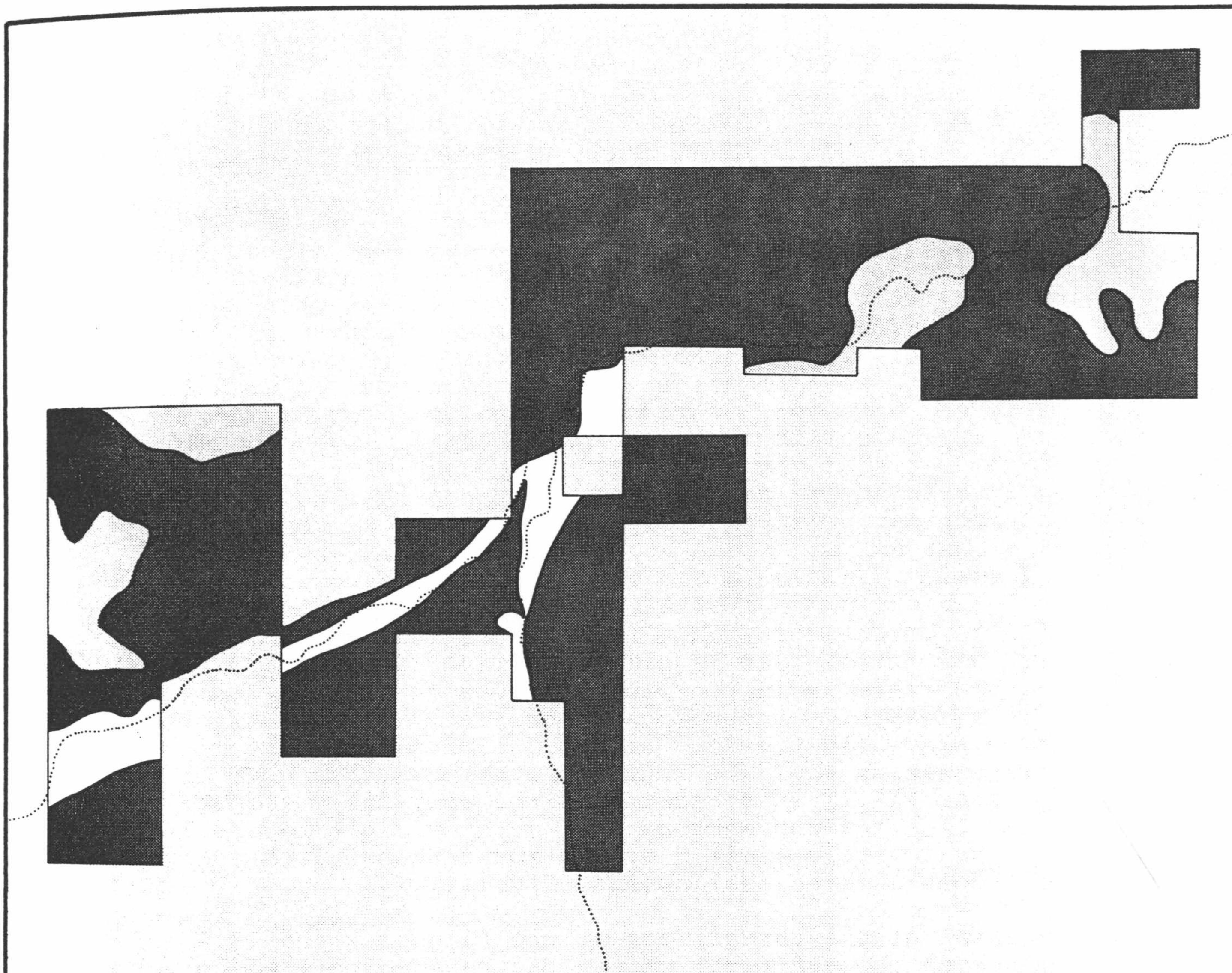
MAP UNIT | SYMBOL

Curant and Tub Silt Loams 40 - 70% Slope - Class VIIe	CtF
Lithgow Very Shaly Loam - Class VIIs	LhF
Rock Outcrop - Rubble - Class VIIIs	Rr
Simas Very Stony Clay Loam - Class VIIs	SmF
Simas Cobbly Silty Clay - Class VIe	SiE
Rail Clay - Class VIw - 1	Ra
Willowdale Loam - Class IIw - 1	Wd

Creeks

Note: Jesus Grove is 44% of City Area. Connecting Road is 2% of City Area.

Ref: SCS Soil Survey, Trout Creek - Shaniko Area



CLASS		% OF TOTAL
Capability Class VII and VIII	720 acres	34%
Capability Class VI	137 acres	6%
Capability Class V and better (includes creekbeds and Kabir Reservoir)	74 acres	3%

Note: Jesus Grove (913 acres) is 44% of Total City Acreage (2,135.5 acres)

Creeks

SCALE IN FEET 2000 0 2000

Ref: SCS Soil Survey, Trout Creek - Shaniko Area

JESUS GROVE SOILS DISTRIBUTION

Capability Class	Acres	% (rounded off)
VII and VIII	720	77%
VI	137	15%
V and better	74	8%
TOTAL	931 acres	

Soil Class Percentages

Tillable agricultural land comprises 8% (74 acres) of the total 931 acres. The majority, 77% (720 acres), is Class VI. The range is in poor to very poor condition with low carrying capacity according to Agri-Tech (see "Gautam the Buddha Grove" in previous section). Mechanical attempts at restoration would be impossible on more than half of the Class VI-VII land because of the very steep slopes. The small areas where mechanical methods might be applied would be severely limited by the abundance of rock outcrop and stones and the shallowness of soils.

The total of the three areas of the City plus the 33.5 acres comprising the 60' right of way of the incorporated connecting road are shown in the following table:

RAJNEESHPURAM SOILS DISTRIBUTION

Capability Class	Acres	% (rounded off)
VII and VIII (+Road)	1459.5	68%
VI	572	27%
V and better	104	5%
TOTAL	2135.5 acres	

CONCLUSION

Five percent of the soil in Rajneeshpuram is classified as Class V or better. Except where presently utilized, this land will be used for urban and agricultural purposes. The remaining 95% is made up of Class VI, VII, and VIII soils with two-thirds of the Class VI soils actually included in Class VII due to adverse site conditions. Insofar as possible, the lands in these soils classes that are not required for development should be preserved and protected as Open Space lands to insure continuation of the natural rehabilitative process that is already in evidence after a year with no grazing. In addition to the natural restoration that is taking place, cost-effective measures should be sought to prevent further site deterioration and if possible, accelerate the restoration process. This can best be achieved through cooperative effort among the City, appropriate governmental agencies and private landowners.

3. WATER

It is not by chance that the present boundaries of Rancho Rajneesh almost exactly outline the edges of a 100-square mile watershed. Early residents were well aware of the need for adequate water supplies as well as control over the source. Today, as a result of the consolidation of several ranches, the residents of Rajneeshpuram inherit a watershed system rich in catchment basins and riparian systems. This watershed, with sufficient technological expertise, will yield a supply of water more than adequate for the community's agricultural, industrial and domestic uses.

In this section of the Plan the nature of the groundwater and surface water supplies for the entire region are discussed. In more detail, the hydrogeology, current water supplies, future alternative sources and proposed development for each of the three City regions are described.

GROUNDWATER

A discussion of relevant groundwater principles that apply to all of Rancho Rajneesh will assist in evaluating the current conditions and groundwater potential for Rajneeshpuram. The following is taken from a report entitled "Rajneeshpuram - Preliminary Hydrogeologic Assessment" by Geo-Mat, Inc., 1981, a copy of which can be found in Appendix No. 9.

> "All groundwater or underground water is derived originally from precipitation. Precipitation, in the form of rainfall or snow melt, enters the groundwater system by percolating down through the soil or by flowing into a stream or pond and then leaking into the permeable materials beneath that body of surface water. The groundwater then moves downward through pores, cracks and other openings in the rock and soil materials until it reaches the zone of saturation (a depth below which all the openings are filled with groundwater). The surface of this saturated zone is referred to as the groundwater table or water table. The shape of the water table normally conforms, in a subdued manner, to surface topography. In general, the distance to the water table is deep below upland areas and shallow in lowland or valley areas. Water normally enters or recharges the groundwater system in upland areas and leaves or is discharged from the system in low-

land areas. The path that the groundwater follows is called a groundwater flow system, and such systems are normally referred to as being local, regional or intermediate. These flow system designations are based on the relative depths and distances of groundwater movement. A local flow system can be characterized as one where precipitation falling on a valley floor or canyon wall percolates down to the water table and then follows a relatively short and shallow path to the nearest seep, stream or spring, where it is discharged as surface water. In a regional flow system groundwater may reach depths of thousands of feet and cover distances of many miles or tens of miles before being discharged.

"In addition to the flow system described above, groundwater can also occur as 'perched' groundwater. This situation develops when downward percolating groundwater encounters an impermeable layer of rock or soil before reaching the water table. In these instances a 'perched' saturated zone will build up above the restrictive layer. These perched groundwater zones are commonly the source of seeps or springs in upland areas, and in many instances are only seasonal features. There are three general rules that apply to all groundwater systems. They are: (1) groundwater is derived from precipitation, (2) it will move from upland areas to lowland areas, and (3) in all but a very few instances groundwater movement is very slow, and will average between five feet a day to five feet a year.

"If groundwater in a zone or layer of saturated subsurface material can be withdrawn through wells, that zone or layer is called an aquifer. Good aquifers yield water easily to wells, and usually consist of materials that are porous and permeable, such as unconsolidated sands and gravels or indurated rocks that have numerous joints, fractures or other forms of secondary porosity. Poor aquifers, on the otherhand, may be saturated, but will yield water very slowly to wells. These aquifers typically consist of fine textured alluvial deposits, or massive, well-indurated bedrock. A good aquifer must also have an adequate source of recharge. This is necessary in order to ensure that water withdrawn through wells will be replaced by the natural system. If this does not occur, the water table will be lowered by continued pumping and the resource may eventually be depleted. Based on the geomorphic setting and surface water drainage patterns, the Rajneeshpuram property may include an entire groundwater sub-basin. That is, groundwater entering the system in the upland recharge areas on the western and southern boundaries of the property will most likely enter local and intermediate flow systems and be discharged in the lowland areas in the central and eastern portions of the property.

"Because of the wide range of rock types, the structural complexity and the large amount of relief, local flow systems may dominate the hydrogeologic setting in the area. Three categories of local flow systems have been recognized on the property to date. The first is the system that is developed in the valley-fill alluvial deposits along Muddy and Currant Creeks.* Groundwater in these sands and gravels is recharged by leakage from the two streams, and moves downgradient to discharge points along lower stretches of Muddy Creek or the John Day River.*

"Local flow systems also have developed in the canyon floor deposits, shallow fractured bedrock, and fan deposits in the lower portions of the major side canyons. These systems are recharged by incident precipitation, by runoff from the steep canyon walls and by leakage from the intermittent streams. Groundwater is discharged from these systems as seeps and springs at the toes of the fan deposits, or enters the valley fill deposits that underlie and interfinger with the fan debris.

"The third type of local flow system appears to be the source of most if not all of the springs in the upland portions of the property. Here, precipitation enters into locally exposed, relatively permeable surface materials, and percolates downward to low permeability layers such as the saprolite layer common at the top of the Clarno Formation. These horizons perch groundwater, and that groundwater eventually migrates laterally to downslope discharge points where the perching horizon is exposed.

"A portion of the groundwater that is recharged in upland areas or that seeps into permeable materials underlying intermittent drainages may follow intermediate flow system paths, and migrate through permeable bedrock

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* The names of these streams have been changed by the present owners of the land to Kabir Creek, Farid Creek and the Radha River.

formations to discharge points along the channels of Currant and Muddy Creeks.* There is very little information on which to base predictions of regional groundwater flow in the area. It is clear, however, that the John Day River* is the lowest drainage in the area, and that any regional groundwater discharge in the area would be as underflow to this river."

Virtually no historical groundwater data was available prior to the purchase of the ranch by the present owners. One low-producing well served ranch headquarters. Spring water was used for livestock and out-camp domestic requirements.

In the region surrounding the ranch, wells are mostly low to intermediate producers (5 to 100+ g.p.m.) but some higher-producing wells (200 to 450 g.p.m.) have been reported. The highly variable production is typical of wells in the Clarno and John Day Formations, which have highly variable permeability. No information is available from outside sources about the presence or absence of regional groundwater aquifers. Detailed geologic mapping is essential to a complete understanding of any hydrogeological system and will eventually be conducted on the entire property of Rancho Rajneesh. Mapping has been conducted for the three City areas and will be updated as additional drilling and other geotechnical information becomes available.

Presently Rajneeshpuram receives adequate good quality groundwater supplies from a total of 29 wells in and adjacent to the City, which produce in the range of three to 250 g.p.m. (See Maps 15 and 16 on the following pages.) The production is from shallow wells (50-200 feet), except for three low-producing wells that are about 360 feet deep, and one moderate-producing well that is 520 feet deep. Water temperatures range from 50-60° F, except in the 600-foot well in Desiderata Canyon and in the 520-foot well, M3, in Gautam the Buddha Grove, where 80° F and 74° F temperatures, respectively, indicate a possible geothermal source. The wells typically are in unconfined (open) aquifers; that is, where there is no impermeable formation such as claystone overlying and thus confining the groundwater in the aquifer. The new well, M3, is in a confined aquifer. The water is of good quality, meeting state health requirements and E.P.A. standards.

RECHARGE -- A GENERAL DISCUSSION

Intensive study and discussion is proceeding on the subject of groundwater recharge. Proposals are propounded for all forms of artificial recharge, ranging from small surface check dams to bentonite-slurry bedrock cutoff trenches across the full width of the alluvial valley.

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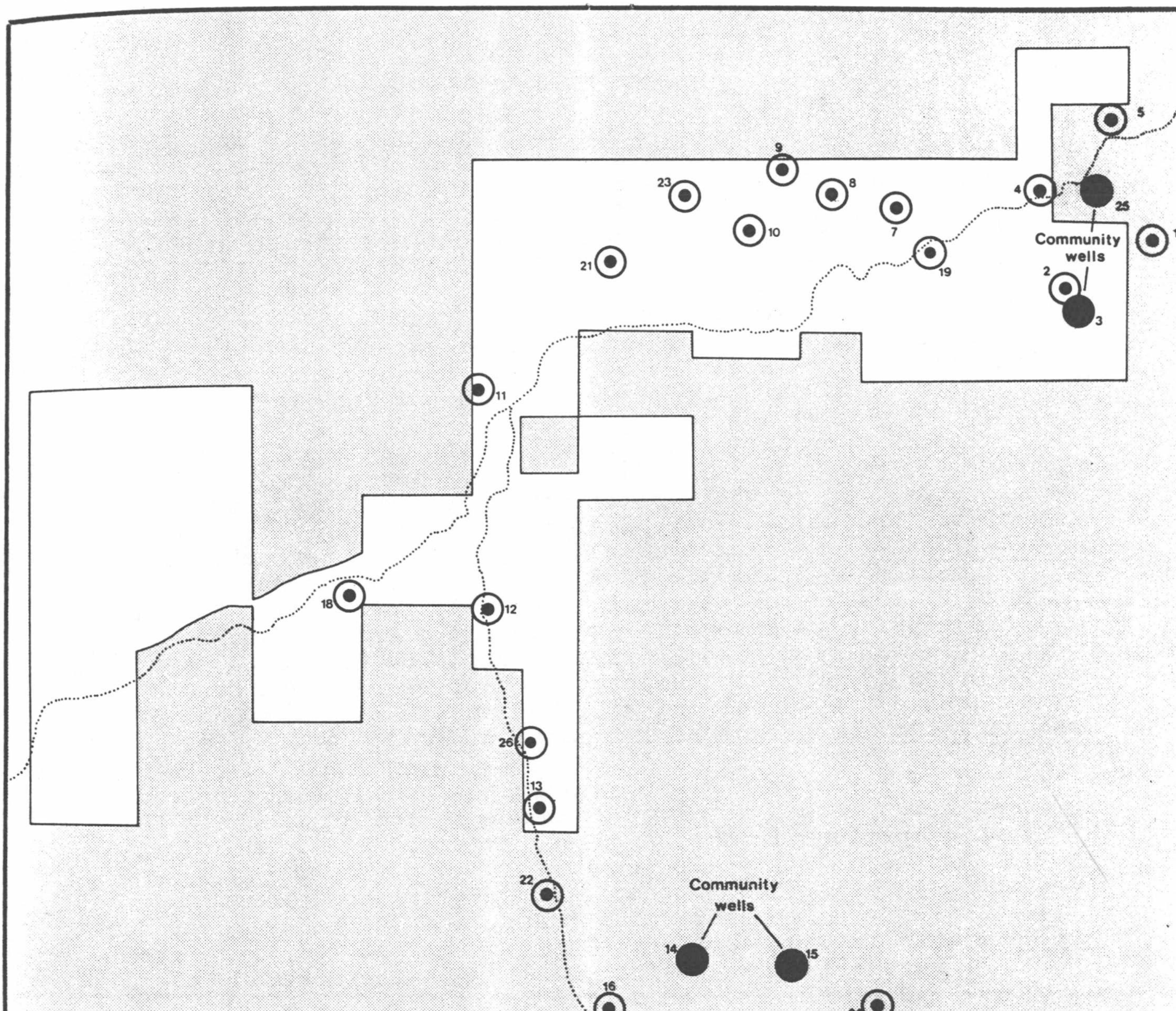
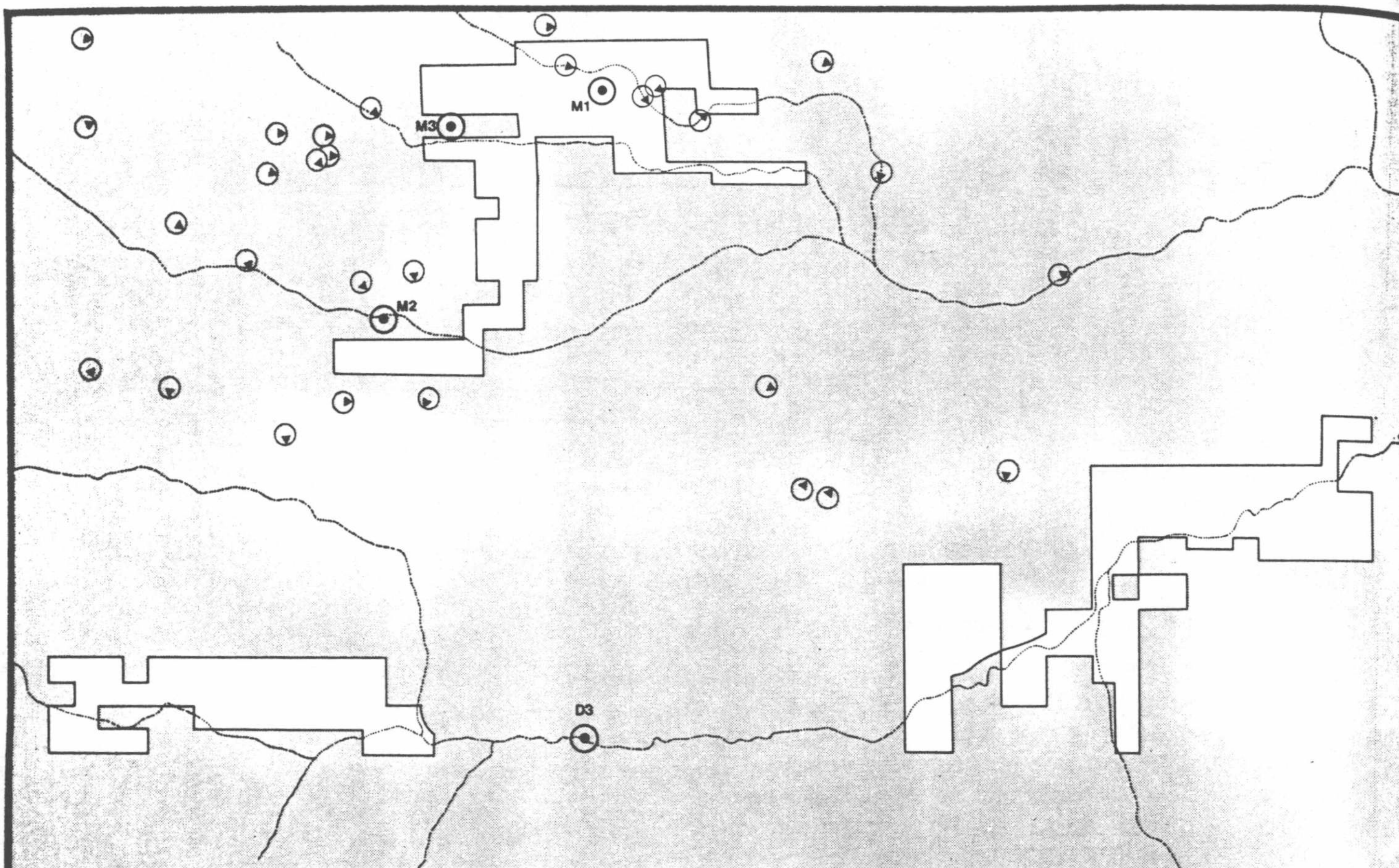
* See footnote on page 61.



Well No.	Completed Depth in Feet	Static Level in Feet and Inches	GPM by Air Drawdown or Bailer Test	Well No.	Completed Depth in Feet	Static Level in Feet and Inches	GPM by Air Drawdown or Bailer Test
1	215	113-9	22-BT	14	100	35-8	80-DD
2	100	72-8	150-AT	15	100	41-11	120-DD
3	125	76-4	180-DD	16	85	25-9	40-AT
4	47	9-6	60-AT	18	140	32-10	9-AT
5	117	49-4	25-AT	19	240	15-8	47-AT
7	104	20-5	33-AT	21	120	95-9	75-AT
8	203	60-0	3-AT	22	50	16-6	80-BT
9	360	39-4	7-AT	23	360	45-2	15-AT
10	160	87-5	14-AT	24	200	41-6	7-AT
11	100	35-6	12-AT	25	220	23-3	250-DD
12	70	17-5	40-AT	26	80	20-2	50-AT
13	52	23-4	15-AT				

SCALE IN FEET
2000 0 2000

CITY OF RAJNEESHPURAM - Well and Spring Location Map — Map 13



⊙ Wells

◔ Springs (showing direction of flow)

--- Creeks

½ 0 ½
SCALE IN MILES

Well No.	Completed Depth in Feet	Static Level in Feet and Inches	GPM/Air or Drawdown Test
M1	100	65	15-DD
M2	260	10	30-DD
M3	530	47	90-DD
D3	260	14	8-DD

Artificial recharge of alluvial aquifers may be a possibility, but the few short months of well monitoring provide no evidence to suggest that the natural recharge will be insufficient. Alluvial wells are so far showing no indications of falling water tables, not even seasonal.

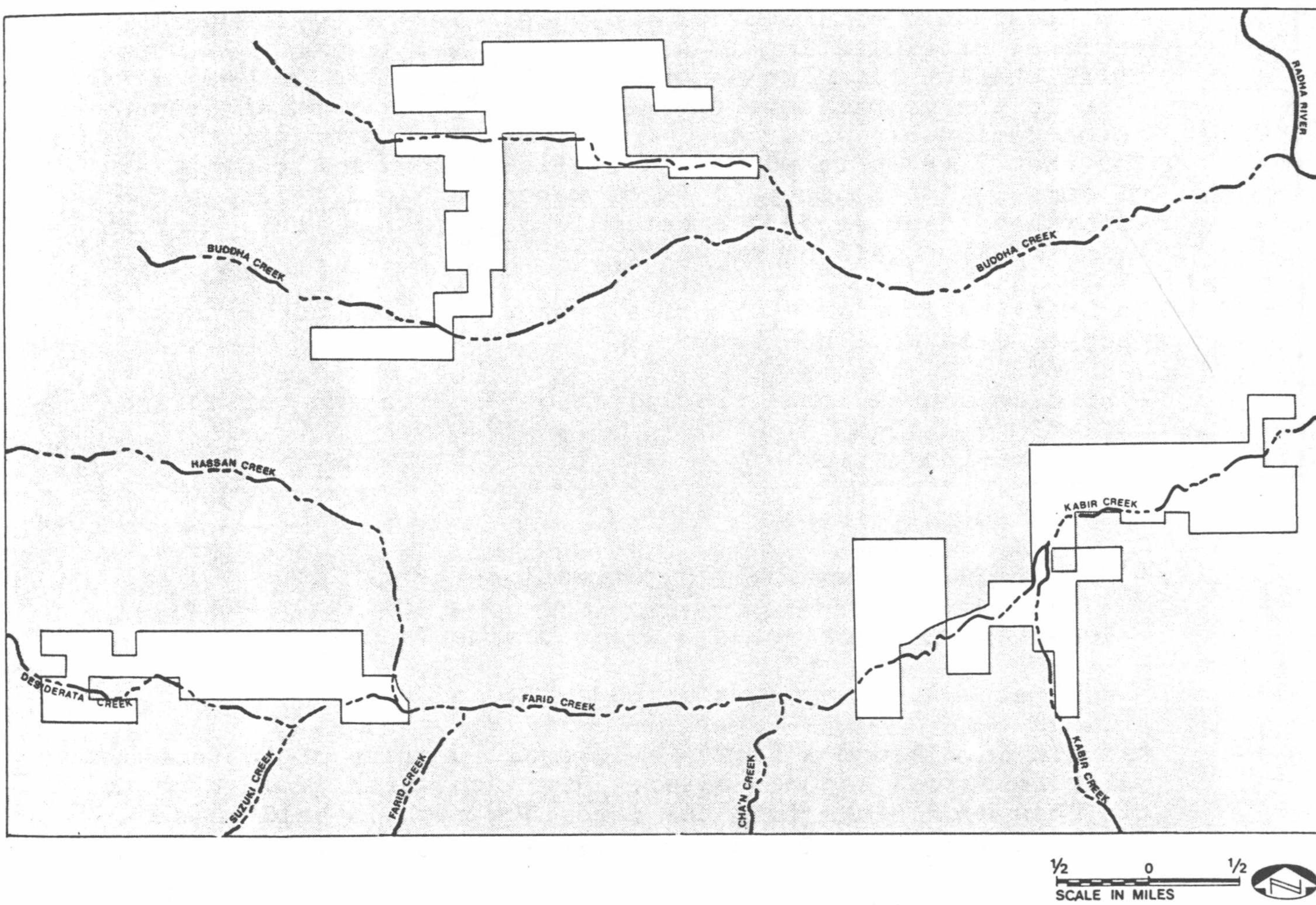
To assess the potential for any form of artificial recharge, detailed information would need to be collected on the surface water availability, the hydrogeologic characteristics and the recharge suitability of receiving aquifers. The steps required to obtain this information are outlined in the section entitled "Water Resources Development Program - Jesus Grove," page 79.

The wells developed in Jesus Grove have encountered a heterogeneous lithology as previously described. A wide range of horizontal and vertical permeability most likely exists in the alluvium. The most permeable lithologies are probably elongated gravel lenses randomly distributed along ancient creek meanders.

Extensive pumping from an alluvium will increase the natural recharge rate and capability of the alluvium. The best immediate methods of assisting the aquifers to recharge are to continue the riparian approach to slowing runoff and encouraging revegetation in drainage systems. Thus, livestock should be kept out of the creeks and springs, and junipers should be thinned from strategic places. Vegetation growth needs encouragement in catchment drainage and possible recharge areas. Erosion rates need slowing down and small siltation ponds can be built. See Map 14 below for location of the major streams in the City.

CITY OF RAJNEESHPURAM - Major Streams

Map 14



SURFACE WATER

Two major watershed systems are available to the City: Gautam the Buddha Creek and the Farid/Kabir Creek watersheds (see Maps 15 and 16 on pages 67 and 68). Gautam the Buddha Creek watershed has a total area of about 17 sqaure miles, of which 11 square miles drains through the City. The Hassan, Desiderata and Suzuki sub-basins of the Farid/Kabir Creek watersheds account for a total of about 100 sqaure miles and ultimately drain through Jesus Grove and into the Radha River.

A detailed and accurate assessment of the total potential water resources available to the City from the several watersheds will require a significant amount of data collection. A number of relevant facts are known or have recently been established, and reasonable estimates can be made. The average annual regional precipitation is known to be 12.5 inches. Although it is characterized as somewhat uneven in distribution due in part to the mountainous terrain, the figure is considered here to be reasonably accurate. Using this 12.5 precipitation factor for the 87,687-acre watershed available to the City, a yield of some 32.6 billion gallons of water per year falls in the watershed; expressed on a periodic daily basis, this amounts to 90 million gallons of water per day.

To quantify precisely the total water resource potential, further data will be needed:

- precise annual local precipitation figures and variations;

- evaporation ratio;

- percolation volumes;

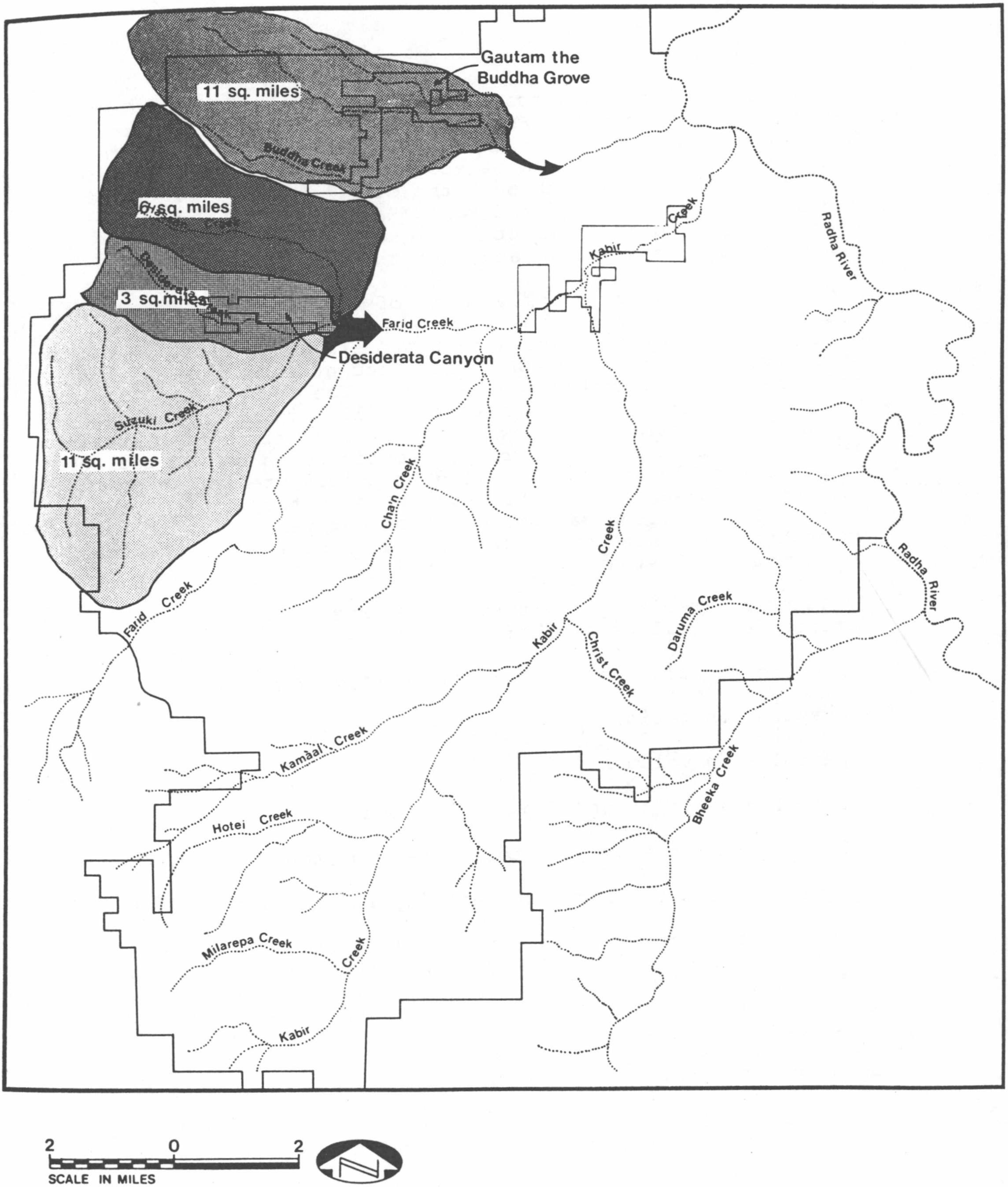
- runoff quantities and flow directions;

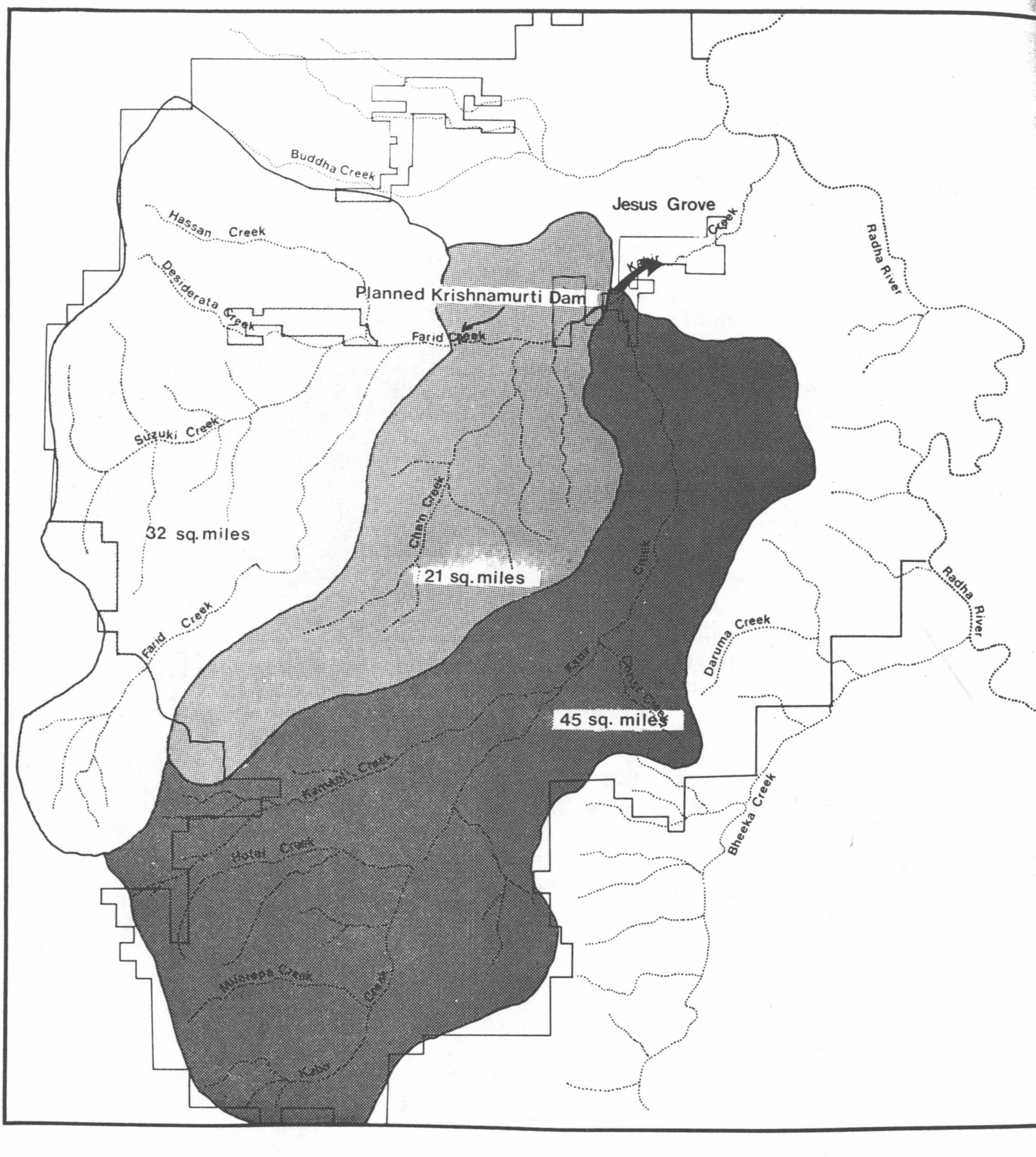
- location of underground storage basins (aquifers);

- aquifer volumes production capacity and recharge ability.

As this data becomes known, an overall picture of the potential water resources becomes clear. How much water is lost to the air, how much sinks into the land, how much is held in underground aquifers, how much runs off to the Radha River - all of this information will allow for intelligent placement of dams and reservoirs as well as providing information about the location and limits of groundwater sources.

Large reservoirs are the most efficient means of catching and storing surface water runoff. Previous owners of the land


Gautam the Buddha Grove
11 sq. miles
Buddha Creek
6 sq. miles
3 sq. miles
Farid Creek
Desiderata Canyon
Suzuki Creek
11 sq. miles
Creek
Kabir
Radha River
Cha'n Creek
Creek
Farid Creek
Radha River
Daruma Creek
Kabir
Christ Creek
Kamaal Creek
Bheeka Creek
Hotei Creek
Milarepa Creek
Creek
Kabir
2
0
2
SCALE IN MILES


Buddha Creek
Hassan Creek
Desiderata Creek
Jesus Grove
Creek
Kabir
Radha River
Planned Krishnamurti Dam
Farid Creek
Suzuki Creek
Chan Creek
32 sq. miles
21 sq. miles
Creek
Farid Creek
Radha River
Daruma Creek
Kabir
45 sq. miles
Kamakil Creek
Bheeka Creek
Hotei Creek
Milarepa Creek
Creek
Kabir
2 0 2
SCALE IN MILES

surrounding the City built four earth reservoirs well located for irrigation, stock and domestic purposes. Unfortunately, the lower Kabir and Farid reservoirs were not built properly and have been breached. Kabir Reservoir in Jesus Grove is now filled with sediment. Patanjali Lake also is half-filled with sediment and now has an average depth of only 15 feet.

The community has plans to construct or rehabilitate several large reservoirs:

1) Krishnamurti Lake - Located just downstream from the old dam site on Kabir Creek, the new dam now under construction will create a reservoir of 1,020 acre-feet. This water will be used primarily for agricultural projects in the Jesus Grove area, and secondarily will serve as a backup community water supply. Other benefits of the lake include increased groundwater recharge and a greatly reduced flood risk downstream due to buffering by the reservoir. Reservoir sedimentation will be controlled through a program that includes streambank overlays of vegetative thinnings secured in place, seeding, and the construction of silt ponds (see Map 17 and Figure 3 on pages 70 and 71.) The lake will also serve as a recreation area.

2) Patanjali Lake - With the sediment dredged, the lake will hold nearly 500 acre-feet of water, which will be used to irrigate agricultural projects in the area. In addition, the lake will continue to serve as a beautiful and popular recreation area.

3) Lower Kabir Creek - A dam and reservoir is planned near the Radha River to provide irrigation for the truck farm and other fields in that vicinity.

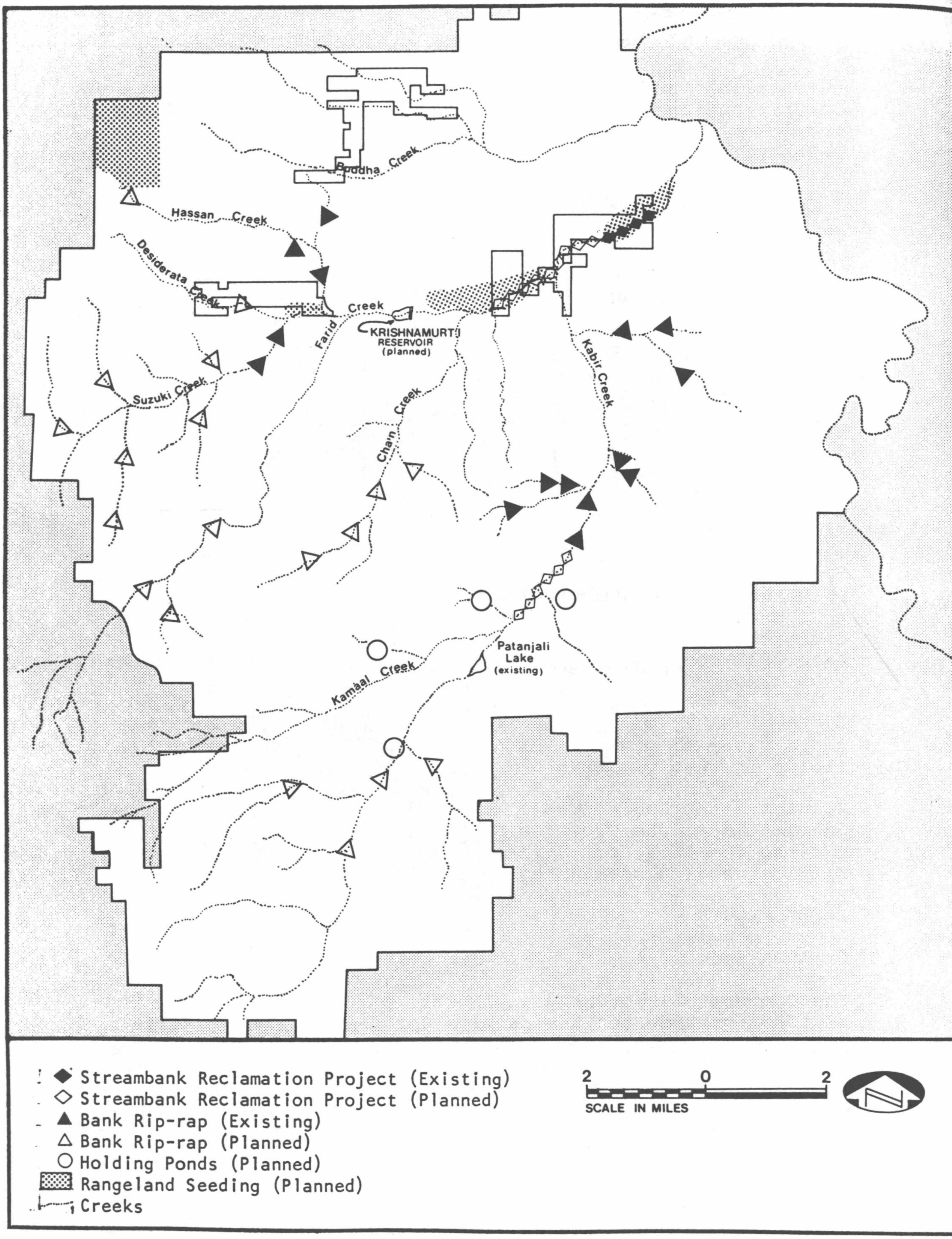
4) Gautam the Buddha Grove - Located in a catchment basin on Gautam the Buddha Creek, a dam and reservoir will provide water for the community for agricultural and industrial uses, and will serve as a backup residential supply.

WATER RIGHTS

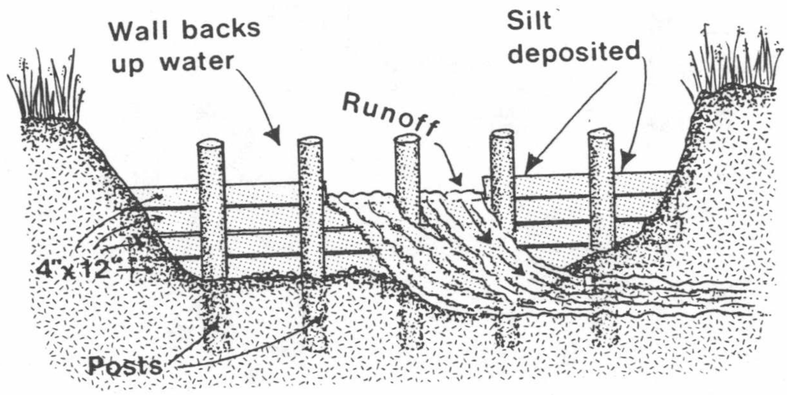
Groundwater

The Commune has recently applied to the Water Resources Department for groundwater use permits for the following wells:

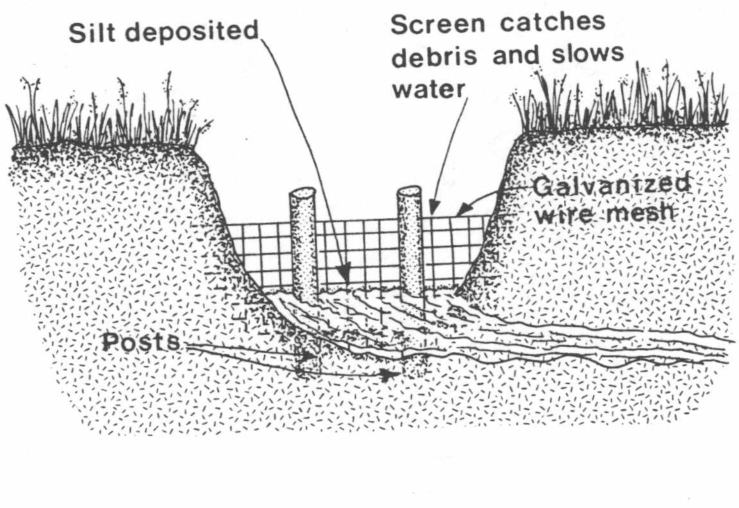
- Two well in Jesus Grove for a community (quasi-municipal) supply to serve all domestic, commercial, industrial and recreational uses;


Buddha Creek
Hassan Creek
Desiderata Creek
Farid Creek
KRISHNAMURTI RESERVOIR (planned)
Suzuki Creek
Chain Creek
Kabir Creek
Patanjali Lake (existing)
Kamaal Creek
Streambank Reclamation Project (Existing)
Streambank Reclamation Project (Planned)
Bank Rip-rap (Existing)
Bank Rip-rap (Planned)
Holding Ponds (Planned)
Rangeland Seeding (Planned)
Creeks
2 0 2
SCALE IN MILES

IN LARGER CREEKS:



OR, IN SMALLER CREEKS:



Siltation Fences

Illustrated above are two types of siltation fences that have been erected in several streams on the ranch. The fences are designed to slow runoff, trap moving debris, and form ponds and areas in which sediment will be deposited. Regrowth is expected to be accelerated in the ponds and deposited sediment.

- A well near Rabiya Barn in Jesus Grove that will be used to irrigate nearby vineyards and serve the dairy barn.

- Three wells in Gautam the Buddha Grove that will be used for community supply. A total flow rate of 600 gallons per minute has been requested.

Permits are expected shortly for all these wells.

These wells alone should provide all the water needed for domestic, commercial and industrial uses and, in addition, supplement the far greater amounts of water to be drawn from the river and watershed area for irrigation. To assure the City a supply of water from these wells, the City has entered into an agreement with the Commune by which the Commune is obligated to make water available to the City.

Surface Water

Rancho Rajneesh has current irrigation water rights totaling 841.8 acres, including supplemental irrigation for 249.7 acres. (Water rights, as measured in acres, refer to the acreage of land to be irrigated at an annual rate of up to five acre-feet per year, depending on the permit.)

The present irrigable acreage includes the fields beside the Radha River, the fields adjacent to Farid and Kabir Creeks extending from the Radha River through Jesus Grove, and the fields adjacent to the Kabir and Kamàal Creeks in the Patanjali Lake area.

Current certificates and permits allow appropriation of surface water for irrigation as follows:

Source	Acres
Farid Creek	26.3
Kabir Creek	134.0
Kamàal Creek	46.8
Patanjali Lake	40.5 (supplemental)
Radha River	135.6
Krishnamurti Lake	458.6 (209.2 supplemental)
Total	841.8 acres

Pending applications requesting permits for surface and groundwater are as follows:

Source	Acres
Rabiya Well	38.3 (22.9 supplemental)
Wastewater Reservoir	61.0 (supplemental)
Total	99.3 acres

The designation "supplemental" means that water is to be used for irrigation only after a primary source has been exhausted.

THE RADHA RIVER

A major river in central Oregon, the John Day River is called the Radha River where it forms the eastern boundary of Rancho Rajneesh. Flowing at several thousand cubic feet per second, this river is a very large source of water for the community. Current permits and applications allow up to five acre-feet per year irrigation for 135.6 acres. Pumping additional water from the river at a rate of even one cubic foot per second (approximately 480 gallons per minute) would be insignificant to the water level of the river, yet would provide a large steady additional source of water for Rancho Rajneesh lands. If required, water from the river could be pumped to other points on Rancho Rajneesh to be used for irrigation, fire protection, construction or other nonpotable uses.

There appears to be no difficulty in obtaining additional permits to use water from the river. Recently, the Water Resources Department granted temporary permission for pumping 50,000 gallons per day for construction. Once water needs have been more carefully determined and quantified, permits will be submitted requesting additional permanent water rights from the Radha River. In addition, the Commune is investigating purchase of water rights with older priority dates than it currently holds, to ensure a continual supply even in very dry years.

It is very important to remember that while the Radha River is primarily a vast source of water for agricultural purposes, it offers an excellent backup source of water and assures the ranch of sufficient supplies of water for domestic as well as construction, commercial and industrial purposes.

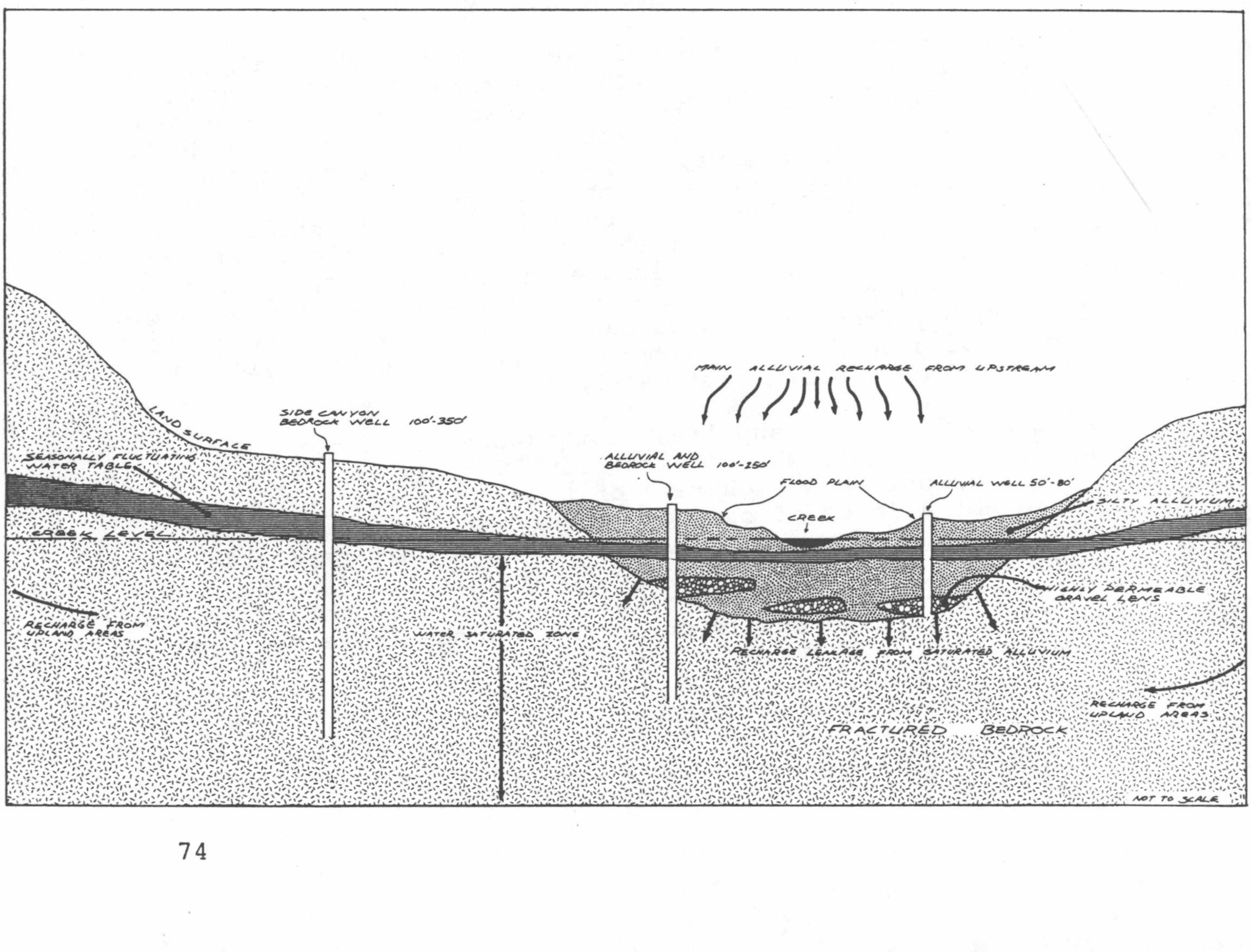
JESUS GROVE

Hydrogeologic Setting

Jesus Grove is situated in a theoretical discharge area for a large portion of the Farid/Kabir Creek catchment basin. Water entering the system in the upland recharge catchment areas should enter local and intermediate flow systems and be discharged in the lowland areas, especially in the area extending from Jesus Grove to the Radha River.

Three types of probable local flow systems have been encountered: (1) valley fill alluvial deposits, (2) fractured bedrock, and (3) bedrock in side canyons (see Figure 4 below). Each of these flow sytems is discussed in terms of the wells that have been drilled.

Wells: Typical Cross Section — Figure 4



The most important local flow system is that developed in the lower Kabir/Farid Creek valley-fill alluvial deposits. Groundwater in these unconsolidated clays, silts, sands and gravels is recharged by leakage from the streams and moves down gradient to discharge points along lower stretches of Kabir Creek or the Radha River.

Wells drilled in the valley have intersected saturated alluvium up to 50 feet thick. The varying permeability of the alluvium is reflected by the well bedrock aquifer through which passes the major portion of the combined Farid/Kabir Creek catchment and drainage systems, totalling about 100 square miles. Most wells located in this aquifer produce in the range of 30 to 80 g.p.m. Experience has enabled more efficient well location and construction for the more recent wells. For example, Well #25 (220 feet deep), constructed in June 1982, encountered an ideal combination of highly permeable alluvium overlying a saturated, highly fractured bedrock. The well has been pump-tested to a maximum of 380 g.p.m.; its normal pumping rate is 250 g.p.m., as described in the next section.

Monitoring of static levels in wells in the alluvial aquifer indicates that the present combined rate of drawing has not exceeded the rate of recharge. A seasonal rise in the water table has been observed, but the anticipated seasonal decline has not yet been observed. Quantification calculations can be made after the seasonal high and low water tables have been determined. Wells have also been developed in shallow fracture bedrock in side canyons of the Kabir Creek valley. Production has been highly variable because of the geology, the high relief and the shallow depth of the wells (100-200 feet). Recharge is probably from local side canyon sources and these wells should be used for low-volume requirements until a longer period of monitoring data can be assessed.

Adequate long-term supplies seem assured from the alluvial production rates, which range from 15 g.p.m. to 200 g.p.m. or more. To obtain a high rate of flow, it seems necessary to intersect a layer of sand or gravel that has little clay or silt to reduce the permeability. These highly permeable gravel layers may be in the form of elongated lenses (as shown in Figure 4), typical of old river channels. It should be possible to locate these channels prior to well development by geophysical surveys and/or scout drilling.

Pump drawdown tests on the better alluvial wells, such as #4 and #12, invariably show that the recovery rate is full and virtually immediate as soon as pumping stops.

A good indication of the groundwater potential of the aquifer is Well #12, which has been pumped at 20 g.p.m. continuously since November 1981 without lowering the static level. In fact, during this time despite continuous pumping the water table at #12 appears to have risen about 15 feet. It will probably decline that much during the dry season. Monitoring records have not been kept long enough to be certain of seasonal fluctuations.

The second groundwater situations is that in which wells have been drilled through the alluvium into the fractured bedrock beneath, usually to a total depth of 150 to 200 feet. This is a combined alluvial/bedrock aquifer in which there is a hydraulic connection between the alluvium and the bedrock. The combined aquifer is essentially the same as the alluvial aquifer. The bedrock is permeable enough to act as an extension of the saturated alluvium.

In this kind of situation, production has been varied and difficult to predict prior to drilling. Well #6 produced only 15 g.p.m. in the alluvium but an additional 60 g.p.m. in the underlying fractured andesitic lava when the well was deepened. The well was still picking up water when drilling was terminated.

Experience has enabled better location of the more recent wells so that they take advantage of the more permeable layers in the alluvium and the underlying highly fractured types of bedrock. For example, Well #25, drilled in June 1982, produced so much water in the alluvial gravels and broken rock at 40 to 60 feet that is was not possible to case it off while the hole was drilled further into the fractured bedrock. More water was picked up in the bedrock, but an assessment of how much could not be made.

The well has been pump tested at the pump capacity of 380 g.p.m., and it has a specific capacity of 42 g.p.m. per foot of drawdown. Well #25 subsequently pumped 250 g.p.m. for about eight hours per day for one week and, in that time, maintained a dynamic pumping level of six feet of drawdown. No significant change of static level was recorded in any other well that might have been affected. (The hydrogeologic setting for Well #25 is a combined alluvium/bedrock well upstream from a natural rock bar that may be acting as an underground barrier, slowing the downstream water movement. Certain types of rock (mainly claystone and slate) beneath the alluvium have not been sufficiently permeable to provide significant quantities of water.)

The third type of flow system encountered is in the bedrock wells in side canyons leading into the Kabir Valley. This system is probably of local origin. These wells also have highly varied production rates. Wells that have intersected less permeable rocks, such as the claystones and tight lavas in #9 and

#23 (both 360 feet deep), have produced only 5 to 10 g.p.m. Wells in highly fractured andesite lavas and flow breccias have produced 75 to 150 g.p.m. (e.g., Wells #2, 14, 15, 21).

Well #14 was pump tested for 22 hours at 120 g.p.m. during which time the well stabilized a dynamic static level 25 feet below its starting level. Well #15, in a 24-hour pump test at 80 g.p.m., maintained a dynamic static level 28-1/2 feet below its starting level.

Apart from the two 360-foot wells, few have reached 200 feet. From the schematic diagram (see Figure 4 on page 74), it can be seen that these wells may not be getting recharged from the saturated alluvium and they may be too shallow to intersect possible intermediate flow systems. The recharge for these wells may be from incident precipitation, runoff from the steep canyon walls and leakage from the intermittent streams. Such wells could, therefore, have limited recharge potential and be subject to greater seasonal water table fluctuations than the alluvial wells.

Indications from the present monitoring systems support this hydrogeologic interpretation of the side canyon bedrock wells. Caution will be exercised in the development of these wells until a longer period of monitoring can be analyzed.

CURRENT WATER SUPPLIES

The present total combined groundwater supplies far exceed the projected permanent City population requirements for this area. Twenty-five wells (producing from 5 to 250 g.p.m.) have been developed to date and these allow a fairly good assessment to be made of the groundwater resources. The wells have been drilled into a wide variety of alluvium and bedrock conditions, as described in the preceding section, "Hydrogeologic Setting." (See Map 12 on page 63.)

In summary, it has been determined that the Jesus Grove area has a combined underlying alluvial/shallow, fractured bedrock aquifer through which passes the major portion of the combined Farid/Kabir creek catchment and drainage systems, totalling about 100 square miles. Wells located in this aquifer are producing an average of 30 to 80 g.p.m. Future development should be directed towards monitoring, quantification and making the most efficient and conservative use of this resource. The water quality of the aquifer and the bedrock wells in general is good and community well test results meet E.P.A. and state health standards.

One well in particular illustrates the potential of this alluvium. Well #25 (220 feet deep), constructed in June 1982, encountered high permeable alluvium and an underlying saturated, highly fractured bedrock. The well has been pump tested to a maximum of 380 g.p.m., and its normal pumping rate is 250 g.p.m. Well #25 was used to test the aquifer production capability during a recent week-long festival held on the ranch. The well supplied water for 5,000 people at an average consumption of about 150,000 gallons per day. There was no significant change in the dynamic pumping level of Well #25, nor was there any change in the static level of alluvial wells used for monitoring during this period. (A report on this test, by Geo-Mat, Inc. is available in the Rajneeshpuram Planning Office.)

Monitoring of static levels in wells in the alluvial aquifer, indicates that the present combined rate of drawing has not exceeded the rate of recharge. A seasonal rise in the water table has been observed but the anticipated seasonal decline has not yet been observed. Quantification calculations can be made when the seasonal high and low water table is determined.

Springs

Only a few minor springs and seeps are within the proposed Jesus Grove boundary. These appear to be intermittent and of no significance as potential water sources.

Future Alternatives

Jesus Grove already has good groundwater supplies. The ultimate drawing capacity will be determined by long-term quantitative assessment. There are numerous alternatives and possible directions for future development.

Groundwater Possibilities

- Sufficient water is available from the combined alluvial/bedrock aquifer to meet current and projected future needs. Future development should be concentrated on this aquifer;

- Wells drilled more than 400 feet deep in selected locations may intersect additional resources if required, but shallow systems appear adequate;

- No information is available on the presence of deep regional groundwater aquifers;

- Shallow side-canyon wells should be used for low consumption purposes unless further investigations can confirm long-term reliability at moderate supply rates.

Surface Water Possibilities

- Krishnamurti Lake should adequately meet irrigation requirements for the Jesus Grove area, as well as supplement the general community water supply.

- An additional reservoir site on lower Kabir Creek will provide additional irrigation or domestic water when the need occurs. The dam to be built on lower Kabir Creek near its confluence with the Radha River will have several beneficial side effects, such as slowing the flow rate and hence the erosion potential of at least the lower part of the Kabir Creek drainage system. The reservoir also should greatly increase the groundwater recharge in the near upstream area.

Water Resources Development Program - Jesus Grove

As previously stated, the alluvial/bedrock aquifer should provide sufficient groundwater for projected domestic and light industrial growth. Krishnamurti Lake should adequately provide sufficient irrigation water.

Any desired additional wells should be located carefully to spread the drawing load in the aquifer, to provide further geologic information, or to be used as observation wells for aquifer capacity tests. Shallow bedrock wells in side-canyon areas should be used for low-production requirements unless additional data indicates otherwise.

Several steps are now required for the quantification of the main aquifer. The collection of the necessary data will take at least another full season, although estimates can be made and updated at intervals. In the meantime, development can continue safely using evaluation of ongoing monitoring data as a guideline.

The following information is required to determine the production capacity and recharge capability of the aquifer:

Water Table Map: This will require measurement of the seasonal high and low water tables so that determination of the average fluctuation throughout the aquifer can be made.

Aquifer Map: The thickness of the alluvium and of the hydraulically connected shallow/fractured bedrock needs to be measured. This information can be gained from surface geologic mapping, from existing well logs, from additional drilling and from geophysical methods.

Aquifer Tests: Standard aquifer tests could be made, if required, on two representative wells such as #25 and #12. These tests are not commonly made because they require the construction of from one to three close-spaced observation wells. The normal practice is to measure the specific capacity of a well in a sustained pump test, and rely on careful monitoring to insure that overdrawing of the aquifer does not happen.

The aquifer tests determine transmistivity (a measure of the rate at which water is available for pumping, and storativity (a measure of the amount of water the aquifer is able to hold).

Stream Flow Measurement: Stream gauging stations will be required upstream and downstream of the aquifer in order to determine the amount of excess water available for recharge.

DESIDERATA CANYON

Hydrogeologic Setting

The hydrogeologic conditions within Desiderata Canyon favor low-yield groundwater supplies. Desiderata Canyon Valley consists mainly of lower Clarno tuffaceous sediments (tuffs, grey clays and claystone) overlaid in places by saprolite (an ancient red soil horizon). (See Map 5 on page 35.)

These strata are tight, have low permeability, and are not good aquifers. The low permeability limits the amount of water entering the ground and also the amount available for pumping. Multiple specially engineered wells may provide sufficient groundwater, but this is not a preferred choice.

Indications from a 600-foot well, from surface mapping and from regional reports, are that the Clarno tuffaceous sediments may be several hundred feet thick. Lava flows, mostly andesitic, are interbedded within this rock sequence, and these should provide good but probably deep aquifers. The distribution and extent of these flows, however, seems to be erratic. Interpretation of regional data suggests that if the 600-foot well were deepened, it might intersect a lava flow between 600 and 1,000 feet.

Areas of extensive earth movement such as faults, brecciated zones and landslides in lower Clarno sediments do not seem to be good drilling targets. Earth movement has rendered already clayey sediments even more clayey and impermeable.

Promising potential aquifers are the basalt, andesite and rhyolite lava flows, and the welded ash flow sheets in the surrounding uplands. Wells #M2 and #M3 in Gautam the Buddha Grove are currently producing water from a welded ash flow sheet that seems to be an extension of a similar formation in the upland area of Desiderata Canyon. These hard strata are permeable due to abundant fracturing. Although these upland areas are basically areas of recharge, multiple wells may provide enough water for domestic requirements in Desiderata Canyon. The water could then be gravity fed to distribution points.

Current Water Supplies

One well, producing 3 g.p.m. of good quality water, was constructed at the entrance to Desiderata Canyon (Map 13, page 64) to service the first homes installed and to test the groundwater potential. The well was drilled to 600 feet and has shown that low yields are available from the fractured bedrock.

The water temperatures below 500 feet were 80° to 85°F, which is high compared to water temperatures from any other well on the ranch. A potential anomalous geothermal heat source is indicated and warrants further exploration.

Exploratory geologic drilling is in progress to assess the groundwater potential of formations that appear likely to produce wells of more than 15 g.p.m. for example, water has been encountered in a well currently under construction in alluvium and shallow fractured bedrock about midway between the entrance to Desiderata Canyon and Krishnamurti Dam. If this well yields low to moderate amounts of water, it will be sufficient to supply all domestic needs of Desiderata Canyon.

Springs

Numerous small springs and seeps flow into Desiderata, Suzuki and Hassan Creeks. A few springs, such as Vimalkirti Springs and a spring at the head of Desiderata Creek, appear to be permanent. There are indications that upper Desiderata Creek may flow throughout years of average or above-average precipitation. Vimalkirti Springs, measured in May and June 1982, flows at 13 g.p.m. Other springs have flows of from one to ten g.p.m.

The springs invariably appear to be of the "perched" type. The typical geologic setting is illustrated by the "ring" of springs on or about the same topographic contour lines as Vimalkirti Springs (see Map 13, page 64). These springs are situated at the contact of a high basalt butte (Columbia River Basalt), which is centered about two miles west of the western boundary of Desiderata Canyon, and the underlying tuffaceous clays. Rainfall percolates down through fractures in the basalt until it reaches the impermeable clay horizon, whereupon it travels laterally on the clay until it seeps out of the side of a hill. See Figure 5 on the following page.

The temperatures of the springs vary with the seasons, from about 45° in winter to 60° in the spring. This is further evidence of the surface source of the springs.

Future Alternatives

The City has numerous alternatives for providing adequate water to the Desiderata Canyon area:

Groundwater Possibilities

- Multiple low-yield wells could be developed along the canyon floor;

- Specially engineered wells could be constructed in the shallow alluvium upstream of the flood area of Krishnamurti Dam where an exploratory well is presently being drilled;

- Wells 600 to 1,000 feet deep in the Canyon may intersect waterbearing lava flows from which good supplies may be possible;

- Desiderata Canyon could, if required, be connected immediately to the Jesus Grove community water supply, where adequate surplus groundwater seems assured;

- At least two springs above Desiderata Canyon appear permanent (e.g., Vimalkirti Springs.) Flows are in the order of 5 to 13 g.p.m. and the springs could be properly developed, treated and used, if required;

- Water has been located in shallow, fractured bedrock of the surrounding upland area where favorable formations are present.

Surface Water Possibilities

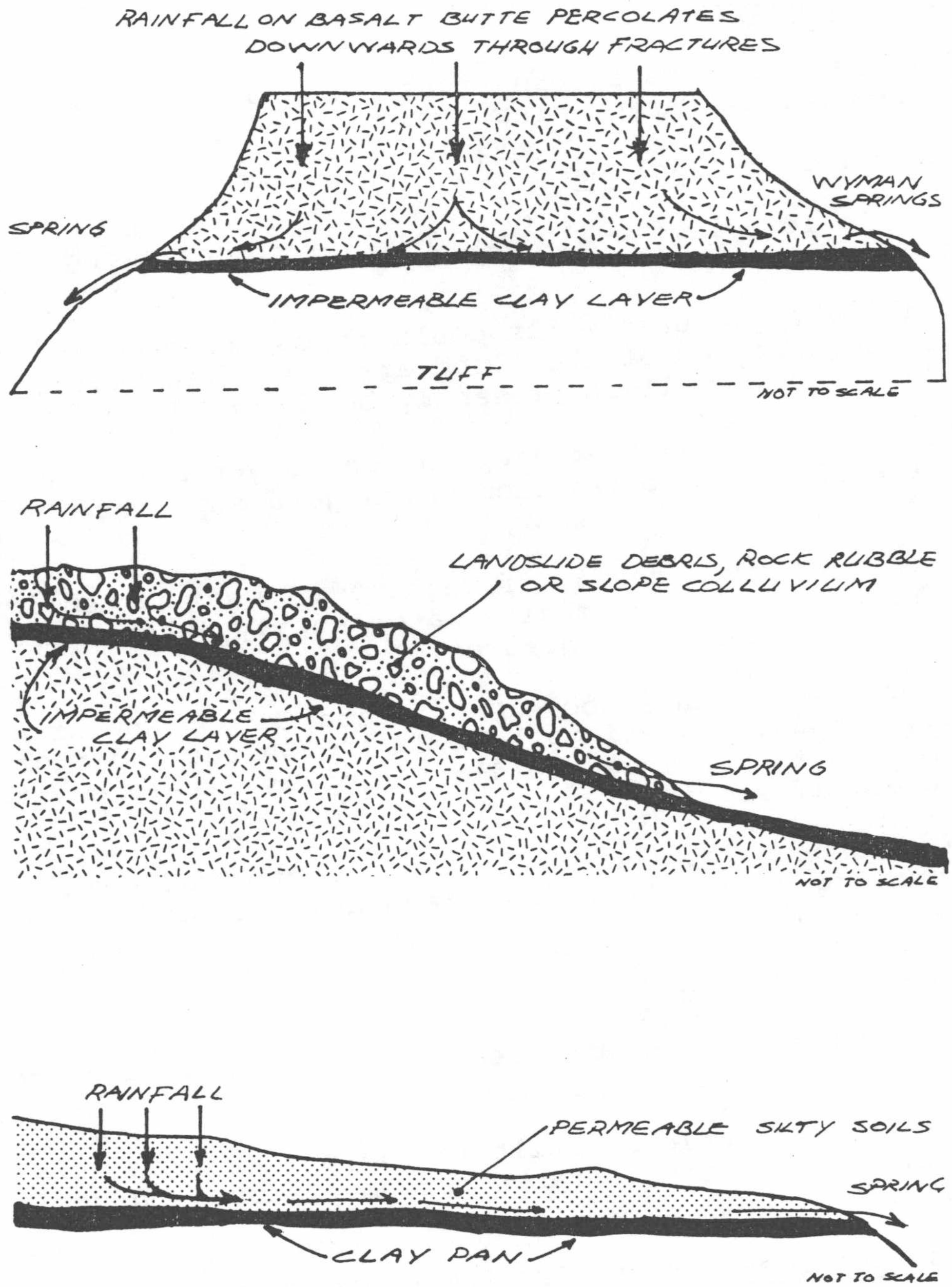
- Water could be pumped and treated for domestic use from Krishnamurti Lake;

- Catchment dams could be built in canyons such as Suzuki Canyon, which has a considerable catchment area and soils that assist runoff.

Water Resources Development Program - Desiderata Canyon

The current program is to evaluate and develop the best available

Typical Spring Cross Section Figure 5



groundwater source. Exploratory drilling is proceeding to determine the hydrogeologic characteristics of the most favorable formations. Well construction will be made accordingly.

GAUTAM THE BUDDHA GROVE

Hydrogeologic Setting

Three wells, called M1, M2 and M3 (see Map 13, page 64), have been drilled to provide water and to test the groundwater potential in Gautam the Buddha Grove. Well M1 is in the center of Section 14, approximately 1,200 feet east of the proposed education center.

Well M2 is approximately 1-1/2 miles from Well M1, in Gautam the Buddha Valley in Section 22, about 600 feet north of Tao Road. This 260-foot well was located to provide preliminary water for the southern portion of Gautam the Buddha Grove, and to test the groundwater potential. The most recent well, M3, was recently constructed in Section 15 (see Map 13).

Well M1 was drilled through 30 feet of surface silts and clays into 70 feet of highly fractured and permeable basalt and basaltic andesite. The aquifer in this rock has a saturated thickness of 40 feet. This aquifer may be formed by a large block and broken rubble of the ancient landslide basalt. Similar broken rock and rubble is visible on the surface from the well site running westwards about four miles to Francis Mountain.

It seems that the broken rock and rubble is acting as a shallow reservoir in local geomorphic basins. Pump tests indicate that the well will maintain a dynamic level at 15 g.p.m. The hydrogeologic setting indicates that this shallow system will receive direct recharge from winter catchment, during which period it could be possible to pump at higher rates. Careful monitoring and experimental pump testing during winter months will determine the recharge capability for M1. Depending on these tests it may be possible to draw the aquifer down during the dry months to take full advantage of the recharge capability.

Well M2 intersected a fractured greyish to multicolored welded ash flow sheet (welded tuff), which contained the water. Water was also present in the shallow alluvium and rubble of Gautam the Buddha Creek and there is a hydraulic connection between the saturated alluvium and shallow fractured bedrock.

Well M3 was drilled to 530 feet and has provided a good picture of the stratigraphy of the area. The 74-foot surface comprised broken basaltic rubble with some mixed clays. Shallow water perching on underlying red claystone was present from 53 to 73 feet. Continuous air testing during deepening of the hole to 500 feet showed a constant 50 g.p.m. flow from this shallow layer. Adjacent new road cuttings illustrate the landslide origin of this shallow rubble and probably of the rock intersected in M1. This shallow water was cased off at the completion of the well to enable accurate monitoring of the deeper water subsequently encountered. The casing could at any time be perforated to use the shallow water, if required.

Beneath the rubble was almost 200 feet of red claystone (a saprolite), and then 140 feet of white hard tuff that apparently did not produce water. The bottom 120 feet of the well penetrated a welded ash flow sheet identical to that intersected in M2. The water was encountered in very hard fractured rock at 505 feet, and was under considerable pressure. The static level rose to within 50 feet of the surface. The water flowed for 3 hours continuously at 520 g.p.m. during drilling and air testing.

The temperature of the flowing water is 74^{o}F, which indicates the presence of a heat source. Deeper exploration for geothermal sources should be conducted.

The aquifer encountered in M2 and M3 could, therefore, prove to be of considerable extent. The welded tuff in which it lies is widespread (as shown in the Geologic Map on page 35) and underlies a large portion of the catchment area of Gautam the Buddha Grove. It outcrops in several places and could be receiving recharge throughout the catchment basin and from the Vimalkirti Springs area, where it also outcrops.

Geologic interpretation of the stratigraphy of the Gautam the Buddha Grove area is made difficult because of the paucity of outcrop and the widespread superficial cover and soil landslide debris. However, there is sufficient exposure in the steep southeasterly facing slopes of Gautam the Buddha Creek in Section 23, in the area between Gautam the Buddha Creek and Desiderata Canyon, and enough drilling information, to form a fairly reliable picture of the geology. A summary of the stratigraphic succession is given in the "Land" sub-chapter and in the Geologic Map and Cross Sections on page 35.

In Gautam the Buddha Grove the surface "float" appears to be landslide rubble from the Columbia River Basalt and tuffaceous clayey sediments of the John Day Formation. These sediments have inherent low permeability. The welded tuff, which is similar to that described in the literature as the base of the John Day Formation, underlies the tuffaceous sediments. This is the strata intersected by Wells M2 and M3, and it has sufficient features to act as a good aquifer.

Beneath the welded tuff, an andesitic lava flow is visible in several places such as Desiderata Canyon, Hassan Canyon and Section 26, T8S, R18E. The andesite marks the top of the upper Clarno Formation and is highly fractured in places, such as at the entrance to Hassan Canyon. It may be present beneath the saprolite in M2.

This lava flow is underlaid by a thick red saprolite, which in turn is underlaid by yellow-white tuffs of the lower Clarno Formation. Both rock types have low permeability, as evidenced by drilling in Desiderata Canyon.

Based on the available evidence, Gautam the Buddha Grove has one and possibly two extensive aquifers beneath the surface clays and landslide debris: the welded tuff and the andesite flow. In places, these two possible aquifers may be found hydraulically connected. The formations will be at varying depths beneath the surface depending on local strike and dip of the formations, which are still to be determined, and on the degree of disruption to the bedrock caused by ancient landslides.

It is possible now to summarize the knowledge that has been gained about the geological conditions in the Gautam the Buddha Grove area and the implications these conditions have for the water supply in the area:

(1) The catchment area is well defined and contained by surrounding ridges, and it has several geomorphic drainage basins that seem favorable for local recharge and discharge. The distance from the head of the catchment basin (Francis Mt.) to the lowest point at the confluence of Gautam the Buddha and the other main streams draining the basin is about 5 1/2 miles.

(2) Runoff is delayed and percolation is assisted by topographic features such as the relatively gentle undulating topography, the numerous broken rocky hills, humps, sag ponds and landslide debris, and the general stoniness of the ground, which traps the surface water.

(3) The fissured, fractured nature of the bedrock, as a result of the ancient landslide activity, will assist recharge, and water can freely enter the ground via large, open near-vertical fractures that are filled with cobbles;

(4) Infiltration and downward percolation of water into the basalt buttes, hills and rocky areas is taking place, evidenced by numerous seeps and springs at the base of these areas. This percolation is slowing runoff and assisting recharge. The lack of large drainage systems and the fast rate at which streams dry up after rains is further evidence that water is filtering into the ground;

(5) The wells have demonstrated that recharge is occurring and that shallow aquifers are present, capable of yielding up to 200 g.p.m. Also a deeper and higher production aquifer exists and may be extensive.

Current Water Supplies

Preliminary pump tests have been conducted on all three wells. The 100-foot M1 well was initially air tested for three hours at 150 g.p.m. A preliminary pump test was made at 75 g.p.m. for four hours, during which time the drawdown was four inches. The well has a maximum pumping capacity of 220 g.p.m. A sustained pump test was conducted at a rate of 20 g.p.m. for 24 hours, then 15 g.p.m. for 29 hours, during which time the static level drew down 4 1/2" from 65'0" to 65'4 1/2", and stabilized. The well has a specific capacity of 40 g/ft of drawdown.

Sustained pump tests were conducted on the M2 well at rates varying from 15 to 200 g.p.m. A 98-hour continuous test was done in two phases - 28 hours at 15 g.p.m. and 70 hours at 30 g.p.m. In the first phase, the drawdown was seven feet (from 7 to 14 feet); in the second it was 13 feet (from 14 to 27 feet). The dyanamic level was steady at 27 feet for more than 24 hours. The well recovered to 9'8" in 15 hours. Over the past six weeks, millions of gallons have been pumped from the well without any effect on the recharge rate or level.

The most recent well, M3, appears to be even more promising. Initially it was air tested for three hours at 520 g.p.m. The first stage of testing was for 30 hours at 100 g.p.m. The static level drew down from 50 to 110 feet in 10 hours, and this dynamic level was maintained for 20 hours. In one hour the static level had recovered to 89 feet, where it stabilized. Sustained pump testing is now in progress. The three wells together demonstrate that the conditions at Gautam the Buddha Grove do favor groundwater recharge and that there are producing aquifers in the shallow, and deeper, fractured bedrock. Multiple low-to-moderate production wells (5-50 g.p.m.) carefully distributed throughout the geomorphic drainage basins should provide adequate water for the City.

Springs

Numerous small springs and seepage areas exist in the Gautam the Buddha Grove area. The springs are seasonal with flows varying from 1 to 10 g.p.m. Temperatures range from 45° to 50°F in winter, to 60°F in spring. Most springs, seeps and streams are dry or have drastically reduced flow by July.

The springs perch on clay layers beneath basalt buttes, rocky outcrops, landslide debris and in shallow clay-pan areas. They do not appear to be an important direct source of domestic water, but the seepage process is delaying runoff, assisting groundwater recharge and providing some late-season water for animals and wildlife.

Future Alternatives

Several possible alternatives exist to provide adequate water supplies for Gautam the Buddha Grove:

(a) Groundwater Possibilities:

(1) Multiple low-to-moderate production wells (15 to 100 g.p.m.) could be constructed in the shallow landslide rubble and fractured bedrock, at suitable intervals to avoid mutual interference. These wells would be distributed throughout the distinct geomorphic drainage basins containing the existing wells, and in other areas. Higher drawing rates can be expected from these wells in the wet season than in summer. This system alone should provide adequate water for all City uses.

(2) The welded tuff aquifer will probably underlie the City area at depths varying from the surface to more than 500 feet depending on the dip of the formation and on the topography. It appears to be a high-producing aquifer but its recharge capacity is not yet determined.

(3) The andesite lava, inferred to be beneath the welded tuff (see Geologic Cross Section on page 35) may provide an additional deeper, extensive aquifer. This possible aquifer could contain warmer water than that encountered in M3.

(4) Groundwater may be present in the fractured rhyolitic and andesitic bedrock in the relatively broad valley of Gautam the Buddha Creek in Sections 23 and 24. This area appears to be a groundwater discharge area.

(5) Other wells could be located in lower Gautam the Buddha Canyon, where hydrogeologic conditions appear favorable for groundwater.

(b) Surface Water Possibilities:

Several potential sites for moderate-sized reservoirs are present in lower Gautam the Buddha Canyon. Surface water could be stored, treated and pumped up to that portion of the City from one or more reservoirs. Sites along Gautam the Buddha Creek are being investigated at the present time.

Water Resources Development Program

Sustained pumping tests are currently being conducted on the M3 wells to determine the specific capacity and probable long-term production rate of the aquifer. The location and construction of additional production and evaluation wells will then be undertaken, depending on the test results. Sufficient water is probably already available for short-term development needs.

Well monitoring systems have been set up with the guidance of Geo-Mat, Inc., Consulting Hydrologists. Geotechnical surveys have been conducted for each of the three City areas and hydrogeologic assessments have been made of borehole information, monitoring data and local geology. Quantification of the total groundwater resource potential is an ongoing process; the data now available is sufficient to guide development planning. Ongoing monitoring and evaluation programs as outlined in Volume 2 will further refine the available information.

4. HAZARDS

The incorporated area has been studied in detail by independent investigators to determine whether or not there are natural hazards that pose a threat to the City's development. Many different kinds of potential hazards were considered, and these are discussed in detail in this section. Among the main hazards identified were volcanic activity, soil creep, floods and landslides.

The primary source of volcanic activity is the Cascade mountain range to the west, which recently demonstrated its active nature with the spectacular eruption at Mount St. Helens in Washington. The impact on the City of such an eruption would be confined to harmless deposits of ash.

The soil in this region is expansive and in many areas is denuded of vegetation, making it prone to erosion. This presents ecological and agricultural problems, but will not affect construction since the topsoil will in any case be removed for the building of foundations. Rock and subsoil formations below the topsoil are adequate for the purpose of construction.

The sites on which the City is to be incorporated fall within a region that is prone to flash floods. However, only one of the three sections of the City is located in the vicinity of a flood plain: Jesus Grove. Estimates were made of a "worst case" situation, in which measurements were made of the volume of water produced by a flood such as might occur once in a hundred years. It was discovered that none of the proposed construction sites in Jesus Grove would fall within the flood zone of such an occurrence.

Landslide susceptability required the most detailed study, particularly in regard to the section of the City known as Gautam the Buddha Grove, which is sited in the vicinity of an ancient landslide area dating back several million years. After extensive tests it was decided that precautionary measures should be taken to prevent the reactivation of ancient landslide activity that has now stabilized. Construction projects in Gautam the Buddha Grove will be designed accordingly.

Investigations of these and other hazards were made by Century West Engineering Corporation of Bend. The findings, analysis and conclusions summarized in this section are based on their findings, hereafter referred to as "The Geotechnical Reports." Copies of these reports are available for review at the Rajneeshpuram Planning Office.

POTENTIAL HAZARDS

Faults and Earthquakes

The largest historic earthquake occurred east of Maupin on April 12, 1976, and was of Mercalli Intensity VI. No surface faults on the site are believed to be active. A probable maximum earthquake of Mercalli Intensity VII is suggested for design considerations in areas of poor ground conditions (unstable colluvial and alluvial soils) in the City. This intensity level corresponds to Seismic Zone 2 in the Uniform Building Code. Quakes of this severity cause only slight damage to well designed and well built structures. Construction standards cited in the UBC should be followed.

Volcanism

Volcanoes in the Cascade Range (i.e., Mt. St. Helens and Mt. Hood) have an eruptional history for the past 4,000 years and are likely to erupt in the future. The most probable volcanic activity of significance to the City will be ash fall.

Landslides

The most conspicuous geologic feature within the Gautam the Buddha Grove area is the terrain associated with the ancient composite landslides (illustrated on Map 18 on page 95). The slide is recognized by the prominent headscarps, extensive sag ponds and large hummocks, gentle to moderate slopes, variable attitudes of bedrock, minor ground water seepage and lateral displacement of creek alignments.

The age of the major landslide masses is probably early Pleistocene, when wetter climatic conditions prevailed and downcutting destabilized the existing bedrock masses. Movement since then has been minor as evidenced in the deeply incised stream drainages occurring within the areas containing landslide debris. Prolonged extensive erosion has reduced the slopes and stabilized the masses. No recent activity was observed during investigations.

The ancient landslide activity has had the beneficial effect of providing Gautam the Buddha Grove with the largest area in the City having gentle to moderate slopes. The prehistoric activity may also be responsible for increased groundwater recharge. (See "Water.")

The major issue posed by the widespread landslide terrain in Gautam the Buddha Grove was that of determining whether a potential hazard for development existed. Potential problems that should be anticipated during development are poor drainage conditions, highly variable bedrock and soils, and highly variable cutback stability. The investigation found that the areas containing ancient landslide debris were buildable within limitations as outlined below.

- Cuts could be made into hillsides that are less than 20% slope. Any cuts on slopes greater than 20% should be monitored by qualified geologic personnel.

- Irrigation or pond construction should be severely limited when uphill from building sites to preclude the possible infiltration of water into dried old slip planes.

In Jesus Grove and Desiderata Canyon, only very small areas of old landslide debris were identified, since landslide areas were intentionally omitted when the City boundaries were selected. However, in these small areas, the same precautions as in Gautam the Buddha Grove should be followed. In short, the ancient landslides in the area occurred when the climate was much wetter causing heavier, more plastic soil conditions. The land is safe to build on provided the conditions of undercutting wet hillsides that caused the movement in prehistoric times are not recreated. The limitations on cuts in slope and irrigation, along with standard good building and engineering techniques, are sufficient to provide adequate safeguards against the recurrence of this geologic event.

<u>GEOTECHNICAL UNITS</u>

The City area has been mapped according to geologic soil units on the basis of geotechnical characteristics. Similar building limitations and mitigations can be expected for the same unit; e.g., "alluvium", whether the unit is in Gautam the Buddha Grove, Jesus Grove or Desiderata. A full discussion can be found in the "Geotechnical Reports." The geotechnical factors considered include:

- expansive soils

- compressible soils

- perched groundwater conditions
- shallow bedrock
- slope stability
- soil erosion.

The geotechnical units are described below and their locations are shown on Maps 18, 19 and 20 on the following pages.

Topsoil

The majority of the City is covered with one to 3½ feet of soil mantle consisting of dark reddish brown to grey-brown, highly expansive, high-plasticity clays and silts. Active soil creep is evident on the 20% to 50% slopes. Some soils have high erosion potential. The loose topsoil mantle at proposed building sites should be processed adequately to an appropriate depth when left in place, in accordance with recommendations. Foundations bearing in these soils should meet minimum design criteria specified in the "Foundation" section of the "Geotechnical Reports."

Shallow Bedrock and Rocky Areas

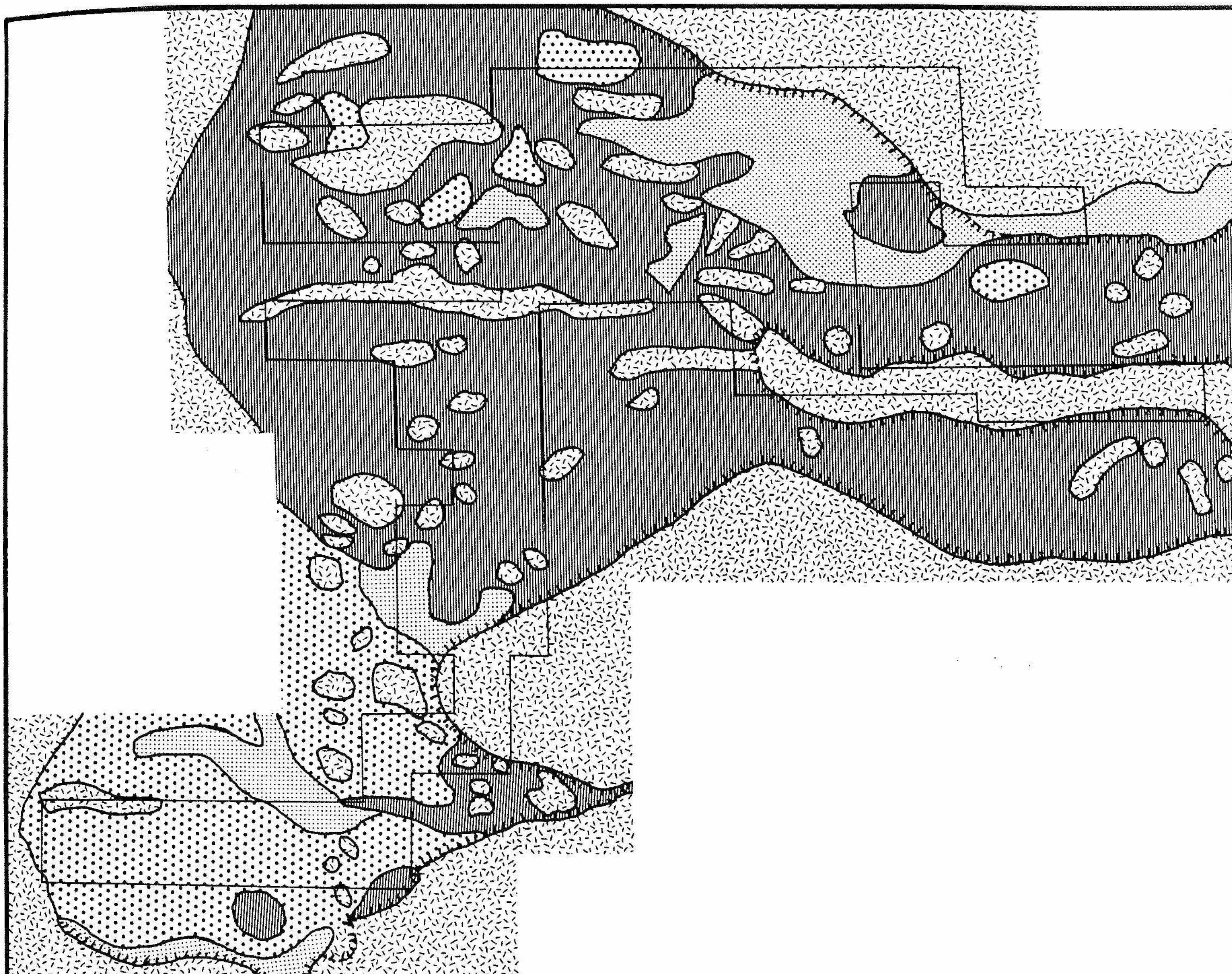
Problems to be encountered will be shallow bedrock, variable ripability, the generation of oversize material, the necessity of blasting for certain excavations and the placement of underground utilities.

Alluvium

The unit is comprised of mostly loose to soft, potentially compressible alluvium consisting of brown to dark brown, sandy to clayey silts. Extensive wet areas of potentially long duration are included. Thicknesses vary from three to 15 feet. Problems to be anticipated are compressibility and a variable water table. Removals to a minimum of three feet (or as determined by the on-site engineer) can be expected where loads from earth fills or settlement-sensitive structures will be applied.

Older Colluvium

These are ancient deposits of slope wash origin. The deposits directly underlie the topsoil and consist of calcium-rich, dark reddish brown, dry to humid, medium dense to dense, angular to round, gravel to boulder-size



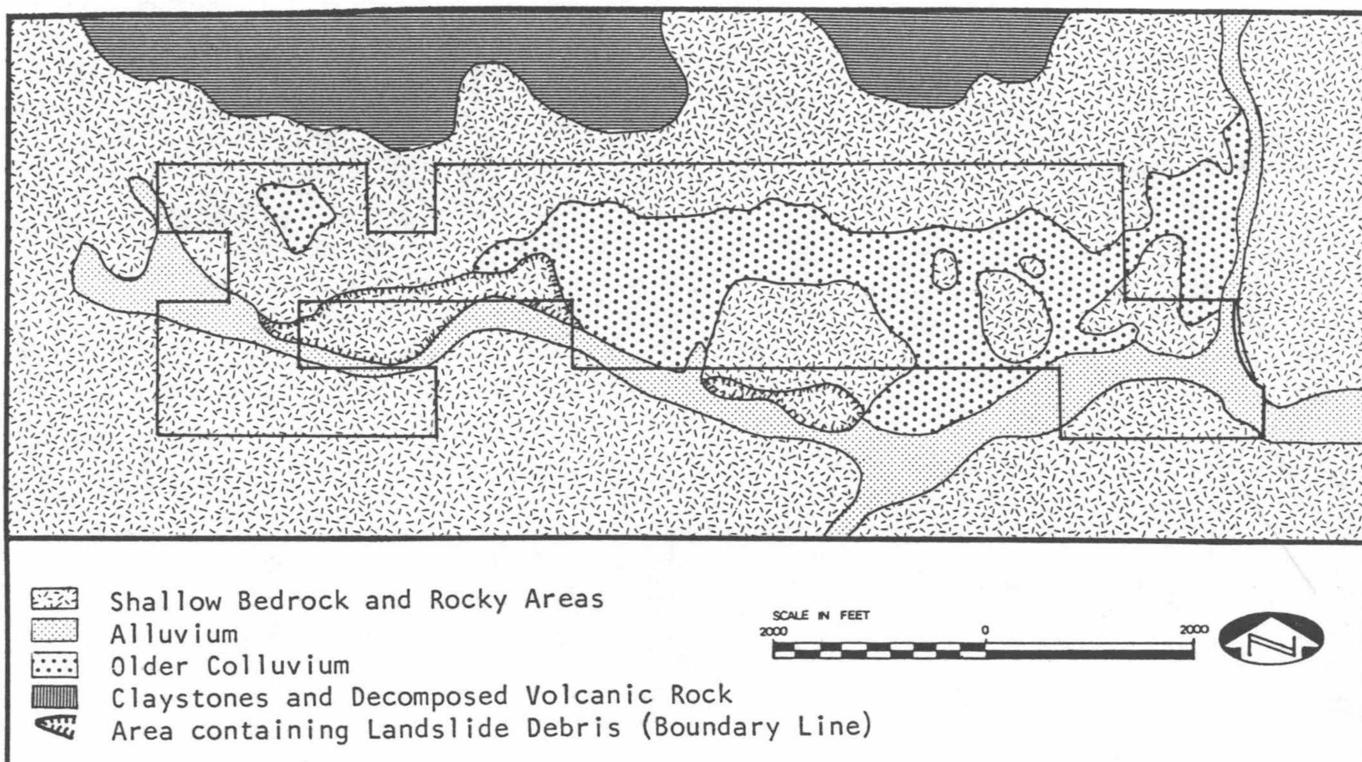
Shallow Bedrock and Rocky Areas
Alluvium
Older Colluvium
Claystones and Decomposed Volcanic Rock
Area containing Landslide Debris

SCALE IN FEET
2000 0 2000

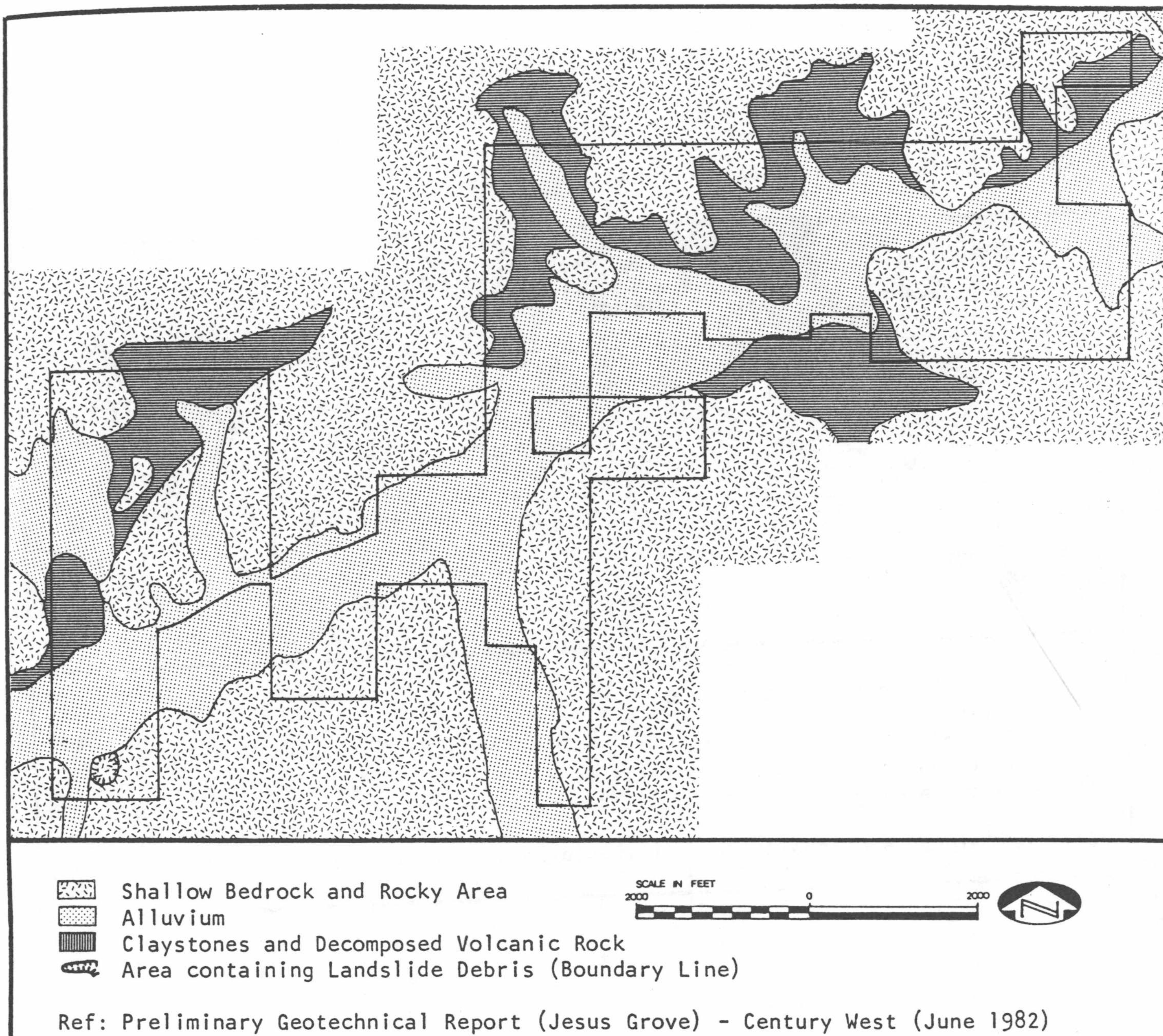
Ref: Preliminary Geotechnical Report (Buddha Grove) - Century West (June 1982)

DESIDERATA CANYON - Geotechnical Unit Map

Map 19



Ref: Preliminary Geotechnical Report (Desiderata Canyon) - Century West (June 1982)


Shallow Bedrock and Rocky Area
Alluvium
Claystones and Decomposed Volcanic Rock
Area containing Landslide Debris (Boundary Line)
SCALE IN FEET
2000
0
2000
Ref: Preliminary Geotechnical Report (Jesus Grove) - Century West (June 1982)

rock in a matrix of low plasticity clay with varying silt and sand content. The observed thickness of the unit varied from six inches to 13½ feet.

Problems anticipated include compressibility, oversize material and variable shrink-swell. Mitigation will include partial removal and recompaction as well as disposal of oversize rock to provide suitable bearing for earth fills and slab structures. Site-specific engineering determinations will be necessary for each proposed development.

Claystones and Decomposed Volcanic Rock

This is comprised mostly of green to brown, low plasticity, locally mottled and hard claystones and siltstones. The decomposed volcanic bedrock consists of humid to damp, medium to dense gravel-sand-clay mixtures. A large percentage of the clays are probably montmorillonite in composition. The expansive potential of the claystone is rated high to critical. This unit underlies the topsoil in the majority of Gautam the Buddha Grove. Anticipated problems are potential for slope instability, variable shrink-swell and variable density. Qualified personnel will be required to make geologic inspections during grading for adverse conditions that may be exposed in cut slopes. All cut slopes in this unit should be seeded and maintained to prevent deterioration. Further information on cut and fill slopes is outlined below under "Slope Stability."

ENGINEERING RECOMMENDATIONS

Recommended grading specifications are detailed in the "Geotechnical Reports" and should be followed. The specifications discuss in detail:

- engineering and geologic surveillance and supervision
- site preparation
- compacted fills
- cut slopes
- grading control
- construction considerations

Recommended foundation details are given in the "Geotechnical Reports" and these should be generally followed, subject to varying site-specific conditions and final design. The foundation details cover:

- concrete foundation footings; interior and exterior; slabs; moisture control;

- all-weather wood foundations;
- pole foundations;
- settlement considerations;
- retaining structures;
- lateral resistance;
- pavement thickness design considerations.

GEOTECHNICAL UNITS AND CHARACTERISTICS STUDY

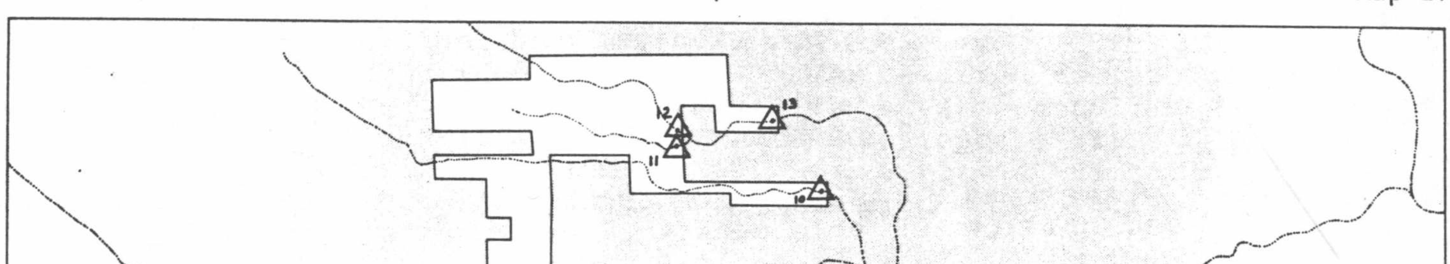
(see text for mitigations)

	GEOTECHNICAL UNIT	CHARACTERISTICS	LIMITATIONS No cuts in slopes over
1.	Topsoil	Variable shrink-swell, erosion potential, active soil creep	30%
2.	Landslide Debris	Poor drainage, highly variable bedrock and soils, variable cut bank stability	20%
3.	Rocky Areas and Shallow Bedrock	Shallow bedrock, variable density, variable rippability may need blasting, oversize material	30%
4.	Alluvium	Compressible, variable water table, slope stability for cuts	30%
5.	Older Colluvium	Compressibility, oversize material, variable shrink-swell	30%
6.	Claystones and decomposed Volcanic Rocks	Potential for slope stability variable shrink-swell, variable density	30%

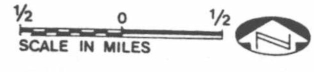
Flood Hazard

This Plan should consider the probability of a maximum runoff occurrence and its effect on the placement of urban improvements. It is generally assumed for such a study that the economic life of a structure is one hundred years. The probable high water that occurs as a result of a storm of 100-year frequency is used to delineate the flood plain. Locations where a 100-year storm does not exceed the steep, well-defined stream banks are not considered to be flood plains. The engineering consulting firm of Century West Engineering was asked to submit estimated flows for 100-year storms at various locations. Map 21 below and Map 22 on page 103 show the results of this study. Century West's conclusions were based on the method for computing flood peaks as set forth in a publication entitled "Regionalized Flood Frequency Data for Oregon," published by the Oregon State Engineer in 1981. The curve for the Radha River, zone 3, was used. Drainage basins were computed from USGS topographical maps. The locations of the points where the estimated flows were made are shown on the map below and detailed on the following pages.

CITY OF RAJNEESHPURAM - 100-Year Storm Checkpoints — Map 21



Ref: Century West Engineering - Letter (6/25/82) re: Flood Calculations 0623.003A1



Point Number	Description	Basin Area (sq. mi.)	Estimated 100-Year Flood (cubic feet/sec)
1	Kamàal Creek Center Sec. 28, T8S, R19E	96	2,060
2	Kabir Creek above Hdqtrs. NW1/4, Sec. 32, T8S, R19E	44	1,360
3	Farid Creek above Hdqtrs. NE1/4, Sec. 31, T8S, R19E	49	1,460
4	Upper Farid Creek SW1/4, Sec. 31, T8S R18E	21	930
5	Lower Desiderata Canyon, SW1/4, Sec. 34, T8S, R18E	14	730
6	Hassan Canyon SW1/4, Sec. 34, T8S, R18E	6.6	470
7	Middle Desiderata Canyon, SE1/4, Sec. 33, T8S, R18E	2.1	210
8	Upper Desiderata Canyon, SE1/4, Sec. 32, T8S, R18E	1.4	160
9	Buddha Creek at Ince Camp, SE1/4, Sec. 22, T8S, R18E	2.1	210
10	SW1/4, Sec. 13, T8S R18E	3.6	300
11	SE1/4, Sec. 14, T8S R18E	0.3	50

Point Number	Description	Basin Area (sq. mi.)	Estimated 100-Year Flood (cubic feet/sec)
12	SE1/4, Sec. 14, T8S R18E	1.1	130
13	SW1/4, Sec. 13, T8S R18E	1.7	180

All these sites were chosen for their greater potential flooding danger. Stream channel and bank slope cross sections were surveyed and plotted. The probable 100-year flood high-water mark at each location was then determined.

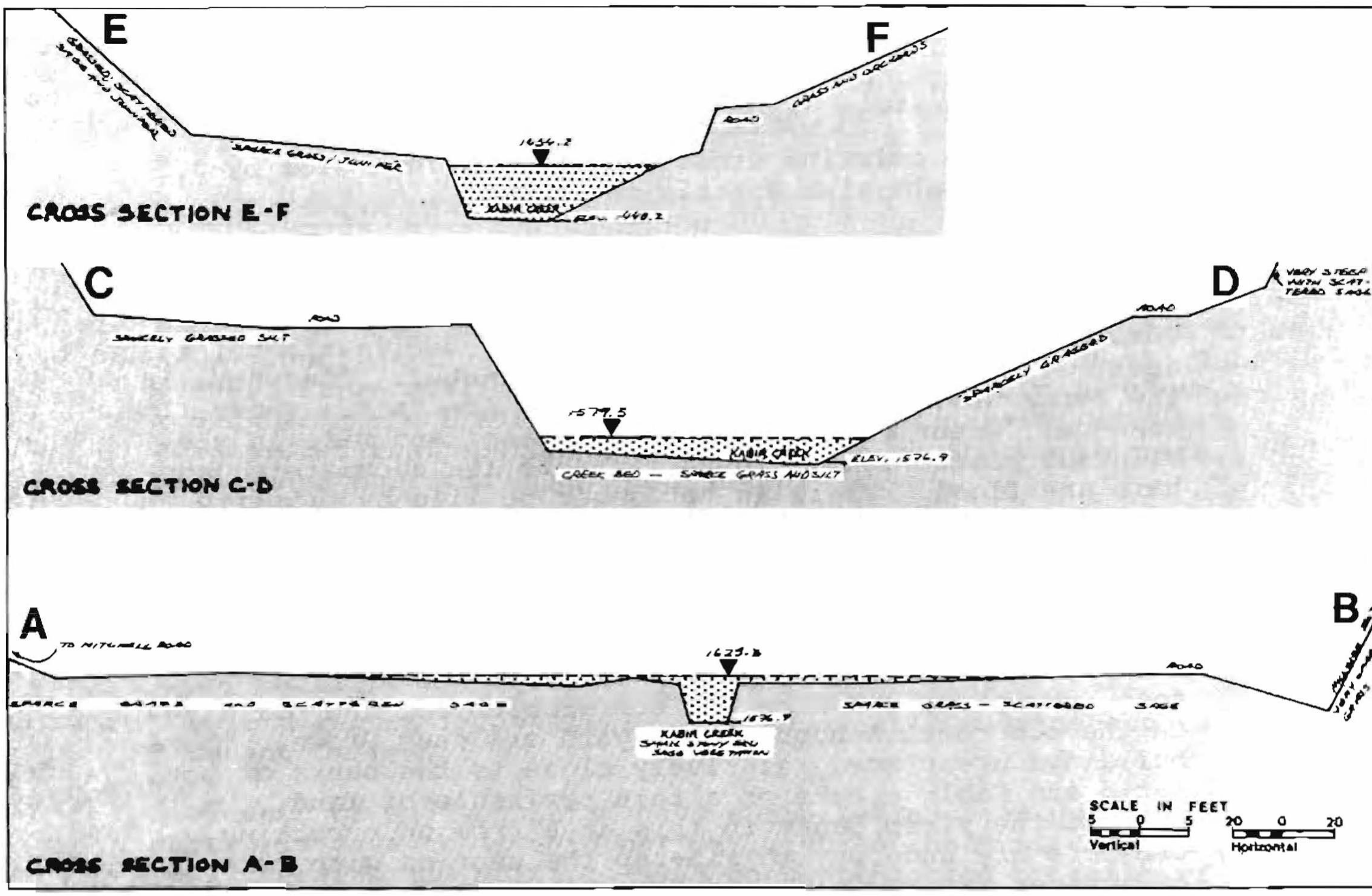
The Jesus Grove area flood plain is shown on Map 22 on the next page; Point 1 tops the creek banks in this area because of the narrow shallow channel. The creek bed at that point can and will be widened to accommodate the flow within the banks. The dimensions of the channel would be approximately 20 feet wide at the bottom, 40 feet wide at the water surface and five feet deep. Even as it is, the 100-year flood plain could partially surround the Zarathustra storage building, but the building has a concrete slab floor that is more than two feet above the high water mark and thus would be virtually unaffected by the occurrence. In the interim before the creek channel is enlarged in that area, improvements should be kept outside flood plain limits as shown on the map.

At point 2 the inundated area was calculated. It would inundate the road to a depth of about 2½ inches but would otherwise be contained within the well defined stream bed at that point.

At point 3 in Jesus Grove after the confluence of the Kabir and Farid creeks, the flood would not exceed the existing creek bank (see the 100-Year Flood Reference Map on the following page).

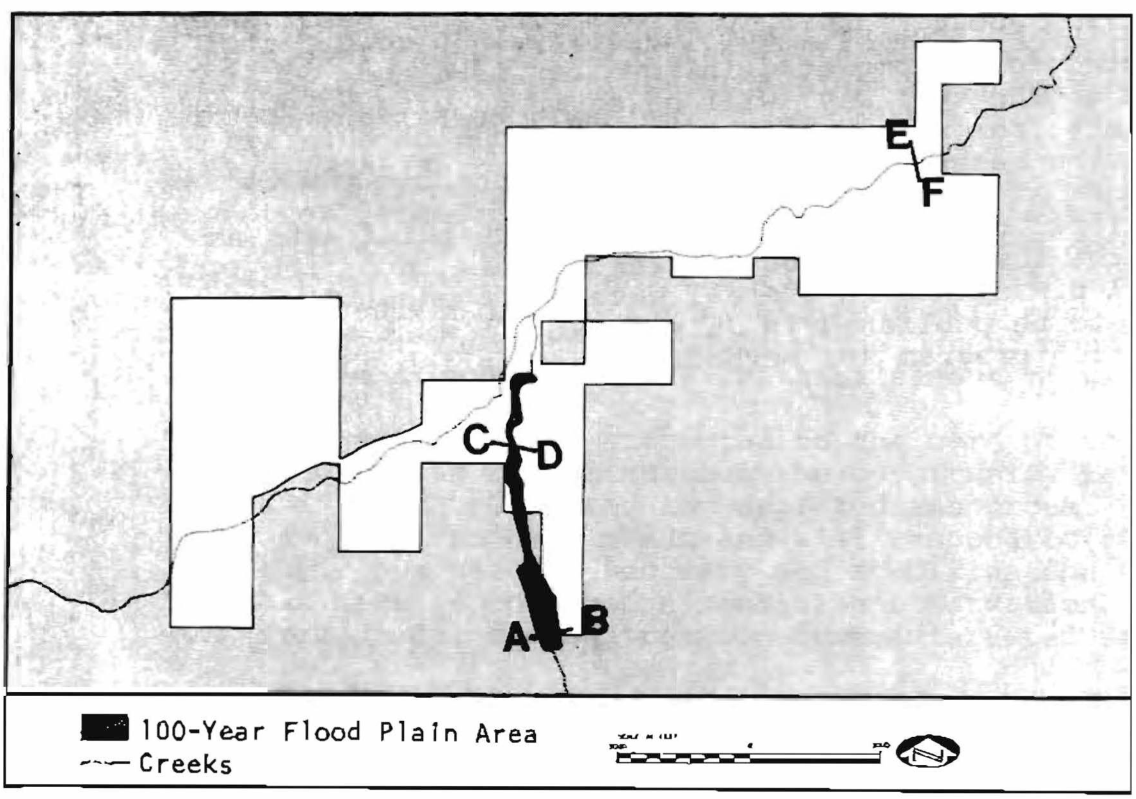
In Desiderata Canyon at the confluence of Suzuki, Desiderata and Hassan creeks, at point 4, the projected 100-year flow is 930 cubic feet per second. The stream cross section is 48 feet wide and approximately three feet deep; this would contain the projected flow.

In Gautam the Buddha Grove the 100-year flow is 300 cubic feet per second at point 10, which is a steep, well defined rocky ravine where it would not be a concern. At point 9 on Buddha Creek the flow is less (210 cfs) but the land is



▼ Indicates Stream Flow Level in Feet Elevation

JESUS GROVE - 100-Year Flood Reference Map (Showing Locations of the above Cross-Sections)



flatter. The existing cross section, 14 feet wide by 2.5 feet deep, would also contain the flow.

Therefore, the major concern is in the Jesus Grove area. At point 1 Kabir Creek would overtop its existing banks in a 100-year flood but no danger to life or property would be imposed. With enlargement of the creek bed in the point 1 area, even this concern would be eliminated. Elsewhere in the Jesus Grove area, Farid and Kabir creeks are generally deep cut (often ten to twenty feet deep) and wide in the alluvial bottom land. These channels are adequate to contain any flood. There is no danger to life or property at Rajneeshpuram from a 100-year storm.

STREAM EROSION HAZARD

In Jesus Grove, rapid and severe streambank erosion under flood conditions, where chunks of earth are undercut and fall, are perhaps a more serious problem for the buildings in the old ranch headquarters yard at Jesus Grove. There, buildings are placed relatively close to the banks of both Farid and Kabir creeks on a thin peninsula of land. To protect the steep banks in this area from undercutting, projects are underway to rip-rap the section with rock and/or juniper trees wired into the banks.

Eight miles upstream, Kabir Creek is dammed (300 acre feet), which provides some cushion from flooding when the water level in the creek is down. In July 1982, construction began on the Krishnamurti Dam (capacity 1030 acre feet.) It is expected to be completed in November 1982 and, in addition to the spillway, will be equipped with a 30-inch sluice gate from which water can be drained to maintain a level in the reservoir suitable for this cushioning effect.

As additional dams and catchment ponds are built, and as some of the lost vegetation returns to this land, the flood risk will diminish. An overall Water Management Plan is expected to be published in July 1983. It will outline the construction program and methods to accomplish this far-reaching goal.

5. FLORA AND FAUNA

All areas of Rajneeshpuram exhibit deterioration of the natural environment caused by man-related activities during the past 100 years. Overgrazing and cattle breakdown of the stream banks have significantly altered the original appearance of the landscape. Large gullies and vertical streambanks devoid of vegetation scar the drainage areas. The native grasses have been so depleted that invader species such as cheatgrass, juniper, medusahead and sagebrush now predominate.

A biological inventory of the incorporated areas was conducted by Intermountain Biology Consultants in May 1982. The objective of the survey was to establish a species list of plants, birds, mammals, reptiles and amphibians. Each of the three areas was thoroughly traversed on foot and intensive searches were conducted in each habitat type within each area of the City. The complete report is available for review at the Rajneeshpuram Planning Office.

Residents of Rajneeshpuram have exhibited a great deal of interest in ways to live in harmony with the natural environment, and "the wise and multiple use" concept adopted by conservationists in the 1930's is in keeping with their goals. Simply stated, this means that the land will be used in a manner that will provide the highest and best use of all resources for the most people for the longest period of time. For the City, this means preserving the pockets of natural areas that remain as open space, rehabilitating the flora and fauna where practical and providing for the orderly development of the remaining area through integrated planning.

The development of portions of the land in the City for housing and other needed community services is not a loss to the natural resources as long as the proper precautions are taken to preserve the natural areas and to avoid erosion. The use of this less valuable land for development will make possible the clustering of facilities and allow the use of more valuable resource land nearby for the reestablishment of vegetation.

The land that has been entrusted to the care of the residents of Rajneeshpuram has given them the opportunity to be creative in working with neglected the depleted resources. The flora, fauna and land do have needs and will respond to guidance that aids their own natural recovery and stabilization processes. The task here is to combine sensitive observation, a dedicated work force, advice and direction from interested state and local agencies, and the best available technology in order to help reestablish a natural balance.

Three highly beneficial measures have already been undertaken that will provide great benefits to both the vegetation and the wildlife at Rajneeshpuram. They are:

- limitation of grazing to reduce greatly a source of disturbance to the natural vegetative communities;

- the start of a riparian rehabilitation program that will eventually restore the most productive type of wildlife habitat to the ranch;

- the setting aside of open spaces to provide escape corridors and nesting areas that will not decrease wildlife diversity and density.

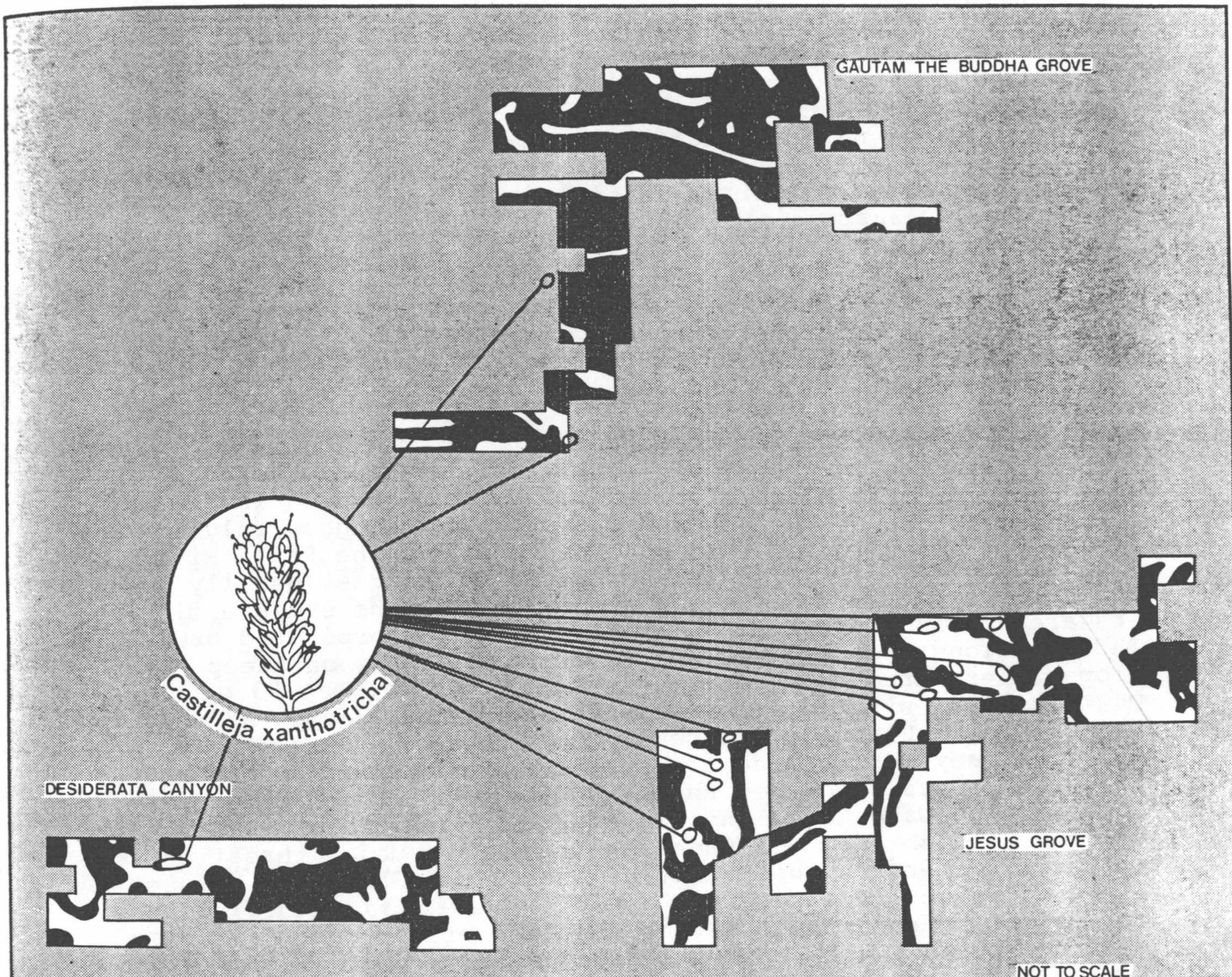
FLORA

One flower that is a candidate for the federal endangered list was found in the incorporated area. A yellow-haired Indian Paintbrush (Castilleja xanthotricha) appears to grow only in the limited region from Mitchell to Clarno in the Radha River drainage basin. The plant occurs on rocky ridges, usually of southerly exposures. Approximately 13 sites where these flowers are growing have been found within the incorporated area. The locations are at generally higher elevations on steep slopes where urban development is unlikely. (See Map 23 on next page; detailed site location maps available for review at the Rajneeshpuram Planning Office.) Good stands of this plant exist in many surrounding areas that are not being incorporated. The consultants concluded that the plant should be listed only on the state watch list due to its abundance within its limited range, which includes Rajneeshpuram. The major threat to it is from overgrazing by cattle, sheep, deer and wild horses. Since domestic grazing is not a part of the agricultural plan for Rajneeshpuram, this species should continue to thrive. It is also possible that with the introduction of bee keeping at Rancho Rajneesh, better pollination may improve its chances for propagation.

Most of the original vegetation of the land in Rajneeshpuram has been consumed, leaving a vast area characterized by erosion and undesirable species. To halt the spread of medusahead, Russian knapweed, blue mustard and other weeds usually requires treatment by chemical methods. At best, this approach is only 70-80% effective. An alternative method is rangeland drilling and seeding. This technique may be worthy

CITY OF RAJNEESHPURAM - Site Locations of Castilleja xanthotricha

Map 23



Ref: Biological Inventory of Proposed Incorporating Areas, Rajneeshpuram, by Intermountain Biology Consultants, Dayville, Oregon (July 25, 1982) of experimentation but there are some inherent difficulties. The soil in the incorporated area is quite clayey in most areas (see Maps 6, 8 and 10 on pages 43, 51 and 54) and consequently is poorly suited to range management because it shrinks and swells with varying moisture content. This makes establishment difficult for the slower developing perennial grasses. Because of the shallowness of the soil, it is questionable whether or not reseeding would be successful on a perennial basis. Rangeland reclamation shall be encouraged where it is feasible. (See rangeland studies, Appendices 6 and 7.)

FOREST LANDS

None of the lands included within the bounds of the City are classified as existing or potential forest land. Hence, Goal 4 has minimal application to the overall Plan. However, the following observations and comments can be made:

The single tree species represented within the City is the juniper, existing in the widely scattered stands typical of much of the semi-arid western states: 3.5 trees per acre with an average height of 20 feet and diameter at breast height of eight inches. The value of this species is primarily as wildlife cover and feed, and for its aesthetic value on the otherwise treeless slopes. Conditions simply have not been favorable in this region during recent climatological periods to support forest growth. Furthermore, conditions also discourage the establishment of forests in the future without considerable modification, and then only on a very limited basis to help achieve specific objectives. Sites providing the most favorable conditions for such limited purposes are those included within riparian corridors, those on unexposed north-facing slopes, and of course, those accessible to artificial forms of maintenance by man.

The Use of Trees Within the City

Black Cottonwood, which is endemic to this region and was once common along the perennial streams in this area (and indeed is reappearing on nearby sites that have been protected from grazing), will offer good potential for replanting on suitable sites within the City.

The existing juniper stands within the proposed boundary can be preserved and protected for aesthetic purposes and to protect the existing bird and animal population through the establishment of open space preserves. In addition to the limited planting of introduced shade trees that has already taken place within the proposed area (150 trees as of July 1982), some 20,000 additional trees will be planted on an experimental basis within the next several years for the following specific purposes:

- to provide visual buffers and enhance existing views;
- to serve as windbreaks in valley bottoms and agricultural areas subject to wind erosion;
- to help maintain soil stability on certain exposed slopes and streambanks;
- to provide additional wildlife food and cover.

Tree species used for the above purposes will be largely introduced, although species native to this region will be planted where their characteristics meet the sought-for planting objectives. In the case of introduced species, careful screening will be undertaken to maximize planting success and the achievement of planting goals.

FAUNA

Three elements are necessary to sustain a balanced wildlife community: water, food and cover. If any of these requirements for a habitat is changed or destroyed, the animal populations will be reduced. The key to survival and growth of all animal life at Rajneeshpuram is water. Hence, every effort must be made to preserve, conserve, develop and maintain every type of water source possible. It is only with the wise use of water that the other two essential ingredients of food and cover can become available to sustain a viable wildlife population. With the use of water, the basic habitat requirements of all species can be established.

The biology inventory conducted by Intermountain Biology Consultants lists the animal species observed during their inspection in May 1982.

In addition to terrestrial-associated life, three fish species have been observed in Farid Creek at the eastern part of the Jesus Grove area. They were steelhead, rainbow trout and whitefish. Since no fish have been stocked in any of the streams, it can be assumed that they have migrated upstream from the Radha River and that their maintenance occurs solely by natural reproduction.

There is a natural barrier to their migration from the Radha River: the approximately 20' vertical waterfall located three miles up Kabir Creek from the river and 1-1/2 miles into the

Jesus Grove area. The waterfall is the spillway of the now silted-in Kabir Reservoir. For the purpose of fish migration, only that stretch of Kabir Creek below Kabir Reservoir will be considered inhabited. Other stretches are intermittent and generally dry during the summer months. Even the stretch of Kabir Creek below Kabir Reservoir flows aboveground in the 1/2-1-cubic-feet-per-second range during the summer months. Therefore, it has potential as a spawning ground but no significant immediate recreational value.

Any activity on the land will affect both plants and animals. The interrelationship is inherent in all action; therefore, a tabulation of high-impact situations that can affect both kingdoms follows. Once these situations have been identified, plans can be devised for minimizing the effects of development and renewing these scarce natural resources.

POSSIBLE IMPACTS

- off-road vehicles
- recreation
- building construction
- use of ponds as wildlife recreational areas
- hunting, fishing and trapping
- agriculture
- domestic pets
- wildlife damage to crops
- harassment of wild animals
- picking of wildflowers
- joint use of open spaces
- fire on wildlands
- development along the edge of water courses
- mosquito control
- water development
- deer fence

POSSIBLE SOLUTIONS

Off-Road Vehicles

Erosion caused by off-road vehicles is a special problem. Four-wheel drive vehicles, motorcycles, tractors and heavy road-building equipment all bother wildlife, destroy habitats and cause excessive erosion. Fragile areas can be damaged, leaving gullies and ruts. Recovery can be costly and slow.

Fire can also result from driving any recent model vehicle over rangeland; the new catalytic converters can start fires easily as vehicles pass over dry grassbreaks. Unnecessary off-road movement should be controlled.

Recreation

Usually, the main source of recreation in regard to wildlife and fish is in the form of hunting and fishing. It is not likely that these will be factors in the City due to the prevailing opinion of the residents, who are opposed to the taking of life. Other recreation activities are not expected to seriously influence animal and fish populations and should be more than compensated for through present efforts to rehabilitate open space lands.

Building Construction

With the advent of urbanization at Rajneeshpuram, many buildings will be erected. Conflict with a few animal species for a given parcel of land is inevitable. Important areas of food and cover such as stream beds should be kept attractive to animals and birds. The selection of landscaping shrubs of a variety that will provide a food source for wildlife can be used in some areas. Often, landscaping includes the use of water. Ponds and other small water areas will attract wild ducks, songbirds, rabbits and even deer at night. Some landscaping techniques can increase natural vegetation, which will hold runoff water, conserve moisture and help reduce the erosion of the soil. Therefore, where limited wildlife occurs naturally, an increased population can be the result of planning for this valuable and compatible resource.

Use of Ponds as Wildlife and Recreation Areas

Kabir Reservoir is an existing silted-in reservoir in Jesus Grove. With a few repairs to the existing impoundment, a park area can be made available to waterfowl, upland birds, fur-bearing animals, songbirds and non-game wildlife. It can also provide a source of recreation for residents. In order to sustain these various species, a minimum water depth of between 15 and 30 inches is required. the location is perfect in that recreationalists have a high vantage point from the adjacent road from which to view the natural activities. Agricultural land on the other side of the pond will act as a buffer zone for animal life. The bottom of this pond is filled now with about five feet of silt sediment.

This park area can perform a myriad of important functions for the immediate area. For one thing, it will affect the local water quality. Aquatic plants change inorganic nutrients into organic material, storing it in their leaves or in the peat composed of their remains. The stems, leaves and roots of these plants also slow the flow of water through this area, allowing the silt to settle out. The pond will act to retain water during dry periods, keeping the water table high and relatively stable. This will help support an increase of surrounding vegetation.

Finally, this area will be an important source for overall environmental health and diversity. It will provide essential breeding, nesting, resting, and feeding grounds and predator escape cover for a wide variety of animal life. These factors have a social value in that they provide recreational, research and educational sites. They also add to the aesthetics of Rajneeshpuram.

It is interesting to note that the spillway of the reservoir tumbles over a 25-foot rock cliff, creating a scenic waterfall. This site could be developed for more accessible viewing from both above and below the falls.

Hunting, Fishing and Trapping

Populations of native mammal and bird populations within the City appear to be limited; probable causes have been discussed and measures are described that hopefully will attract wildlife and enhance habitats. An integral part of the protection process would be the prohibition of hunting and fishing. In terms of human safety, hunting or the discharge of firearms of any sort should be seen as obvious hazards considering the level of outdoor use for hiking and other activities by the residents. Potential human hazard, or adverse effect on City wildlife or fish populations, presented from hunting or fishing on neighboring public lands should be discussed in cooperation with appropriate governmental officials.

Agriculture

At the present time, the most immediate and long-term threats to the conservation of fish and wildlife habitats comes from adjacent agricultural activity and development. The impact of agriculture on these areas can be direct, by their conversion to farming use, and indirect, depending upon how the farming is practiced.

The following agricultural practices would benefit the wildlife community:

- delaying the mowing of headlands, roadsides, and watercourses until after the nesting seasons are over;
- leaving sections of grain unharvested along the edges of fields, in the corners of fields, and next to good cover;
- planting cover crops;
- stripcropping;
- stubble-mulch tillage;
- liming and organic fertilizing;
- cropping systems that include grain-legume meadows;
- promotion of useful insects (bees, ladybugs, etc.)
- reseeding, renovating or overseeding with legumes;
- piling brush near edges of areas frequented by wildlife;
- seeding clover and grasses along roads;
- food patch plantings;
- planting of windbreaks in open areas;
- construction of water retention systems in areas where upland surface water flows;
- planting grasses, willows and cottonwoods in ditches and along stream banks.

Avoidance of the following will allow wildlife to increase:

- bare soil; some type of vegetation should be growing wherever soil exists;

- burning of ditchbanks, fence rows and crop residue;
- clean mowing;
- brush removal;
- cutting of den trees;
- plowing close to fences or wildlife borders;
- free-ranging dogs and cats.

Domestic Pets

In the Biological Inventory of Rajneeshpuram, one of the co-authors, Brad Griffith, has made a recommendation that "no free-ranging domestic cats or dogs be allowed. Both dogs and cats harass and prey upon wildlife." There is not a large population of either cats or dogs in Rajneeshpuram, and this situation will be maintained and controlled as necessary.

Wildlife Damage To Crops

Probably the main conflict between human development and wildlife will result from deer browsing on gardens, field crops, nursery stock, shrubbery and fruit trees. With hunting restrictions in effect at Rajneeshpuram, the deer will increase. They can be expected gradually to lose their fear of man and become bolder. They may browse closer to cultivated areas. A New Zealand electric fence has been erected in Jesus Grove to exclude deer from an area with a circumference of about 17 miles. In unprotected areas, the use of odiferous predator repellents applied to trees, orchards and plants may be helpful. The deer population will be monitored so that other remedies can be initiated if necessary.

Damage from pheasants to field or garden crops can be expected. Starlings, robins, blackbirds and crows will feed on fruit crops, grapes and berries. Where possible, netting can be used to shield produce from the birds. Hazing may also be effective. Hawks and owls prey upon chickens and ducks unless the tops of their pens are covered with chicken wire.

Picking of Wildflowers

Picking wildflowers is not a significant problem at Rajneeshpuram, since residents are generally aware of the effects of disrupting the plant life. As an alternative to picking wildflowers, nature trails, enclosures and perhaps botanical gardens could be utilized to heighten the awareness of residents and visitors to Rajneeshpuram.

The Joint Use of Open Space

The land designated Open Space within the City must be used carefully if it is to remain a significant factor in terms of wildlife. Roads through land designated as Open Space need to be buffered when possible to limit traffic noise. Noisy land use areas adjacent to significant areas of Open Space should have buffer plantings to reduce noise and induce wildlife to venture closer to inhabited areas.

Since a large amount of land surrounding Rajneeshpuram will remain as agricultural land, it is probable that the numerous other conservationist activities described in this Plan will more than offset any loss of habitat for wildlife within the City. Nevertheless, with careful use of the land within the City, it may actually be possible to support an increased wildlife population.

The Aspect of Fire on Wildlands

Fire can be either helpful or harmful to the land and subsequently to wildlife. Prescribed burning can be effective in removing water-consuming vegetation that does not provide food or cover for animals. This allows the change that permits native "fire pioneer" species to come back to the range. If the more rapid establishment of vegetation is desired in certain sections, an intensive hand-planting project can be instituted. There are many governmental agencies that can assist and advise on the effects that the various types of controlled burning may have on a specific area.

On the other hand, fire in a prime habitat at nesting time could be disastrous for the whole life chain. Therefore, the education programs for residents and visitors intended to raise their awareness to the causes of fire will be continued. Firefighting training and early detection of fires is also a key defense. The existing Rajneeshpuram Rural Fire Protection District already has a trained fire-responding team with modern equipment ready to make quick initial attack on harmful fires. Potential locations for firebreaks should be identified and constructed.

Development Along the Edges of Water Courses (Riparian)

Common agricultural practices include farming to the edge of a field even when the edge is on the bank of a stream. Serious erosion problems are created thereby, causing gullies and banks to cave in when crops are planted so close to an edge.

This situation will be avoided. In addition, a rehabilitation and revegetation project will be undertaken to restore the holding power of the soil. This will increase the capacity of the land for supporting wildlife as well.

It is best if native vegetation is specified. Native trees, shrubs and grasses are an important alternative to the domesticated plant species to which we have become accustomed. The natural selection process within native stands have developed superior plants that are able to withstand the harsh climatic conditions of central Oregon.

These riparian habitats are very sensitive to adverse impacts. They serve a great number of wildlife species in a variety of ways. Wildlife species are supported by vegetative communities, water and cover offered by vegetation and geological features. Each species of wildlife has its own habitat, which is a complex and specific set of conditions to which it is adapted and without which it cannot survive. Destruction of the habitat need not be total to exclude a species from a given area. Loss of only one element that fills a critical need within the habitat is enough to render it inhospitable.

The riparian areas of Rajneeshpuram are extremely important. In this mostly treeless landscape, riparian vegetation is important not only because of its association with water and moist areas, but because its use by wildlife is intensified as a result of the overall openness of the rest of the terrain. This habitat is used for nesting, perching and feeding by many species of birds and animals. Numerous species utilize the area for cover, feeding and shade. In addition, the welfare of many species is enhanced by the presence of drinking water. Water quality and quantity to a large degree is dependent upon the condition of the riparian vegetation. Additionally, the health and size of many wildlife populations is directly influenced by riparian vegetation and condition, as it supplies all three elements essential for wildlife survival: food, water and cover. These riparian areas must be protected from destructive erosional forces and enhanced in terms of water and vegetation.

Mosquito Control

When water areas are developed, it is possible that breeding grounds for mosquitoes are created. Therefore, it is important to develop good wildlife habitats near the water to attract insect-eating birds such as swallows or purple martins, as they consume enormous quantities of mosquitoes. Erecting bird houses near ponds and streams are a good way to establish a permanent population of those birds. Amphibians also consume mosquitoes,and fish hold down mosquito larvae populations. The best means of controlling mosquitoes is the elimination of stagnant water areas.

Water Development

The prime consideration for maintaining and increasing the quantity of animal and plant life is water development. Water is such a basic requirement that watering holes are the hub of wildlife activities. Therefore, they should be designed and maintained for the use of all species of wild animals. In a natural progression, the more usable water that is available, the more the surrounding vegetation increases, providing food and cover for wildlife.

Natural water holes can often be improved by deepening a catchment or by trenching runoff water directly into the basin. Cement embankments can increase the storage capacity by raising the lowest level of the basin's edge. Where streams flow intermittently, it may be advisable to store water further upstream to be released when necessary to recharge downstream areas.

Farid Creek passes through the Jesus Grove area, and with the construction of Krishnamurti Dam during the Fall of 1982, it is virtually assured that water will be available throughout the driest season of the year. This headwater storage project will encourage good riparian vegetation, which in turn will provide important stream cover and have a moderating effect on high summer water temperatures. With increased vegetation and flood control, the excessive silt that has been carried by this stream will be drastically reduced. One end result is that the quality of gravel available for trout spawning will increase.

The first priority in stream improvement is to halt the erosion from all causes. The stream banks must be protected, replanted and reseeded. When the conditions have stabilized, various fish species can be introduced with a good chance for survival, and natural reproduction can maintain the population.

Krishnamurti Dam, when completed with its 1,030 acre feet of water, will provide a large habitat for a variety of fish species including large mouth bass, crappies, perch and sunfish.

6. NATURAL FEATURES, HISTORIC AREAS AND OPEN SPACE

Lands contained within the City of Rajneeshpuram that require preservation and protection as Open Space are: lands undevelopable because of topographic constraint; aggregate and mineral lands; native animal and plant habitats; scenic views and sites and riparian corridors. In addition to the explicit objectives of setting aside lands in each of the above categories, other benefits are implied: improvement of air quality; noise abatement; visual buffering; soil stabilization, natural land rehabilitation, and erosion control; educational study sites; secondary watershed and groundwater recharge potential and low-impact recreational use.

The most striking physical features of Rajneeshpuram are presented in its geology and related topography. The volcanic material making up its land surface has been deposited, uplifted and folded and presents a fascinating visual display. The presence of residual volcanic plugs and dikes adds striking emphasis to the overall land form. Besides the aesthetic value presented in the topographic features, practical limits to development such as slope severity are imposed. (See "Buildable Lands") and suggest the setting aside of such areas as Open Space.

AGGREGATE AND MINERAL RESOURCES

A description of known and potential natural rock materials, minerals and other resources follows. Most of the resources discussed are outside the City area, but they are included in this report because of possible future effect on the economic activity within the City of Rajneeshpuram.

Road and Construction Materials

The City is fortunate to have an abundance of hard basalt, andesite and rhyolite lavas suitable for road building and construction purposes and available on adjacent private lands. Road fill and surfacing material for the county roads was taken in the past from "borrow pits" near Devateertha Rock and next to the county road, just north of Desiderata Canyon (Section 34, T8S, R18E.) The Devateertha Rock material (slope wash derived from weathering of the slaty hills) was used extensively by Rancho Rajneesh for earlier construction purposes. This source is being phased out due to limited supply and use of the material, and for visual and aesthetic reasons. In January 1982 a quarry was opened and in a hard andesite lava formation in Section 5, T9S, R19E south of the City limits. A crushing and screening plant was installed and 70,000 yards of various aggregate sizes have been produced for road and general construction use. This quarry site alone probably could supply the projected short term requirements of the entire development of the City, but other quarries will be developed at strategic locations to minimize hauling time. A site in Section 23, outside the City limits but near Gautam the Buddha Grove is currently being investigated for suitability as a new aggregate quarry for that area.

A summary of the main rock resources is given below:

Andesite and Basalt: dark grey, brownish and greenish-grey to black, hard dense rock found mainly in subhorizontal lava flows, in places strongly jointed and fractured. Deposits suitable for quarrying are widespread throughout the ranch and with a large deposit adjacent to the Jesus Grove area, (noted above). The rocks provide crushed aggregate suitable for road base, surfacing, general construction use and concrete. Rocks from places where the lavas have surface green, blue, brown and red coatings would make an attractive natural finishing surface.

Rhyolite and Welded Tuff: varies from a pinkish-white, brown, purple, to reddish banded rock. The rock is hard, lighter than basalt, and commonly has a glassy appearance. Abrasiveness tests on the rhyolite have shown it to be suitable for general road construction and probably for concrete aggregate (subject to weathering tests and trial batches). Crushed samples appear to be too sharp for road surfacing. In some places these rock types have a marble-type appearance when cut and would make an attractive wall finish. Cut blocks of various sizes could be used for general brick-type structures or for more decorative finishes. The rough broken stone is also suitable for decorative stone finishes.

Abundant sources of these rocks are located near the City in Sections 25 and 30 to the north of Devateertha Rock, and also in the vicinity of Hassan Canyon.

Cinder, Pumice and other Lightweight Aggregates: No significant deposits have been located in the near vicinity of the City. Red, orange and yellow "cindery" outcrops are present in Section 30, T9S, R17E, and are reported in the southern part of the ranch, over 20 miles on present roads from Jesus Grove. When better road access becomes available these outcrops will be investigated. They could make attractive ground surfacing material for walkways and around buildings.

River Sand and Gravels: Extensive alluvial beds, up to a measured 60 feet thickness, of mixed clays, silt, sand and gravel, have been deposited along the middle and lower Kabir and Farid creek valleys. Some stratification and sorting into distinct size layers can be seen in creek banks, but in general the alluvium is not well sorted. No tests have been made but, on appearance, the alluvium could be easily separated by screening into several size fractions. Screening could provide an important source of sand, which is otherwise in short supply, for concrete and general construction use. The rounded and sub-rounded gravel fraction could be used for general site surfacing, being more aesthetically pleasing and less sharp than crushed rock.

The best immediate site is the alluvial flats that will be flooded by the proposed Krishnamurti Dam. Several acres of alluvium 12 to15 feet thick could be screened and the sand and other desired fractions recovered before the reservoir is completed. Test pits dug during the evaluation of the reservoir site show that the alluvium contains considerable sand-size fraction but the proportion is highly variable from pit to pit. Sampling and screening tests would determine the proportions of the different particle sizes present.

Other potential sites near the City are along Kabir Creek, for example, in Section 5, T9S, R19E near the present rock quarry. Here the surface is too stony for agriculture and there is a wide meander in the stream providing an aggregate site in which activity would have no impact on the stream channel. Any excavations should be restricted to creek areas upstream of the spillway falls at the Kabir Reservoir in Jesus Grove, and during dry weather to avoid any disturbance to fish in the lower Kabir Creek.

Clay: The known deposits of clay that may have commercial potential appear to be outside the City limits. Nearby lands have abundant widespread clays in surface soils, clay beds and decomposed rock, ranging in color from white, grey and green to red. The clays have been formed by various processes, as discussed in the section called "Geological History": by the reworking of volcanic ash falling into ancient lakes, by the hydrothermal alteration to clays of the rock formations in past geologic time; by deep weathering of ancient land surfaces during subtropical climatic conditions; and by present-day weathering and breakdown of rocks to clay minerals.

The majority of the clays seem to have formed in ancient times and are probably of montmorillonite type, commonly grouped under the general name of bentonite. Bentonitic clays have a high potential for expansion when wet. Most of the surface clays on the ranch exhibit this characteristic, as do the subsurface clays tested during geotechnical investigations of the City soil and geologic conditions. (See "Hazards", page 91.) Tests should be conducted to determine the suitability of the clay deposits for brick manufacturing, pottery, adobe-type structures and other uses, because of the abundance of the deposits. Problems can be expected because of the high expansive property, and it may be necessary to locate kaolinitic (low-swelling) types of clay to blend with the bentonitic clays.

Kaolinite clays are commonly formed by weathering in situ of various rock types. Several white clay outcrops that have the appearance of having been formed by weathering in situ have been observed on the ranch. One such location is north of the new sewage lagoon in Section 36, T8S, R18E. Expansiveness tests should be made of clays from places such as this to locate a low-swelling variety suitable for blending and for direct use.

ECONOMIC MINERALS

Bentonite: Nearby lands contain widespread deposits of bentonite as discussed above. High-grade bentonite is used commercially in drilling and general industry because of its ability to expand and form a waterproof seal. It is best known for its use as a drilling mud and for sealing earth dams against leakage.

A cursory inspection of several clay exposures was made but no samples were tested. The deposits appear to have significant quantities of impurities and to be generally of low grade. It was not determined whether the impurities are due to surface slope wash contamination, or whether they are present within the deposits themselves. Further exploration for a high-grade bentonite deposit is warranted; this should consist of potential market evaluation, location of possible deposits and sub-surface sampling and testing.

Agate, Jasper, Opal, Thundereggs and Other Gems: Oregon is known as the Agate State, and it has adopted as its State Rock the unique "thunderegg". The name thunderegg was given by the Northwest Indians, whose legends tell of ancient disputes between the gods of Mount Hood and Mount Jefferson. In their rage, the gods threw Thunderbird eggs at each other and covered the land with these gem-filled spheres.

The region surrounding Rajneeshpuram is famous for its deposits of thundereggs and various forms of agates, jaspers, opals, petrified wood, and quartz crystal specimens. Richardson Ranch and Priday Ranch are particularly well-known for their deposits of various gems. A wide range of commercial enterprises ranging from the sale of rough rocks to sophisticated lines of jewelry is based on central Oregon's gem deposits.

The area surrounding Rajneeshpuram also contains widespread scattered specimens and deposits of various forms of agates and other gemstones. Two thunderegg beds have been located at the head of Desiderata Canyon, outside the City boundary. The beds have been opened and there is sufficient good-quality material to support a commercial enterprise. Several other localities have been found in the area from which agates, jaspers, opals and petrified wood can be collected to support such an enterprise. An inventory was made of similar potential deposits in the City areas so that any such resources could be protected from construction activity. Gautam the Buddha Grove contains no known deposits of commercial value. Only isolated pieces of petrified wood, agates and jasper have been found scattered on the surface. These appear to have weathered out of the saprolite sediments. The geology does not seem favorable to the presence of commercial deposits. Desiderata Canyon contains abundant surface float, of various colors, of jasper, agate and some petrified wood. The float has weathered out of the saprolite within Desiderata Canyon, and out of the welded ash flow sheet on top of the hills forming the northern boundary of Desiderata Canyon. (For illustration, see Map 5 on page 35.) No commercial deposit was, nor is, expected to be found within Desiderata Canyon. The attractive orange-to-red jasper occurs as isolated small veins (commonly one to two feet long and two to four inches wide) in various places in the welded ash flow sheet. The thunderegg beds mentioned above are outside the City boundary in a rhyolite lava.

In Jesus Grove, scattered surface specimens of common agate jasper and quartz crystals can be found. These can be traced to small isolated veinlets in the volcanic and sedimentary rocks and they have no significant potential resource value. The agates and other gems have been derived from the same basic source - silica (silicon and oxygen), the earth's most abundant rock-forming mineral. Free silica has been dissolved by the acids in percolating groundwater and deposited as concentrated liquids in subsurface cracks and cavities. The cavities in volcanic rocks are commonly formed by gas given off by the cooling volcanic rocks. The form, color, shape and type of gems formed from these deposits depend largely on the mineral impurities present in the liquids and on the characteristics of the receiving cavity and host rock types.

Petrified wood is formed through cell-by-cell replacement of organic material by silica-rich solutions. Thundereggs consist of an outer sphere of the enclosing rock, commonly rhyolite lava, and an in-filling of agate, jasper, opal or other minerals. Some of the thundereggs found on the ranch have hollow "geode" centers that were formed by growth from the cavity walls.

Precious, Semi-Precious and Other Minerals: Two important mines have been worked in the recent past in the district. The Horse Heaven Mine was a major source of mercury, present in volcanic rocks in the form of cinnabar. The Oregon King Mine was a major source of gold and silver. It is in Section 30, T9S, R17E, Ashwood District. Neither mine is currently being worked. Numerous other old diggings and small mines, mainly for cinnabar, are in the southern half of the ranch and surrounding district. The Queen Oregon Mine, which is on the ranch in Section 30, T9S, R18E, was a prospect for antimony.

The geologic setting, particularly in the southern half of the ranch, is favorable for the presence of additional undiscovered mineral deposits. The location and evaluation of such deposits would require a comprehensive exploration program using modern exploration techniques. An inventory was made of known or potential mineral resources. There are no known mineral deposits in the City. Gautam the Buddha Grove and Desiderata Canyon have no known potential for the existence of any undiscovered deposits. Jesus Grove contains small veins of black carbonaceous material in the road cutting alongside Kabir Reservoir, Section 29, T8S, R19E. The carbonaceous material is of visibly low-grade quality and is contained in the sedimentary slate formations. It has no economic potential.

OIL AND GAS

There are several oil and gas leases on City and adjacent lands. Theories have been postulated about the possible existence of oil and gas in Cretaceous sediments that are assumed to underlie the ranch and the surrounding district. No exploration activity is currently taking place within the City or in the district, as far as is known. No oil or gas deposits have been reported in the region other than in the Willamette Valley. No predictions can be made about the likelihood of any deposits being located on the ranch.

NATIVE PLANT AND ANIMAL HABITATS

Native plant and animal populations and their respective habitats will benefit from the protection of open space. Approximately nine acres within or adjacent to City boundaries have been identified as habitat of Castilleja xanthotricha, a candidate for the federal list of endangered plant species. This habitat is scattered over a number of sites (see Map 23 on page 107) all of which are included within Open Space designation. Animal and plant populations are the most concentrated along riparian corridors within the City. A more complete discussion of these elements of the natural environment is developed in the Flora and Fauna chapter. (Also refer to Appendix 13.)

VIEWS AND SCENIC SITES

Virtually every area within the City provides some unique perspective from which the adjacent landscape can be viewed, a perspective that is ever-changing because of the changing patterns of light and shadow. Existing road rights of way and the establishment of Open Space preserves along upper stream corridors will preserve an adequate number of viewpoints and insure unobstructed visual access to surrounding viewsheds.

The Radha River, at least 1½ miles to the east of the City, is designated by the state as a scenic waterway. The proposed buildings and grounds will not be visible from the scenic waterway, which is more than 1,000 feet lower in elevation.

WATERSHEDS AND RIPARIAN SYSTEMS

Compared to the large drainage basins that feed the riparian system flowing through Rajneeshpuram, no major drainage basin exists totally within the City. However, protected Open Space lands will present some secondary watershed value. All three City areas conta n portions of major streamcourses (shown on Map 14, page 65). Native vegetation is sparse within the City except where associated with the riparian system. It is not coincidental that these corridors also present the richest potential for wildlife habitat, they break up and soften the landscape visually, they contribute to air quality by serving as dust abatement strands in wind storms, they distribute surface water and aid in recharging groundwater supplies, and they provide opportunity for low-impact recreation activity. No wetlands exist within the City.

CULTURAL AND HISTORIC FEATURES

Although no sites have been identified that evidence the remains of past cultures, the City will, in planning for future land use, provide protective measures for such sites should they be found during developmental activities.

Historic sites of significance appear to be limited to traces of the old Dalles Military Road that have largely been incorporated in necessary improvements to the existing road system. Portions of the old stage stop associated with the spring along the Military Road in the SE¼ of Section 27, T8S, R18E exist within the road right of way approximately 1.5 miles north of the Desiderata junction. The remains consist of parts of a rock retaining wall along the north slope of the arroyo between the existing road and the spring that lies outside the right of way. Although surrounding lands are not within the incorporated limits, the connecting road right of way between the separate City units is under City jurisdiction and portions of the site with the right of way can be preserved free of development.

Three buildings (a house, a barn, and a cookhouse) that formed the headquarters of the Big Muddy Ranch were evaluated for their historical significance. The following factors were considered in this evaluation: 1) prior designation or nomination as an historic building, 2) distinctive or unique architectural style for the period in which the buildings were constructed (early 20th century), and 3) association with persons or events of great historical significance. Using these three criteria, the buildings were found not to be of major historical significance.

Other Open Space Designations

Future exploration may develop some geothermal potential within the City; otherwise, no specific energy sites appear to be present.

No wilderness areas exist within the City.

No portions of approved Oregon recreation trail systems are found within the City.

7. BUILDABLE LANDS

CLASSIFICATION OF LAND ACCORDING TO BUILDING LIMITATIONS

Within the City of Rajneeshpuram, there is a great variety of terrain that includes rock outcrops, steep slopes, rolling land, alluvial terraces and creek bottoms. Some of this land is buildable using standard building practices; some of it is buildable but requires special construction and site preparation techniques, and some of it is non-buildable.

Land is designated non-buildable not necessarily because it is impossible to build on but because the expense of providing access and utilities, the limited purpose for which it could be used, the high potential for site damage and/or the risk to life and property involved would render such a site unfeasible for development. Steep slopes, rock outcrops, wet areas, stream beds and flood plains are all areas that are designated non-buildable. Certain standards must be set as a basis for decisions. Rajneesh Neo-Sannyas International Commune requested Century West Engineering of Bend to make a geotechnical evaluation of each of the three areas of incorporation. The results of these studies are available at the Rajneeshpuram Planning Office and are entitled "Dry Creek Geotechnical Investigation" and "Vanderhoof Canyon and HQ Area Geotechnical Investigation." The results of the Dry Creek study indicate that in Gautam the Buddha Grove, because of the ancient landslide origin of the area, buildings that require cuts into hillsides should not be placed on slopes greater than 20%. However, buildings on post or pier foundations not requiring cuts could be placed on slopes up to 30%. In Jesus Grove and Desiderata Canyon, cuts into grade of up to 30% would be permitted. Therefore, with the understanding that in Gautam the Buddha Grove buildings requiring cuts could not be placed on slopes in the 20% to 30% range, hillsides with slopes greater than 30% are designated non-buildable.

Flood plains are based on a 100-year storm runoff projection. Results of the investigation on flooding are addressed under "Setting and Natural Environment, Hazards" on page 96. Flood plains are listed here as non-buildable. Stream beds are similarly designated. The location of land determined to be non-buildable based on these criteria is shown on Maps 24, 25 and 26 on pages 131, 132 and 133. Non-buildable lands total 158 acres in Gautam the Buddha Grove, 246 acres in Desiderata Canyon and 633 acres in Jesus Grove.

In addition, the 33.5 acres comprising the right of way along the county road that connects the three areas of the City extends 30' on either side of the centerline of the road and is also considered non-buildable.

ANALYSIS OF NET BUILDABLE LANDS

Of the 2,135.5 acres of the City, the following non-buildable acreages are subtracted to yield the gross buildable acres.

	2,135.5	Total acres in City
-	158	Gautam the Buddha Grove: Non-Buildable Acres
-	246	Desiderata Canyon: Non-Buildable Acres
-	633	Jesus Grove: Non-Buildable Acres
-	33.5	Road Right of Way
	1,065	Acres of Buildable Land (Gross)

BUILDABLE LANDS (in Gross Acres)

AREA	NON-BUILDABLE ACREAGE	BUILDABLE ACREAGE	TOTAL
Gautam the Buddha Grove	158	568	726
Desiderata Canyon	246	199	445
Jesus Grove	633	298	931
Road	33.5	0	33.5
TOTAL	1,070.5	1,065	2,135.5

50.1%	Non-Buildable Lands
49.9%	Buildable Lands
100 %	

Within these 1,065 acres of gross buildable land, there will be certain requirements and site-specific conditions. Roads, utility easements and facilities, and graded slopes will require land. In Gautam the Buddha Grove, because of its rolling topography and its 20% ceiling on cut slopes, only an estimated 15% of the buildable land will be required for roads, utilities and slopes, Jesus Grove and Desiderata Canyon, with their 30% cut slope ceiling, will require an estimated 20%.

In addition, when the areas were mapped for slopes, certain pockets of slope greater than 30% were included to simplify the designated buildable land maps, but when areas are developed these pockets will not be used. In Gautam the Buddha Grove, 10% is allowed for this adjustment. In Desiderata Canyon, 25% will be allowed and in Jesus Grove, 20% will be allowed.

When an area has been selected for development, additional adjustments will be made in order to situate the individual buildings to achieve the best solar orientation or view, to avoid attractive vegetation or rocks or to avoid local drainage patterns. All of these site maneuvers require land. Because of Gautam the Buddha Grove's more gently rolling terrain, 10% is the estimated adjustment necessary in gross buildable acreage to achieve this. In Jesus Grove, a 20% adjustment is made, and in Desiderata Canyon, 35%, because of their much more rugged and unpredictable terrain.

ADJUSTMENTS IN GROSS BUILDABLE ACREAGE

TO ESTIMATE NET BUILDABLE ACREAGE

ADJUSTMENT	GAUTAM THE BUDDHA GROVE	DESIDERATA CANYON	JESUS GROVE
Roads, utilities, grades	- 15%	- 20%	- 20%
Slope pockets greater than 30%	- 10%	- 25%	- 20%
Site-specific variables	- 10%	- 35%	- 20%
TOTAL (cumulative, non-additive)	- 31.2%	- 61%	- 48.8%

For example, of 100 acres of gross buildable land in Gautam the Buddha Grove, 31.2 acres is actually not available for building, for the mentioned site specific factors, or 100 minus 31.2 equals 68.8 acres is the net buildable land available. To convert gross buildable land to net buildable land the gross to net buildable land multiplication factor would be 68.8 acres/100 gross acres = .688. Note that the adjustment percentages are cumulative, not additive. If there are 100 acres of buildable land in Gautam the Buddha Grove and 15% are subtracted for roads, utilities and grades, 85 acres are left. Then of the remaining 85 acres, 10% is subtracted for pockets of slope, etc. The adjustment percentages convert gross buildable land into net buildable land, land that is actually available for building.

To convert net acres to gross acres, the following conversion factors would be used:

Buddha Grove:

$$\text{gross acres} = \text{net acres} \times \frac{1}{.688} = 1.4 \times \text{net acres}$$

Desiderata Canyon:

$$\text{gross acres} = \text{net acres} \times \frac{1}{.390} = 2.5 \times \text{net acres}$$

Jesus Grove:

$$\text{gross acres} = \text{net acres} \times \frac{1}{.512} = 2.0 \times \text{net acres}$$

CITY OF RAJNEESHPURAM

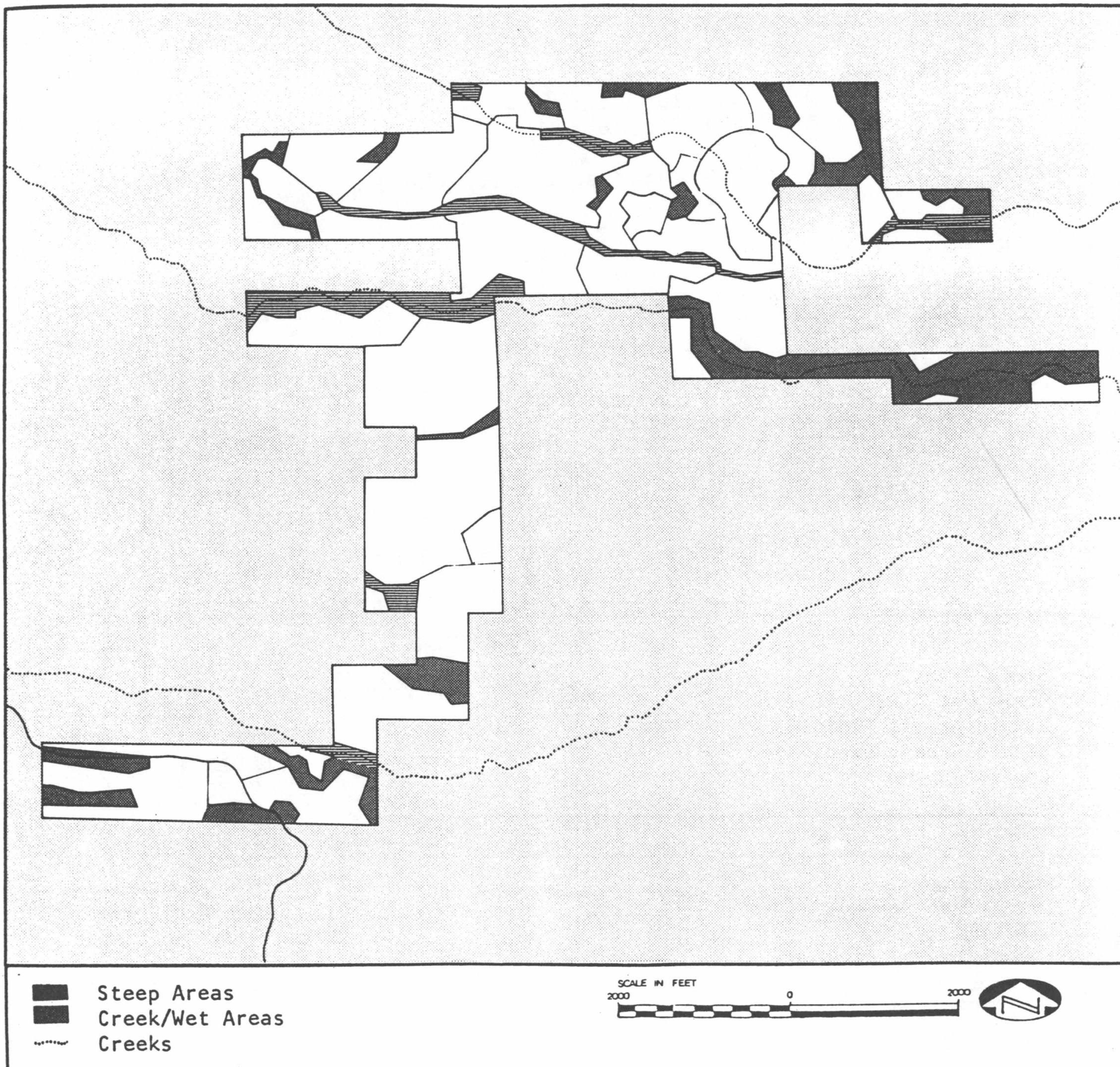
GROSS AND NET BUILDABLE LAND

PLANNING AREA	GROSS BUILDABLE ACRES	X	ADJUSTMENT FACTOR	=	NET BUILDABLE ACRES
Gautam the Buddha Grove	568	X	.688	=	391
Desiderata Canyon	199	X	.390	=	78
Jesus Grove	298	X	.512	=	153
TOTAL	1,065				622

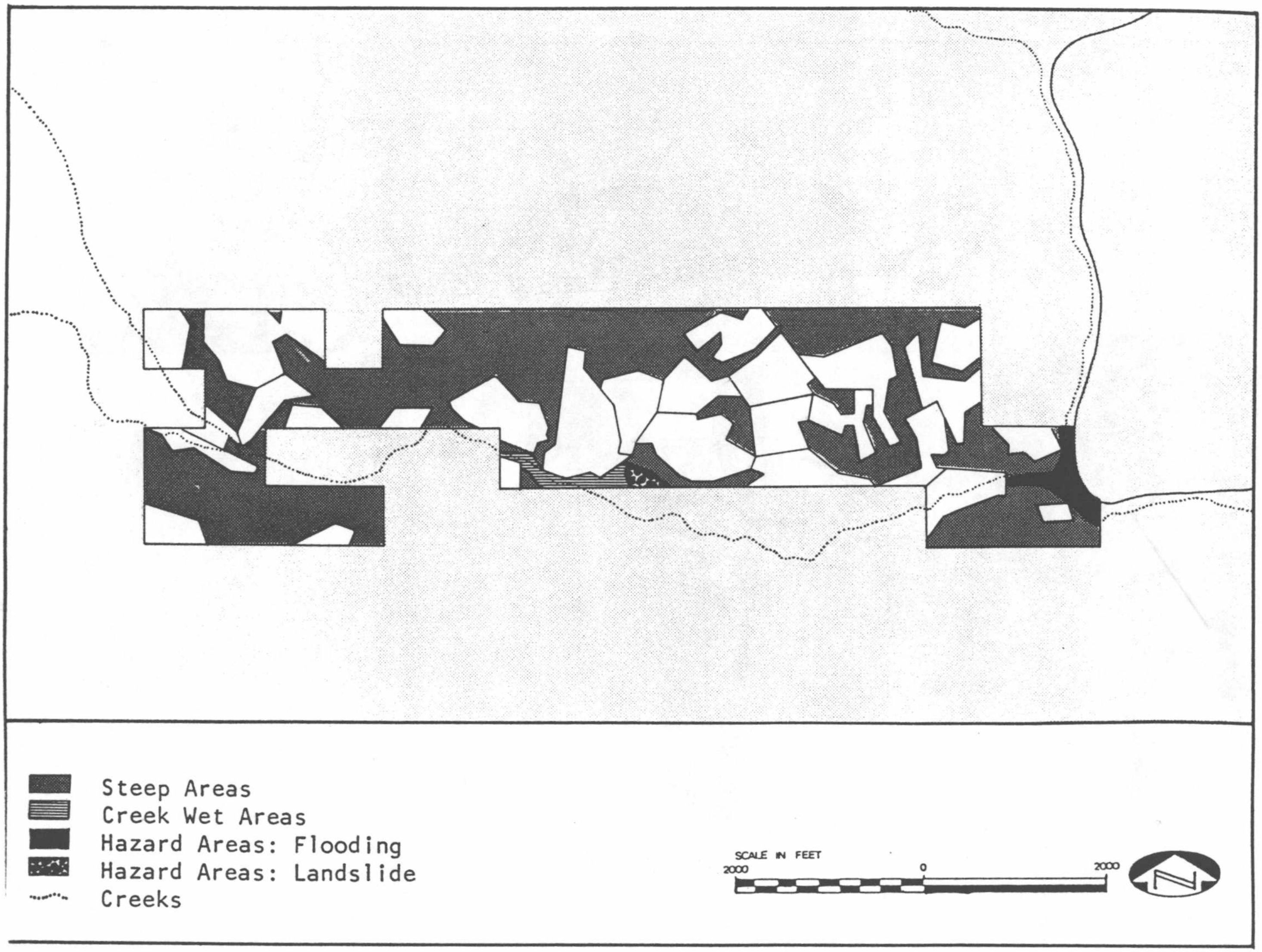
In summary, of the 2,135.5 total acres in the City, there are only 622 (29%) net buildable acres.

GAUTAM THE BUDDHA GROVE - Buildable Lands

Map 24



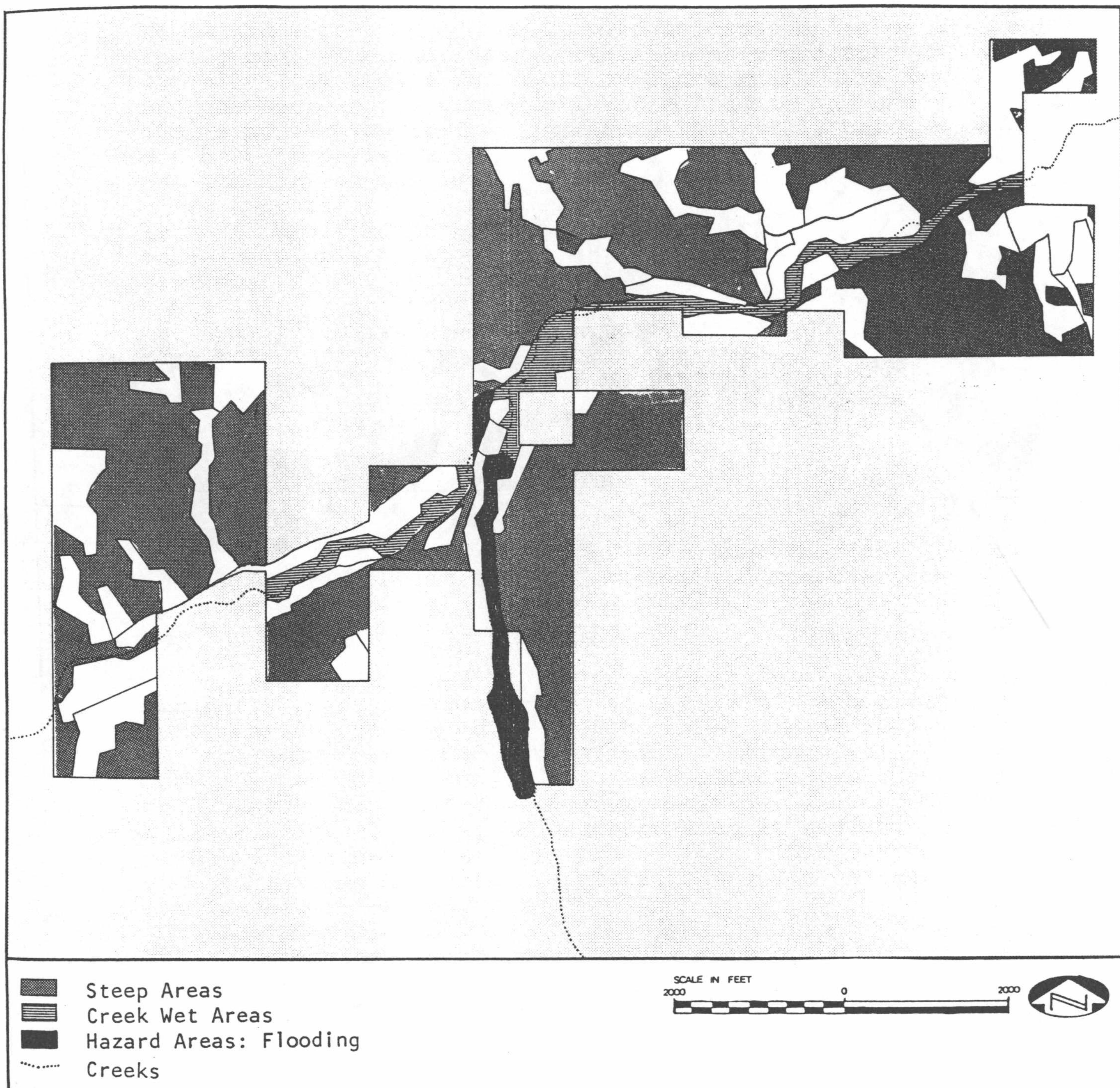
DESIDERATA CANYON Buildable Lands Map 25



Steep Areas
Creek Wet Areas
Hazard Areas: Flooding
Hazard Areas: Landslide
Creeks

JESUS GROVE - Buildable Lands

Map 26



8. ENVIRONMENTAL QUALITY

It is the intention of the City to assure compliance with all applicable state and federal regulations concerning air and water quality, solid waste disposal and noise. Rajneeshpuram and the surrounding area represent a fragile and undeveloped albeit overgrazed region, and every attempt is being made not only to preserve the natural quality of the land but to use the City as the implementing body for its renovation where appropriate. Some programs are already under way that serve to monitor the environmental impact of farming and urban development upon the land. In response to the "DEQ Handbook for Environmental Quality Elements of Land Use Plans", a preliminary inventory of present and potential conditions that may affect environmental quality and harmonious land use have been included in this preliminary plan. For some issues there is insufficient data and at present insufficient impact to warrant a full policy and implementation program. These areas are identified in the plan as such and will be monitored closely.

AIR QUALITY

The present primary sources that have impact on air quality are road dust, automobile, truck, bus and construction equipment emmissions and a rock crusher currently under a DEQ air contaminant discharge permit.

Road dust, represented as suspended particulate matter, is currently being controlled by the owners of Rancho Rajneesh by reducing vehicular speed on ranch roads. In addition, an application of an aqueous suspension of lignum sulfonate has been applied to all roads in the inhabited areas to retain molecular water and reduce dust production. A subjective evaluation of this program suggests that it has resulted in a 70% reduction in road dust production. This may be reduced further by further applications and other methods in the future.

Vehicular emmissions, represented by carbon monoxide and hydrocarbons, are currently being controlled through limitations of vehicular use and by providing public transport. (See "Transportation" in Services and Facilities Section.) Private vehicles are used by less than 10% of the current population of Rajneeshpuram, and communal vehicle use of farming, construction and organizational purposes in the City and surrounding areas is being managed by a central transport office. Automobile maintenance is done to improve combustion efficiency. Large construction equipment is seen as a short-term source of pollutants.

The rock crusher site is presently not in use. When it was, it was operated under an air contaminant discharge permit. A fogging system was installed to settle dust during dry weather conditions. Some blasting was done at the site and on ranch roads but not to an extent considered significant. The location of the crusher site is not within any residential or inhabited area.

A crematorium will be constructed at a site outside of the City limits. This should have negligible impact on air quality as its use will not be of a continuous nature. Also, a return system is being incorporated into the combustion system which will increase smoke temperature by 500^{o} to 1400^{o}F. This should greatly reduce any particle emission.

Burning to reduce wastes and clear fields is currently practiced rarely in the area and only during wet or misty conditions. No wood-burning heating appliances are used, for lack of firewood and because of summer cooling requirements.

A small carpentry shop located in the Jesus Grove area does not produce significant discharge. The landing strip does not have enough traffic to affect air quality. As population increases and commercial and small-scale industry development proceeds, it will be necessary to continue present programs and monitor air discharge and air quality more closely. Rajneeshpuram is in a Class #11 Prevention of Significant Deterioration area. Present air discharge is well within acceptable limits. Pollutants other than those listed are not expected to be introduced in future development. Goals and policies should support current programs.

WATER QUALITY

The maintenance of surface and groundwater within Rajneeshpuram and the surrounding area is a highest priority. A central aspect of an overall watershed maintenance program is a water quality monitoring program.

Potential sources of water quality degradation can be classified as point source and non-point source. Point sources are represented by agricultural activities, stream corridor management activities, road runoff and construction activities.

Present waste treatment systems are limited to on-site septic tanks with subsurface disposal. These have been installed in conformance with DEQ regulations and do not represent a threat to either surface or groundwater. The solid waste program, to be described, also does not represent any threat. The small volume of non-domestic wastes produced, primarily chemicals used for disinfection at the emergency medical clinic near Jesus Grove, are being stored in sealed non-degradable containers awaiting evaporative concentration.

There is at present no discharge into any surface water. With growth Rajneeshpuram will be providing expanded sewage treatment facilities (See "Sewage Disposal" in Services and Facilities section.) These systems will be designed to be energy efficient and resource conserving and will not degrade any water source. Close contact will be maintained with the DEQ to ensure conformance to water quality standards and compatible land use.

Non-profit sources represent a complex series of interrelated phenomena. The development of Rajneeshpuram and the renovation of the farm and riparian systems initially affected the quality of the stream water. These effects were primarily due to disturbances caused by crossing the streams. New roads were initially a problem until dust control and proper drainage ditching was accomplished.

Outweighing any temporary detrimental effects is the program of erosion control that has been in progress since November 1981. A number of experiments have been done with stream bank protection, the elimination of livestock from the stream beds and the construction of small siltation ponds. (See "Water" in Section II.) The construction of a large dam expected to contribute to the overall reduction of erosion has begun.

Erosion control and riparian repair are major elements of the Rajneeshpuram watershed management program (see Volume 2, pages 154 - 157) , and will have a direct effect on streamwater quality and thereby an effect on the Radha River. Cooperation with the Division of State Lands will be required to ensure that all guidelines and standards for stream modifications are met.

NOISE CONTROL

The major significant noise sources in Rajneeshpuram are heavy construction vehicles, power tools, motor vehicles, refrigeration and air conditioning equipment, and small airplane traffic.

The use of construction equipment outside community working hours has been minimal, except in areas such as the Krishnamurti Dam where noise does not affect any non-construction personnel. As a general rule there is little heavy machinery work taking place in or near residential areas. When this does occur, it is during periods when most residents are away at work.

Construction power tools occasionally do represent a noise disturbance, but only for limited periods.

Motor vehicles are used on a restricted basis and are routed primarily beyond the audible limits of residences. All residences employ double-glazed windows for insulation and sound barriers.

There has been some complaint about machine noise produced by the refrigeration units at Magdalena Cafeteria. This noise affects three nearby residences. A baffle is being constructed to reflect and absorb this noise, and the operation of the machine is being improved to minimize noise caused by worn bearings.

The airport located in the Jesus Grove area hosts an average of less than ten take-offs and landings daily. The firm of dBH Engineering calculated an Airport Noise Impact Boundary for the airport and concluded that the Ldn 55 (minimal noise impact) boundary does not extend beyond the existing runway layout. According to the Environmental Protection Agency noise levels below Ldn 55 are unlikely to draw complaints or to interfere with the activities of the community. The DEQ accepted the dBH report and approved the Noise Impact Boundary pursuant to airport noise regulations (OAR 340-35-045). As an added protection, the land within the landing and take-off corridor (the approach zone) is zoned only for commercial and recreational uses.

Sensitivity to others and respect for the environment are an integral part of the lifestyle practiced by the residents of Rajneeshpuram. Noise pollution is, therefore, not a problem.

SOCIO-ECONOMIC POTENTIAL

existing economic resources
human resources
economic development
population

138.1

III. SOCIO-ECONOMIC POTENTIAL

INTRODUCTION

The City of Rajneeshpuram is currently inhabited by an intentional communal settlement that is based upon the religious teachings of Bhagwan Shree Rajneesh. Because of its communal nature, similar in organization and structure to the kibbutzim of Israel, similar achievements in reclaiming land and engaging in intensive agricultural production are possible.

The settlement has attracted people of outstanding competence who wish to live, study or visit at Rajneeshpuram. This assures the City a broad base of human and economic resources within which to grow and prosper while remaining sensitive to the rural character of Rajneeshpuram's setting and the need for maintaining the environmental integrity of the area. The community's work force is highly motivated and is organized on a cooperative basis; the workers donate their labor and skills. These people, who in the past year have spent $30 million on transforming a deserted sheep and cattle ranch into an expanding, multi-dimensional farm, now are pouring their efforts into the creation of a city.

Of the $30 million invested in the first year, over $27 million has been spent with 700 Oregon companies. Within five years of the City's inception, an estimated $150 million worth of investments will have been made in it and in agricultural and other economic sectors associated with it. These investments come at a time when Oregon's economy has been suffering an acute depression. Statewide unemployment has been running in excess of 11%, which is the sixth highest rate in the U.S. Some of the counties in central and eastern Oregon near Rajneeshpuram are experiencing unemployment rates in excess of 15%. Oregon's lumber and wood products industry, which normally provides more than one third of the manufacturing jobs in the state, has been decimated by the drastic decline in national home building and construction. Agriculture, Oregon's second largest industry, has been adversely affected by falling prices and rising interest rates. Tourism, Oregon's third largest industry, has also exhibited the effects of the nationwide recession, but has fared best among Oregon's big three.

Oregon's economic condition has led to efforts by the state government, along with numerous local communities and the private sector, to diversify the economy. Increased funds will be spent by the state to recruit new industries from outside Oregon and to help industries already located here to expand.

A key to Rajneeshpuram's economic success is diversification of its economic base, which will also expand its export markets and bring increased revenue into the City and state. Agricultural production, which is presently the main industry of Rancho Rajneesh and takes place just outside the City, will soon expand into the processing of such items as wine, cheeses, jams, wool products, etc. The educational institute that will be established in Rajneeshpuram in conjunction with the tourist destination facilities will attract visitors to the City and to central Oregon throughout the U.S. and from abroad. This will result in an annual infusion of millions of dollars into the City, regional and state economies.

There are thousands of Rajneeshees and others from the U.S. and abroad who will visit Rajneeshpuram and then go on to ski at central Oregon's winter recreational facilities, visit the Indian reservation at Kah-Nee-Ta, utilize the facilities at Sun River and Black Butte, and tour Oregon's coastal resorts.

As the population of the City expands it will be necessary to increase the infrastructure of trades and services. This in turn will require ever increasing purchases of all kinds from the Oregon market.

Because of the special nature of the City's residents, who have been attracted by a dedication to the principles of Rajneeshism, the broad human resources represented make possible the development of several high-technology enterprises. City production, for instance, of software computer packages could mean additional markets for Oregon's producers of electronic and computer hardware. Also, the unique clothing, accessories and cosmetics used by Rajneesh disciples will be marketed to followers around the world. The contracting, warehousing and distribution of such items will not only furnish highly skilled jobs to City residents but will lead to many contracts for Oregon companies for production and transportation of raw and finished materials.

In summary, the diversified industries planned for Rajneeshpuram will provide not only an excellent and stable economic base locally but also a healthier state economy. It is estimated that within the first five years 1400 new jobs will be created within the state as a result of the development of Rajneeshpuram.

III. SOCIO-ECONOMIC POTENTIAL

1. EXISTING ECONOMIC RESOURCES

The economic and human resources available for the development of the City of Rajneeshpuram are unique and extensive. Economic development of the City and the surrounding Rancho Rajneesh has been undertaken as a joint venture between the owner of the land, Rajneesh Investment Corporation (RIC), and the tenant of the land, Rajneesh Neo-Sannyas International Commune. Rajneesh Investment Corporation is an investment company with substantial financial resources. The Commune is a religiously based community with a communal treasury. Taxes are paid on all commercial enterprises.

The $30 million that has been invested in the first year and the available human resources provide an excellent asset base for economic development. One of the developer's greatest assets is the land itself, a vast physical and natural resource. Land improvements within the City and Rancho Rajneesh include drainage systems, water storage, irrigation systems, road construction, utilities, erosion prevention and reclamation projects, all of which are continuously improving its value. Fifty-four mobile homes have been sited, a 10,000-square-foot cafeteria complex, a similar steel structure for farm storage, and a two-acre greenhouse have all been erected. In addition, a modern dairy barn and a number of other farm buildings have been built. The land and the improvements of the past year create an asset base that will make feasible the financing of projected development. It is expected that through conventional financing, business income and donations a total of $150 million will be invested during the next five years. These investments will be made both in the City and in the agricultural ventures of Rancho Rajneesh, which are an integral aspect of the City's economy.

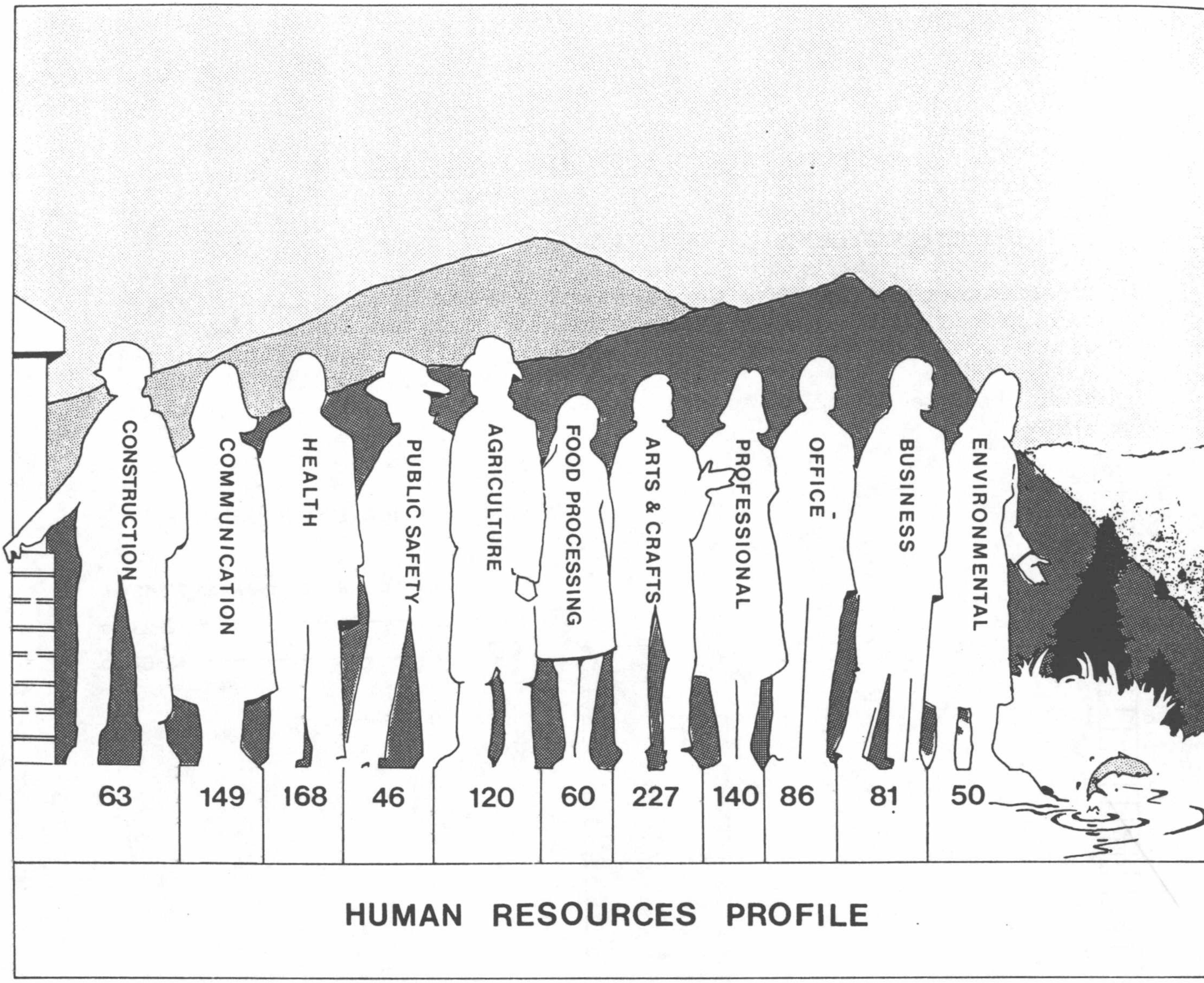
2. HUMAN RESOURCES

In preparation for the Comprehensive Plan of the City of Rajneeshpuram, the Interim Committee for Citizen Involvement distributed a human resources questionnaire requesting information on vocational skills, educational background and other statistics. The results of the questionnaire show that within the present population there is a wide spectrum of professional, well educated and skilled workers coming from diverse backgrounds. Forty-nine percent have obtained bachelors, masters or advanced degrees. Another 71% have had some college education. (See following table of educational achievements.)

LEVEL OF EDUCATION COMPLETED	PERCENTAGE OF POPULATION
Beyond Master's and/or Doctorate Degree	7%
Master's Degree	12%
Bachelor's Degree or Equivalent	30%
Some College	22%
Vocational School	5%
Secondary School (Grades 7-12)	15%
Elementary School (Grades K-G)	9%

These highly skilled people form a broad and reliable base for economic development.

The information derived from the questionnaire was used to determine the human resources base available for planned economic ventures. The Human Resource Profile (see Figure 6, next page) clearly reflects the unusually high level and multiplicity of skills available at Rajneeshpuram and the consequent ability of the community to successfully carry out the economic development projects set forth herein.



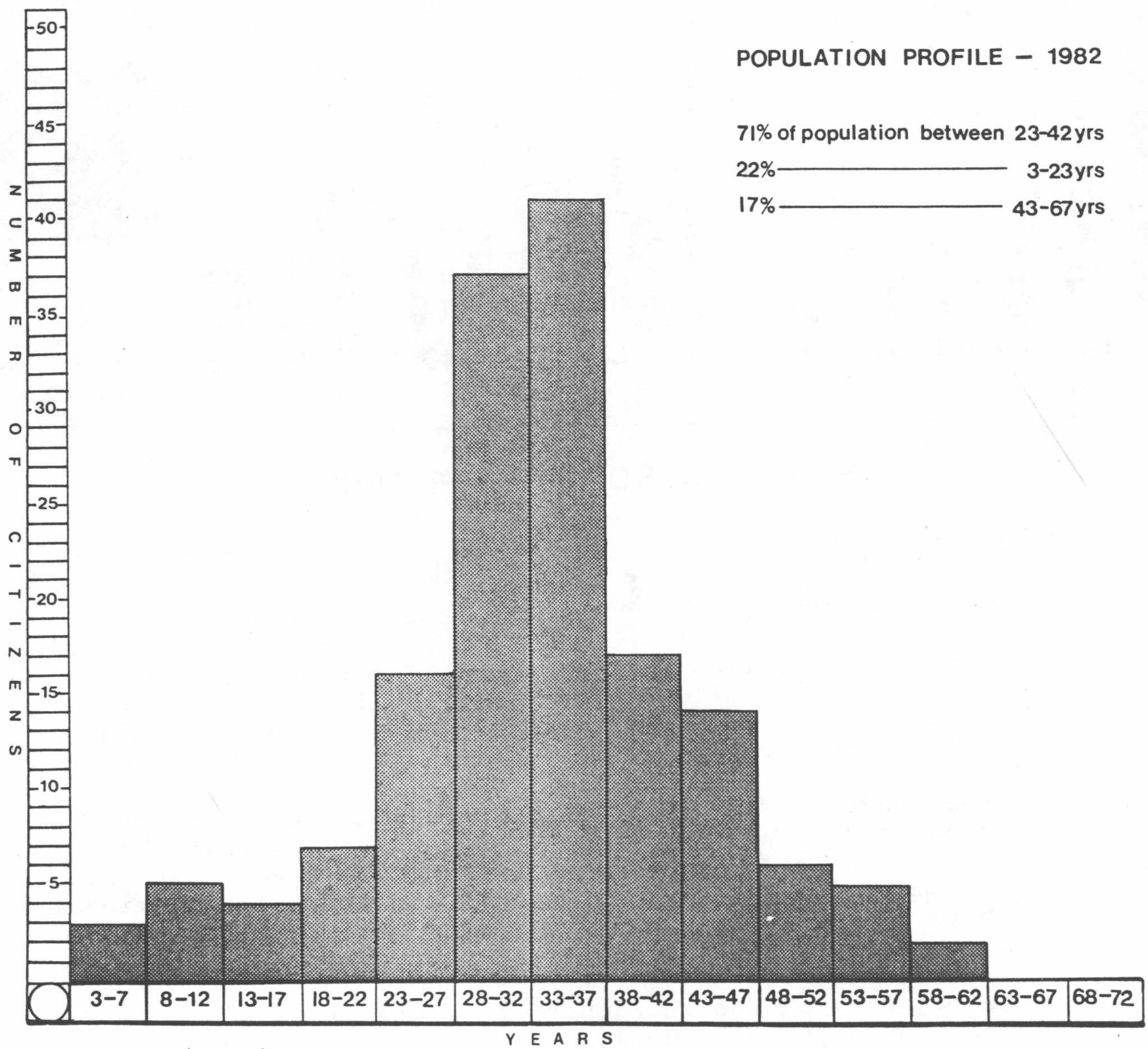
Ref: Survey of 160 Residents of Rajneeshpuram (June 1982)

These crossover figures reflect the accumulative abilities of those residents who responded to the human resource questionnaire that was circulated by the ICCI. Based on the 160 who completed the questionnaire, it is obvious that the members of this community have a multiplicity of talents that enhances greater role mobility and diversity.

Three hundred twenty people presently reside within the City and on Rancho Rajneesh; 186 of these reside within the City limits. Most are disciples of Bhagwan Shree Rajneesh and all are committed to realizing a community that is economically viable and aesthetic, and that makes use of modern technology without upsetting the balance of nature.

The majority of the residents are young (see Figure 7, next page) and physically healthy. Through the rapid development of Rancho Rajneesh they have already demonstrated their ability to work together in harmony, quickly acquiring whatever additional skills may be needed for any particular project and working long hours to achieve their goals rapidly and efficiently in as short a time span as possible.

Population Profile - 1982 Figure 7



Ref: Survey of 160 Residents of Rajneeshpuram (June 1982)

III. SOCIO-ECONOMIC POTENTIAL

3. ECONOMIC DEVELOPMENT

INTRODUCTION

Diversification is the key to the success of economic activities within the City. Without diversification, the economy is subject to the market fluctuations of a narrow range of products and the economic viability of the community is jeopardized.

Although agriculture is presently the principal industry on Rancho Rajneesh, with most activity occurring outside the City limits, the marketing of processed farm products will begin soon. Since most of the farm and processing workers will live within the City, the agriculture of Rancho Rajneesh will have a major impact upon the economy of the City. In the book "The Economy of the City", the author, Jane Jacobs, speaks of the importance of the economic enterprises of a city providing the necessary services and markets as a prerequisite for agriculture. A description of the types of agriculture taking place on the ranch is therefore included in this section.

In addition to the agricultural enterprises, it is planned that light manufacturing, crafts and professional management services will take place in the city in order to utilize effectively all the skills available in the local population.

Educational programs are expected to generate a significant level of interest and course enrollment, establishing another major economic activity. The creation of this community is perceived as an educational endeavor in itself and is expected to draw the interest of sociologists, ecologists, planners and experts in many other fields. This educational program will complement interest in the religion of Rajneeshism, as exhibited by the recent festival attendance and in the sale of books and other related items.

All of these factors generate interest among the general public, and many visitors, including the media, come daily. More are expected as the community grows and its activities become more widely known. This continual flow of visitors necessitates a tourist/visitor service industry, with a destination center as the eventual goal.

Rajneeshpuram's diverse economic activities will create new jobs within the state as well as within the city, as additional support services are required for the city's expanding work force.

AGRICULTURE

A unique agricultural program is taking place on Rancho Rajneesh. A large tract of marginal rangeland that has been neglected and overgrazed is being turned into a productive farm. It is clear from the level of ecological deterioration of Rancho Rajneesh lands that, in the past, whatever economic return was realized took place at the expense of the land's capacity to maintain its own integrity under previous farming practices.

What is being undertaken now is a form of agriculture that requires immense human and economic resources. For example, greenhouses are being used to extend the growing season to year round. An extensive variety of fruits and vegetables are being added to the regional regulars. A 17-mile electric fence has been constructed to deter deer and predators. Different kinds of animals and birds are being introduced to the ranch.

Facilities located on Rancho Rajneesh will process raw farm products and market them throughout the state.

From the milk, cheese and yogurt will be produced; from the grapes, good Oregon white and rose wines will be made; from the wheat, bread will be baked - much of which will be marketed outside the community. Many of the fruits and vegetables will be preserved and sold. This results in a more productive use of the land, profiting not only the City but the central Oregon region and entire state as well.

This type of intensive agriculture and agricultural processing is economically viable at Rancho Rajneesh notwithstanding its history of neglect and its poor soil conditions. It can only be accomplished, however, with a large input of human resources, especially in the initial stages. The land and water resources must be restored and irrigation systems and farm buildings must be built. Labor-intensive activities in planting, cultivation and harvesting are needed. A community effort in which labor is donated makes it possible to bring this agricultural venture to a thriving economic level.

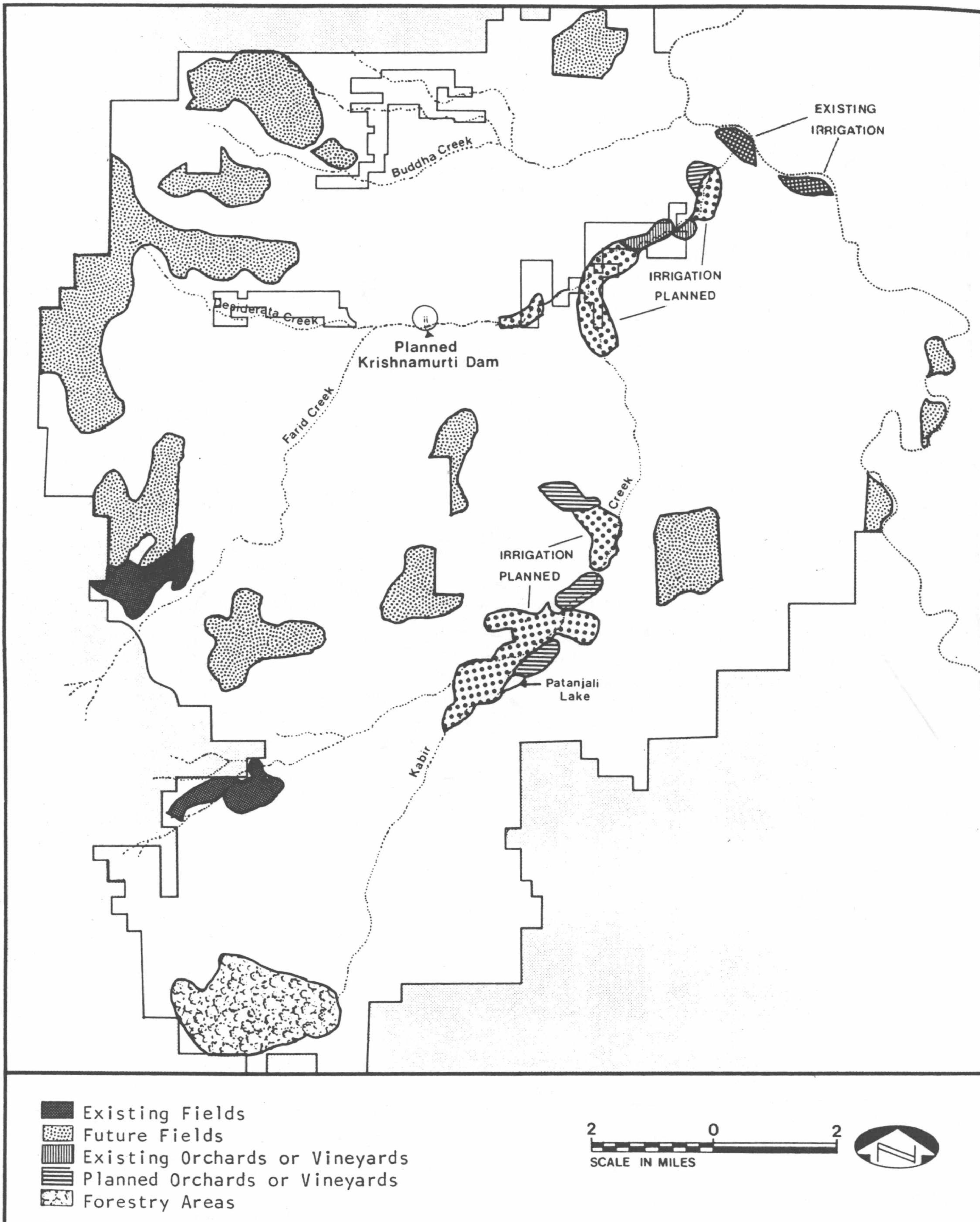
One of the first steps in turning Rancho Rajneesh into a productive farm is restoration of the watershed. Eroded uplands must be reseeded with native grasses and 260 miles of eroded gullies must be fenced to slow runoff, retain the water-carried silt, and keep the flow away from fragile streambanks. (See Figure 3 on page 71 for a diagram of fences to be used.) Another three miles of creekbank in the Jesus Grove area and three miles in the Patanjali Lake area need rip-rap to slow the undercutting of the bank by rapid winter runoff. In the first year, about 10% of the gullies were treated and the rip-rap project was partially completed. Ultimately, the fences will slow water runoff and sediments will build up at these locations. Natural riparian systems have already begun to re-create themselves at the time of this writing. As the creek-bank is restored, the water table on either side of the creek rises and vegetation can return to or exceed its original state. In addition, holding ponds and dams are being built to catch and store the winter rain for irrigation purposes. A 1,000-acre-foot reservoir that will serve agriculture in the Jesus Grove area of the city is under construction. Patanjali Lake, which is in the southern portion of the ranch, will be enlarged to 650 acre feet in the summer of 1983 and in 1984 another reservoir will be developed at a higher elevation in the same area of the ranch. This third reservoir will have a capacity of 1,000 acre feet. These reservoirs will provide enough water to irrigate comfortably approximately 1,200 acres, which is the acreage planned to be under irrigation within five years. Of the total 1,200 irrigated acres, 88% will be irrigated with water provided from reservoirs. The agricultural development will not place a demand upon groundwater resources. Existing and planned agricultural ventures for Rajneeshpuram and Rancho Rajneesh are illustrated in Maps 27 and 28 on the following pages.

IRRIGATED CROPS

Truck Farming

Fifty acres of vegetables, including staples such as sweet corn, beets, beans, peas, carrots, lettuces, potatoes, tomatoes and more than 50 other varieties of vegetables have been planted this year. This will be increased to 100 acres within five years. An intensive bio-dynamic cultivation system is being employed. For example, gardens are being planted in raised beds to increase the warmth of the soil. This system of planting also uses companion planting and composted kitchen wastes, worm casings and mint fines (the charred remains of mint plants) to increase the humus content of the soil.

The commercial value of this truck farming operation will depend on what grows successfully and what markets are available.


EXISTING
IRRIGATION
Buddha Creek
IRRIGATION
PLANNED
Desiderata Creek
Planned
Krishnamurti Dam
Farid Creek
Creek
IRRIGATION
PLANNED
Patanjali
Lake
Kabir
Existing Fields
Future Fields
Existing Orchards or Vineyards
Planned Orchards or Vineyards
Forestry Areas
2
0
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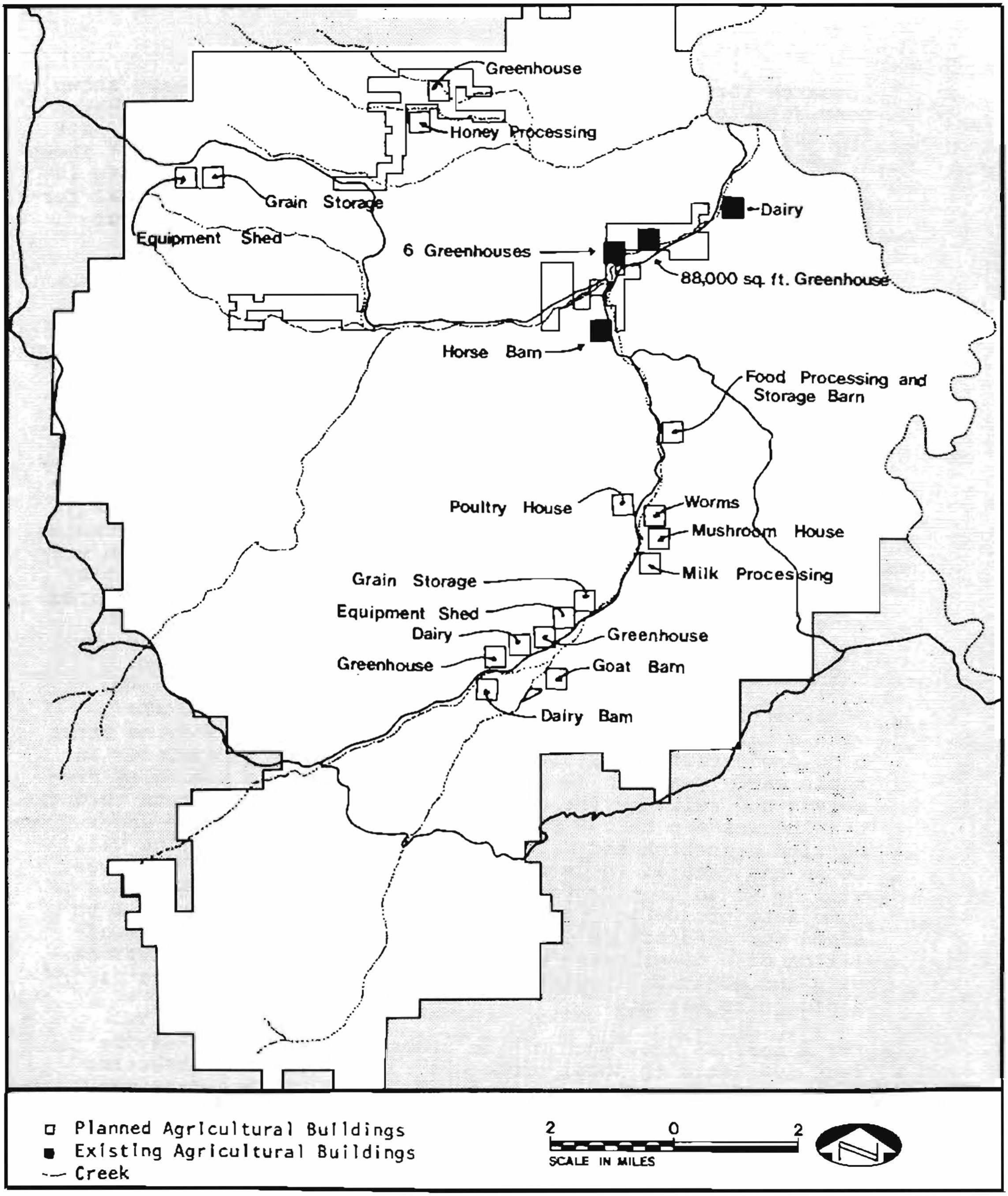
SCALE IN MILES



□ Planned Agricultural Buildings
■ Existing Agricultural Buildings
--- Creek

Research through local vegetable wholesalers has already shown considerable market potential both in Oregon and in Washington for the organic produce we intend to grow. Crops for the next two seasons have been planted with these markets in mind. These organically grown crops marketed to outlets that specialize in such foods will not compete with crops grown with chemical fertilizers, but rather will generate an additional market for Oregon's organically grown products.

Vineyard

There are presently eight acres of vineyard using drip irrigation; this will increase to 30 acres by 1984. Eventually a small winery will be established in order to produce Eastern Oregon rose and white wines. There is a great deal of interest in Oregon wine production and approximately 2,000 acres of vineyards now exist in the state. At this time nearly all of the vineyards and wineries are located in Western Oregon. They produce three to four tons of grapes and 2,000 bottles of wine per acre. It is expected that Rancho Rajneesh vineyards will produce this amount and possibly more, as the ranch experiences greater numbers of "sun days" and higher temperatures than are found in Western Oregon. Wine sales are expected to begin by 1990 and if successful more land and resources will be devoted to vineyards.

Orchards and Berries

Strawberries, raspberries, gooseberries and rhubarb, along with a variety of vegetables and herbs, will provide the first base products for the city's food processing industries. In their early years these industries will produce specialty preserves and relishes for distribution to gourmet markets throughout the western United States. While these items are under production, research and development of a frozen food line will begin and natural foods distributors in the Pacific northwest will be added to targeted markets. As 200 acres of orchard come into production in the late 1980s, these fruits will be added for manufacture of fruit butters and spreads. Installation of a cider press will provide another method of processing and additional outlets, as the community investigates organic juice markets.

For a nominal fee, much of the processing equipment may be made available to local producers for aid in the processing of their own crops for home use. In this way the food processing plant will be able to realize a small return on its investment while making a valuable service available to the surrounding agriculture.

Greenhouses

As a result of experimentation in soft plastic quonset greenhouses, a larger greenhouse is under construction. The large size (88,000 square feet) and innovative design permit the use of farm tractors and machinery inside the building. Technical innovations and computer simulations ensure that the building will be energy efficient. Four different climate zones will be available for use to ensure crop diversity. This building will make it possible to grow off-season and relatively high-priced fruits and vegetables in the winter, including tomatoes, cucumbers, snow peas, strawberries, peppers, and zucchini. In the late winter, young starter plants can be grown; this will boost spring and summer crop yields. In 1983 another six acres of greenhouses will be constructed that will come into production in 1984. (See Map 28 on page 151.)

Of the produce grown, it is estimated that in the first two years approximately 25% will be used for home consumption. After the building of six additional acres of greenhouses, only 10% will be used for home consumption. Data on year-round prices and market potentials have been gathered from the Commune's current produce suppliers, many of whom have expressed keen interest in marketing produce from the ranch.

Experimentation will also take place in the first year with the growing and marketing of flowering plants. This will expand into transplants. Indications are strong that houseplants could be distributed easily through smaller greenhouses and nurseries that currently buy their plants west of the Cascades.

DRYLAND FARMING

Initial focus is on land clearing, soil enrichment and experimentation with various types of crops. Short-term goals include production of the ranch's livestock feed requirements and additional crops for food processing. Ultimately, surplus crops will be marketed.

To date, 3000 acres have been cleared. Within three years, a further 5000 will be cleared. During the first year, 1000 acres will lie fallow while much of the remainder will be seeded with Austrian winter peas primarily to be plowed under as an economic form of organic fertilizer. Various types of wheat, barley, oats and alfalfa will also be seeded during the first year.

In addition, dryland farmers are working with the University of Idaho in examining the potential for production of dryland legumes. Their market potential will be evaluated after the first two years.

FARM RELATED

Dairy Products

Over the next five years the dairy herd will be increased from a current 38 milking cows to 550. In the fifth year this herd is expected to yield approximately 4000 gallons of milk daily, of which one third will be consumed by the community, tourists and visitors to the ranch. The balance will go towards the production of a variety of high quality dairy products for export.

A new dairy barn and processing plant has been constructed during the first year. These were designed with the assistance of Oregon engineers, and the equipment was bought from Oregon cheese distributors, delicatessens and natural food stores. Eventually, however, distribution will be throughout the western United States, thereby expanding the number and variety of Oregon's quality agricultural exports.

Soy Products

Recognizing the growing American interest in high-protein, low-cholesterol foods, the soy dairy will produce fine quality tofu (soybean curd), and tempeh (fermented soybean cake). To provide the required soybeans, 25 irrigated acres will be planted in the first year, increasing to 100 acres in the fifth year.

Under the direction of three experienced soy workers currently living in the community, these items will be brought to market daily. While tempeh is frozen, tofu is a perishable item, and freshness is essential to its marketability. The tofu currently available in central Oregon comes primarily from two firms located west of the Cascades and in some cases takes three days to travel from producer to user. By trucking within central Oregon and using current Portland-based suppliers of other items to backload soy products to Portland, the freshest possible product will be brought to wholesalers, natural food stores and restaurants.

Production as projected in the first year will be less than 10% of the current total production in Oregon. By the fifth year, production is planned to be about 1200 pounds of tofu and 150 pounds of tempeh daily, of which about 25% is targeted for internal consumption.

Marketing efforts will focus on bringing these products to the attention of mainstream customers through advertising, recipes on packages, demonstrations in markets and the use of products in restaurants. Eventually the marketing efforts will extend beyond Oregon into California, Washington and Idaho.

Bakery

The bakery that will be developed in Rajneeshpuram will produce all the breads, granola and baked goods needed for the City in addition to marketing these items commercially. It will also market one specialty item, using a family recipe for what is currently the most popular snack item in the community, a brownie-type bar. The bakery will begin with a small production, 100 packages per day in the first year. Market research and development will continue during the first two years, and product diversification will begin in the third year. By that time, production will reach 400 packages per day. By the fifth year, production will increase to 1000 packages per day.

The market for these baked goods will include restaurants, groceries and natural food stores within a four-hour drive. Deliveries can be made fresh several times a week to Portland and daily to Bend, Redmond and The Dalles when Rajneeshpuram trucks go out to pick up supplies.

Sheep

Unusual and specialty breeds of sheep will be purchased for breeding stock and also for the production of high fashion, high quality knitted garments. These unusual wools will be blended with standard wool purchased from local Oregon sheep ranches. Specialty breeds under consideration are Leicester, Jacob's Flock and Corriedale. Also under consideration is the Romney sheep, which produces a full and good quality fleece.

Fleeces will be cleaned, carded, spun and hand-dyed on the ranch. Natural dyes will be used.

This will be a year-round operation. Sheep will be sheared in the spring, with production of hats, scarves, mittens, socks, vests and sweaters continued all year. These garments will be retailed through the City's commercial center as well as at ski and winter resorts in Oregon and throughout the U.S. The flock will number 500 in the first year (480 ewes and 20 rams), building up to 2600 in five years. Throughout this period, additional fleeces will be purchased locally to supplement the wools produced on the ranch. Research is being conducted to explore the possibility of raising llamas and mohair goats to produce other specialty wools for the production of unique fine quality garments. It is intended that these wool products provide a permanent high quality export market for Oregon's wool, thereby improving the economic margin for Oregon's sheep ranchers.

PUBLICATIONS

Rajneesh Foundation International markets a full line of books and other items to carry the message of Bhagwan Shree Rajneesh throughout the world. The products include fine quality hardback and paperback books, video tapes, music tapes, and a large variety of posters, photographs, and gift items. A newsletter is sold by subscription to countries throughout the world.

These items are marketed through the following outlets:

- retail outlets	35%
- Rajneesh centers	30%
- individuals	28%
- distributors	6%
- libraries	1%

Sales for 1981 have been studied carefully. Innovative marketing techniques will be introduced in 1982.

At the present time, the production of all printed items is subcontracted to Oregon printers. This has constituted a source of export earnings to the state. During the third year of these projections, some printing will begin at Rajneeshpuram. The first step in this direction will be creation of a design studio in the first year. With each succeeding year, machinery will be introduced, until by the fifth year full-scale production of printed materials will be underway at Rajneeshpuram. It is likely that some portions of this activity will continue to be subcontracted to printers outside the community, thereby adding business to one of Oregon's growing industries.

MANAGEMENT SERVICES

Computer Software

The Rajneeshpuram community includes people with outstanding capabilities and experience in computer technology. It is planned to utilize these talents to develop a variety of services that will be developed and directed from Rajneeshpuram and marketed throughout the U.S. and the world. This program is based on high quality state-of-the-art computer software/hardware geared to very specific markets with the longer term objective of labor-intensive, steady, income-producing operations. As such, the focus is not on the highly priced competitive volume markets but rather on specific industries or applications known to have certain processing requirements that are not presently being met by other suppliers.

Mainframe Software

With the sale of IBM's new 4300 series computers, the cost of large mainframe computing power was made economically available to a wide range of smaller corporations (annual gross sales of $5 to $20 million). While the cost of hardware was substantially reduced, the cost and particularly the absolute availability of competent, experienced programmers to maintain and utilize the hardware effectively is relatively limited. This situation places a premium on software that is labor saving relative to programmer time. Some of the Rajneesh members are expert in the design of such software.

At the same time, the use of computers by corporate management is becoming more widely accepted, calling for software that is non-technical from the user's standpoint. The report writer and interactive driver is labor saving and is specifically designed for use by IBM 4300 (DOS) computer departments. The report writer virtually eliminates programming requirements in the generation of tabulated reports, while the interactive driver for the report writer utilizes question/answer dialogues that enable non-technical users to specify the reports they need.

The software products that will be developed should sell themselves, requiring only adequate exposure in the market and well documented installation procedures for distribution.

Turn Key Micro Package

The sale of microprocessor software and hardware is an intensely competitive market. An effective means of market penetration is specialization of software/hardware to meet the needs of a specific application/industry. As such the user is offered software tailored to his specific needs and hardware economically configured to support the software in question. This can be an effective sales tool, as the small businessman does not have the expertise to fit software to hardware or vice versa. A turn key package in which software and hardware are installed and made operational in the user's business environment has considerable attractiveness. Maintenance contracts offered by the seller also add to salability and produce a source of steady cash flow. The computer experts at Rajneeshpuram can provide such specialized packages.

The freight forwarder industry consists of many smaller businesses that typically have not automated yet have common processing procedures and requirements - an ideal market for microprocessor-based systems. There are at least eight cities throughout the U.S. that have a minimum of 50 freight forwarders. They would constitute potential prospects for the envisaged system. Sales estimates are based on reaching 10% of that market. In the second or third year, other applications could be developed to boost annual sales above the projected levels.

This program should enhance Oregon's image as a major center of high technology industry and should provide additional market outlets for Oregon's manufacturers.

Data Base Management

The data base management program entails the collection, organization and maintenance of primary and secondary data for sale to industry on a subscription basis. This project requires a longer gestation period for system development because it would require the installation of a main frame computer at Rajneeshpuram, but it offers more labor-intensive operations with a steady income-producing capability. With the growing use of computers, more information that can be centrally organized for user accessibility is becoming available. Collection of primary data from the source, i.e., data that has not been previously collected or previously centrally organized for distribution, offers more potential for income generation and can have greater job producing effects. Data bases currently being considered include combinations of secondary and primary data.

Fifty collation points are envisioned throughout the U.S. that will feed data into regional/state collection points for evaluation and validation. Once information has been validated it will be sent directly to the main frames installed at Rajneeshpuram for detailed processing.

EDUCATION/RELIGION AND VISITORS

The potential that Rajneeshpuram has for attracting visitors has been proven during the first year of its existence. Up to 100 visitors per day have been coming from all over the West Coast to see the community at work, yet there has been neither advertising nor special attractions beyond the ranching activities themselves. In addition, the religious festival held at the ranch in July 1982 drew more than 5000 people from all over the world. It is clear that a large amount of income can be generated not only for this community but also for the economy of Oregon by offering programs that will enable visitors to study and work in the City, thereby gaining a first-hand experience of the various aspects of community life, including its spiritual base, its use of meditation as an integral part of daily life, and the interaction between the ecology of the area and the community effort.

In the religion of Rajneeshism, education, especially in meditation and personal growth, has been extremely important and integral. Education in many types of meditation has been offered around the world by Rajneesh organizations. This has included the many special methods developed in Rajneeshism, as well as traditional methods such as Zazen, Vipassana and Sufi whirling.

In the educational programs there is a special emphasis on awareness: awareness with self, in relations, with the community and with the environment. In the facilities in the new City, there will be many programs with this focus.

Another area of religious education will be the opportunity to study all other religious traditions and methods and how they apply to contemporary life.

The Academy of Rajneeshism, which is responsible for the selection and training of Rajneesh ministers, will develop facilities and programs within the City.

The City has extremely high resources of people with backgrounds in education and teaching, people who are experts in many areas ranging from psychology and ecology to community planning and geology. The citizens also have a keen interest in ongoing education, and in providing unique, pioneering and excellent learning activities. With these resources, the space for educational facilities and the desire for ongoing learning of all types, it is anticipated that education will include 500 participants a day by the end of 1983, with up to 1000 participants a day in five years.

The educational experience may vary in format from a 12-week semester to a three-day conference, a month-long intensive workshop or a six-month work/study apprenticeship.

The following is a more complete list of subject areas being discussed for possible inclusion in a growing educational program.

- communications: reading, writing
- math, accounting, finance
- business, computers, clerical
- psychology, self-exploration
- interpersonal communications
- biology, ecology, land management
- architecture
- commune living
- education
- home economics, cooking, sewing
- social studies, geography, geology
- languages
- religion, meditation, philosophy
- carpentry, construction
- mechanics, surveying
- community development
- health, physical education
- dance, music, martial arts

An entire service industry will be developed to meet the needs of these visitors. These services will include lodging for overnight and extended periods, food, entertainment and recreation.

As these facilities evolve, more and more people will be drawn to Rajneeshpuram because of the recreation potential and the sheer beauty of the surroundings.

Plans call for the utilization of the 64,000 acres of scenic ranchland with its river, lakes and woods to provide all possible tourist attractions, and for the building of first-class facilities at every level. These facilities will be geared for year-round use as well as the annual summer festival.

The First Annual World Celebration in July 1982 illustrated the enormous potential Rajneeshpuram and Rancho Rajneesh have to attract visitors from all over the world. During the five-day festival, visitor accommodation was made available for the first time on a large scale, and although it was limited primarily to camping facilities, all available accommodations were filled.

During the next year, tourists will be accommodated in a guest lodge. In the second year, the first section of a hotel for 150 visitors will be built. It will feature 100 rooms with single, double and suite accommodations, a restaurant, a bar, and a swimming pool. Hotel facilities will increase each year until by the fifth year the hotel will consist of 500 rooms and will meet all the standards of a first-class resort.

Special attention will be given to the development of the winter tourist trade. First, emphasis will be given to one of the four celebration days in Rajneeshism: December 11. Second, Europeans and Americans can be given the opportunity during the winter holiday season for day tours to ski at other resort areas nearby. Winter visitors will assuredly wish to visit and ski at the facilities of Mt. Bachelor and the proposed ski development at nearby Warm Springs Indian Reservation. Third, people who live in the southern hemisphere, especially those in South America and Australia, will be attracted to the skiing during their summer holidays (December to February). It is estimated that a significant proportion of the overseas visitors coming to the ranch will spend time at tourist resorts in other parts of Oregon, particularly those in central Oregon but also including some on the Oregon coast.

The importance of education in Rajneeshism, the quality of the education, the commitment of the staff and faculty, the emphasis on experimental learning, the beauty of the environment and the community's previous experience with successful educational programs indicates that education will contribute substantially to the job and financial base of Rajneeshpuram, as well as the visitor/tourist industry of the region and state.

WHOLESALE/RETAIL MARKETING

Wholesale/retail marketing is geared to the selling of clothing, cosmetics and other general items that are contracted for manufacture outside the City. This will involve use of the labor and resources of many Oregon companies both for purchase of raw materials and manufacture. By working in this way, marketing can concentrate on research, design and other facets of pre-production work without tying up large amounts of capital in the establishment of factories. An Oregon-based export industry is the goal. Rajneeshpuram already has a built-in worldwide market among Rajneesh disciples and followers.

Clothing

A range of casual clothing that is both comfortable and stylish will be produced. Garments of jersey, knit and velour, including a wide range of stylish t-shirts, will be the principal focus of manufacture.

Cosmetics

Market research has shown the feasibility of successfully launching a new range of scentless, natural and beautifully packaged cosmetics. In the first few years these would be skin and hair care products primarily, but the range would be expanded as existing products become established on the market.

Marketing

Products will be distributed initially through an existing network of worldwide Rajneesh center outlets. In the next few years a series of small boutiques will be opened in major American cities and goods will be wholesaled to established retail outlets. A mail-order catalog business will also be set up during the first year as a way of launching the products at a selected market.

COMMERCIAL CENTER

Service Center

Historically, cities have become established as centralized suppliers of goods and services needed by the wider surrounding community. Rajneeshpuram must become a local service center because current available services are 60 to 100 miles away. Development plans call for a retail center, a recreational sports complex and a cultural and entertainment center. Residents of the surrounding area as well as visitors will take advantage of these facilities. The commercial center will offer a wide variety of goods and services and many Oregon products will be for sale. Other goods will be manufactured under the Commune's label and produced to its specifications. Eventually, however, a number of the items sold will be produced within the City. In addition, the cultural, recreational and entertainment facilities will generate income.

Professional services will be available for the City and the region. Such services will include legal, medical and emergency services, engineering and materials testing, and psychological and interpersonal counseling.

In conclusion, the direction of economic development for the City of Rajneeshpuram is expected to reflect that of traditional production and marketing systems in which potentially attractive markets are identified, means and costs of production are determined, necessary resources are allocated, production is effected, and finally goods are distributed to marketing points. Of great significance to the success of the City's economic program is its highly productive, innovative and energetic human resource, which is willing to apply itself to the task of building a rich a diversified local economy.

III. SOCIO-ECONOMIC POTENTIAL

4. POPULATION

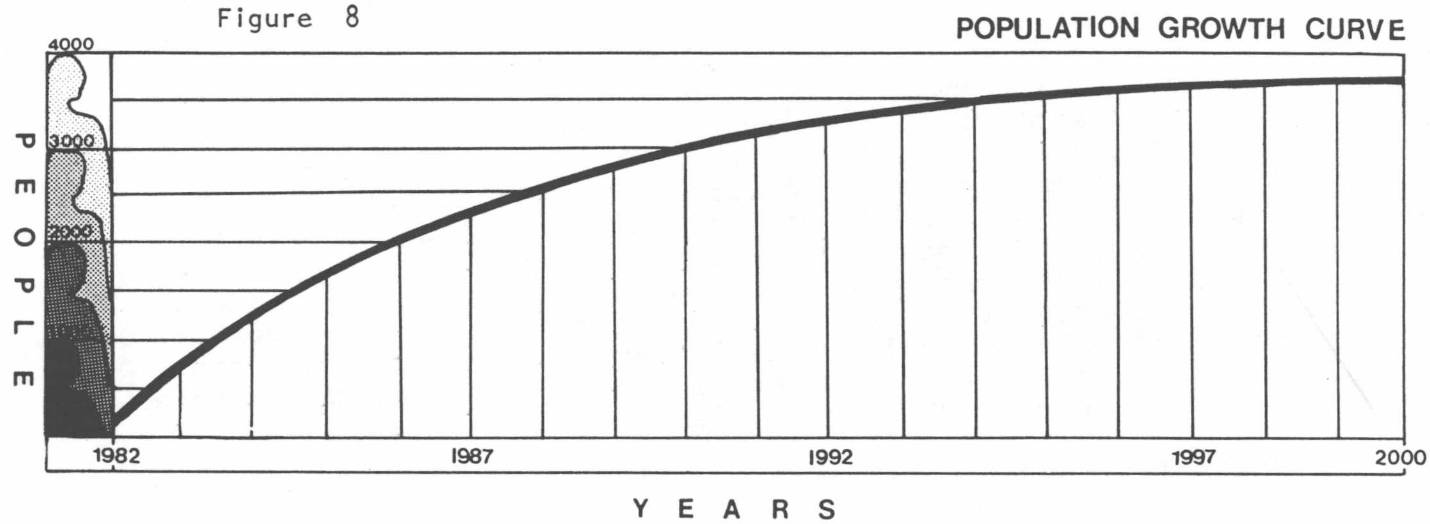
INTRODUCTION

The population projections for the City of Rajneeshpuram to the year 2000 are based upon the following factors:

- There is currently a large demand to live at Rajneeshpuram because of the dual attractions of a common belief system and the high level of interest in the communal approach to economic development.
- The community is sensitive to the potential impact of urbanization on rural areas. Therefore, it will not exceed the carrying capacity of the natural resources.
- Citizen participation is strong as to the type of city and types of services desired.
- The population is and will be of a size that will allow a diverse economy (including agricultural and other commercial enterprises) while continuing to provide the high level of support services basic to a communal life style.
- Financial and human resources are available for the development of the City and provision of income-producing jobs.
- Natural growth can be expected in the community through births, deaths, in-migration and out-migration.

Presently, more people want to live in the community than can be accommodated. This assures an adequate population base to carry out any planned activities. However, population growth will be determined largely by the desire to minimize urban impacts in the rural area and by financial conditions such as the availability of jobs and the ability to finance adequate City facilities. While the City can minimize urban impacts through its planning, it does not have control over the level of financial investment. The investment plans for the Rajneesh Investment Corporation (RIC) and the Rajneesh Neo-Sannyas International Commune (RNSIC) and the timing of these investments will have a major effect on the projected total population as well as on the rate of population growth. By the end of the first five years, RIC and RNSIC plan to generate adequate financing to accommodate a City of approximately 2367 people. After the first five years the rate of investment and construction is expected to decline and it is assumed that by the year 2002 the population will reach 3,713 through normal growth of existing businesses, births, deaths, in-migration and out-migration. The rapid increase in population in the first five years is considered realistic because of the demonstrated ability of the Commune to create an infrastructure rapidly and because of the availability of both capital and people willing to move here to participate in the growth and development of the economic base. The slowdown in growth after the initial period is equally realistic because most of the major capital investments will have been made in that first period; later growth will be dependent on internally generated income. Furthermore, residents employed in the creation of facilities and infrastructures will be retrained to assume some of the employment openings created by their construction efforts. (See Population Growth Curve below.)

Figure 8



METHODOLOGY

In order to determine the future population of Rajneeshpuram, a study was undertaken by Dr. Anthony Rufolo, an economist at Portland State University. Dr. Rufolo studied the economic base model that was used to determine the total work force. Based upon the work force, the Center for Population Research and Census of Portland State University used the Cohort-Component model to project the population of Rajneeshpuram. The Cohort-Component model is used to forecast the population by age and sex, taking into consideration births, deaths and migration patterns. Migration assumptions were generated from the economic development plans of RIC and RNSIC.

Migration is generally viewed as a response to changing economic conditions; that is, people tend to move to areas where they can obtain more desirable jobs and living conditions. Thus as more employment opportunities become available in the Rajneeshpuram area, more people will be attracted to the City. The economic base model was used to determine the probable total work force that would migrate to the City. The economic base model divides the economy into two sectors, the economic base and the support sector. The economic base includes all those workers involved in the production of goods and services that bring capital into the community. The support base is composed of all those workers required to maintain the income-generating residents.

For example, when a business in the City sells something outside the area, the sales create both jobs and income within the City. In turn, the business making the sale will require a variety of goods and services, some of which will be produced within the City. Thus, each job in an exporting industry will require some additional workers in the service sector of the economy to support them. In addition, the support workers also need another ring of support goods and services. The income-generating residents who work in the areas of agriculture, commerce, manufacturing or adult education are supported by workers in many fields, from laundries to medical centers. Doctors and lawyers also must have their homes cleaned, their children educated and their meals provided. And of course, these cleaners, teachers and kitchen workers need not only medical and legal care, but transport, entertainment and postal services. In turn, each worker generates support workers. This is an ever-widening circle.

The relationship between the total employment in an area and export-related employment is frequently referred to as the multiplier. In standard market arrangements, once the number of workers in exporting industries has been identified, it is possible to determine how many people will be in the service sector.

A 1.7 multiplier, which the City is using for the first five years, means that for every worker in the exporting base sector of the economy there would be 0.7 workers in the service sector. Two factors have been identified as generally relevant in determining the size of the multiplier, and one additional factor appears to be relevant for Rajneeshpuram. First, the larger the area under study, the larger the multiplier. For example, a multiplier commonly used for the State of Oregon is 3.0, whereas smaller communities would have a multiplier of 1.4 to 2.0. This is because the larger the region, the less likely it is that a person or firm will look outside the region for particular goods or services. The more isolated the region, the larger the multiplier. This is because it becomes very costly to import goods or services and there is a stronger incentive to provide them locally. The unique factor at Rajneeshpuram is that the residents have relatively less of their consumption in the form of goods and more in the form of services than is generally true in the U.S. For example, every member of the Commune has his food cooked, his laundry washed, his house cleaned and his clothes mended. Since these services are provided locally, this would tend to raise the multiplier. These services in other communities are usually provided within the household, whereas in Rajneeshpuram, there are people in the work force carrying out these activities, thus raising the number of service workers and thereby the multiplier for Rajneeshpuram relative to other communities of its size.

In determining how many people would be in the total work force of Rajneeshpuram, the number of jobs in the exporting income-producing activities were identified based upon the exporting plans of RIC and the Commune.

BASE EXPORTING SECTOR LABOR BREAKDOWN

Year	1983	1984	1985	1986	1987	1992	1997	2002
Agriculture	90	149	180	200	240	250	285	340
Construction	240	300	325	352	325	320	220	210
Local Commercial Center	20	24	28	33	40	65	80	130
Wholesale/Retail	8	13	15	19	29	41	65	100
Management Services	6	10	19	25	35	50	66	80
Tourism	32	72	127	200	260	295	375	400
Education	30	44	65	96	105	185	225	256
Publication	18	28	30	45	54	60	70	80
TOTAL	443	640	789	970	1088	1176	1386	1596

To determine the number of service workers, a multiple of 1.7 was used. This multiplier was chosen for reasons previously stated, and is based upon recommendedations contained in Anthony Rufolo's "Estimate of an Export Base Multiplier for the City of Rajneeshpuram."

In the sixth year of development the multiplier will be raised to 2.0. For every base worker there will be one support worker. The proportion of base workers to service workers is higher in the first five years because the construction workers who are building the infrastructure are included in the economic base even though they are not involved in income-producing activities. Within a moderately growing or stable community, it is reasonable to treat the ongoing construction in the area as part of the service employment. But in the initial rapid growth of Rajneeshpuram, the level of construction is beyond what will be sustainable as service to the community. In this case, the construction work acts essentially as additional basic employment. The product is not sold directly outside the region, but most of the financing comes from external sources. Further, the product is not used for direct consumption by the City's residents. Rather, it is an investment that produces services over a long period of time. Therefore, after five years the number of construction workers would be reduced, thereby increasing the proportion of service workers to base workers. In addition to the jobs created by the base exporting sector within the City itself, jobs will also be created within the state, especially in terms of materials and services imported into the City. A multiplier generally used for the state is 3.0. By using a multiplier of 1.7 to determine the service jobs created within the City, this would leave a 1.3 multiplier for service jobs created within the state. This means that for every ten export jobs in Rajneeshpuram, 13 additional jobs would be generated in the state. Based upon the projected number of jobs in the base export sector in five years, there would be 1,414 jobs created within the state.

Once the number of people involved in the work force had been determined, the next step was to forecast the population in terms of age and sex. Since the City is new with only a small population, assumptions had to be made about the age and sex of future migrants. The major stream of migrants who have been moving into Washington County also are young adults. This is similar to the current population of Rajneeshpuram; many members of the religion of Rajneeshism also are young adults. The major modification made to the Washington County pattern included a lowering of the proportion of migrants in the ages 0 - 17. This was done to compensate for the lower-than-average birth rate among Rajneeshees. Two factors that attribute to the lower-than-average birth rate are that Rajneeshee women are effective contraceptors and that 50% of the females are in their 30s. In the State of Oregon, 15% of the female population are in their 30s. When using an employment-driven Cohort-Component model, some provision must be made to determine what size labor force a "survived" population can supply. This is usually done by multiplying the survived population by the labor force participation rates.

In these projections, labor force participation rates were assumed to be 1.0 for all ages between 18 and 64 years. For those over 65 years, labor force participation rates were reduced to 0.5. The rationale for the above assumptions is that in a working commune, all adult members contribute. One aspect unique to the population of Rancho Rajneesh is that there is no unemployment. The lowering of the participation rate after ate 64 reflects both anticipated increased non-work activities by the elderly and a lowering of productivity due to advanced age.

Since not all of the migrants are eligible for labor force participation (i.e. the very young and the very old), total migration generally exceeds labor force migration in magnitude. In order to determine the percentage of eligible migrant workers, assumed age and sex patterns of migrant populations were applied to the total migrant population and the eligible migrant labor force was determined. That multiplier is 1.32. The following tables are included to illustrate the data presented in this section. Table 1 covers Age-Specific Fertility Rates; Table 2 projects Employment by Base/Non-Base Sector; Table 3 shows the non-working population for Rajneeshpuram; Table 4 shows age distribution by sex for the next 20 years in five-year increments. These tables are included in the report "Population Projections for the City of Rajneeshpuram, Oregon, 1982 - 2002," prepared by the Center for Population Research and Census, Portland State University, August 1982.

Table 1. Age-Specific Fertility Rates Used in the Population Projection of Rajneeshpuram, Oregon: 1982 to 2002

	1982-1987	1987-1992	1992-1997	1997-2002
Age	Rate			
15-19	.038	.051	.051	.051
20-24	.093	.124	.137	.137
25-29	.086	.114	.140	.140
30-34	.043	.057	.070	.070
35-44	.008	.011	.011	.011

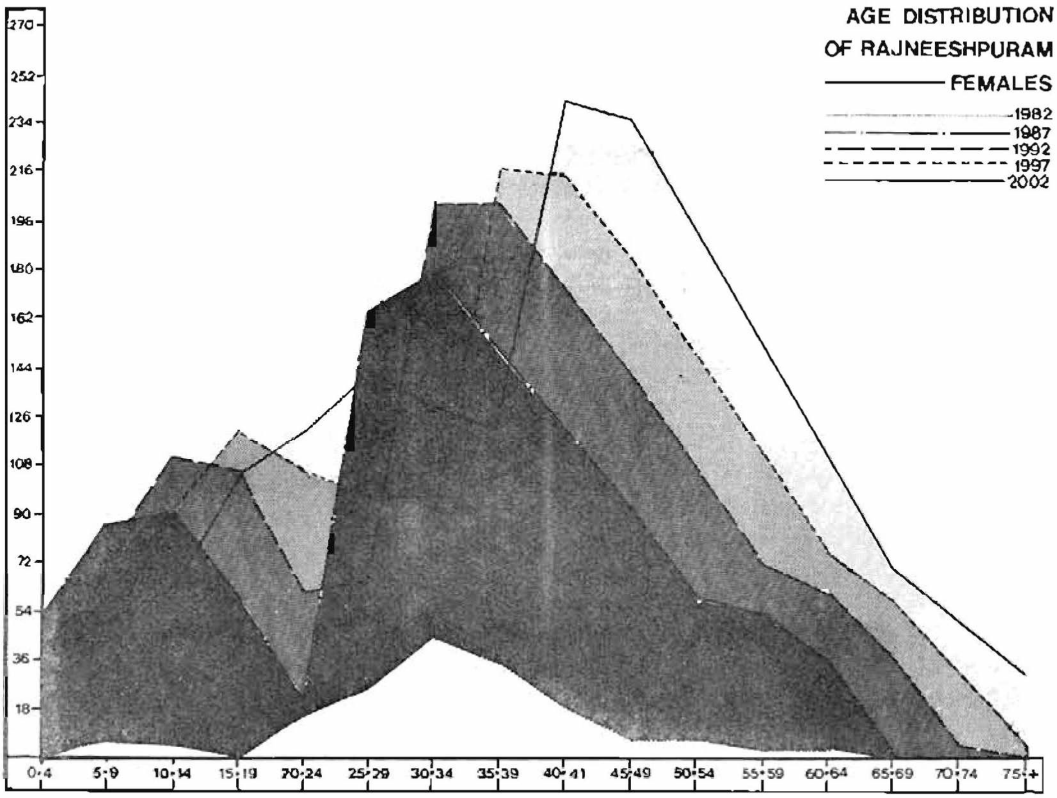
Table 2. Projected Employment by Base/Nonbase Sector for Rajneeshpuram, Oregon: 1987 to 2002

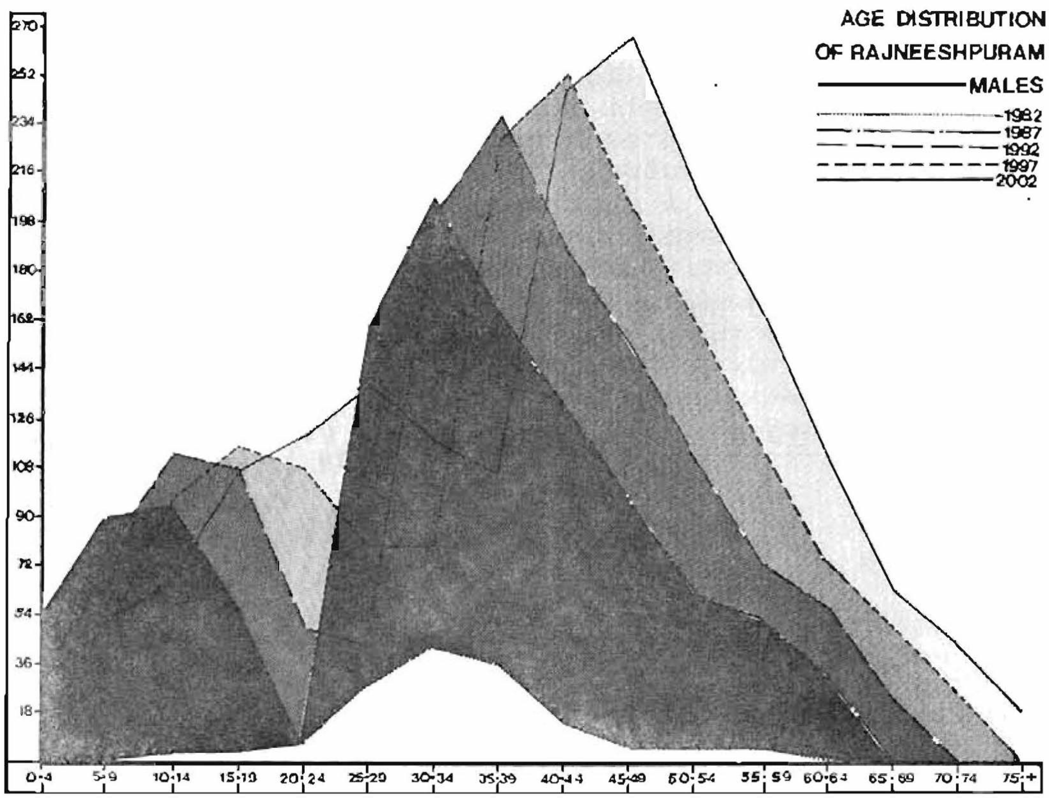
Sector	1987	1992	1997	2002
Export base	1088	1176	1386	1596
Nonbase	762	1176	1386	1596
Total	1850	2352	2772	3192

Table 3. Projected Non-Working Population for Rajneeshpuram, Oregon: 1987-2002

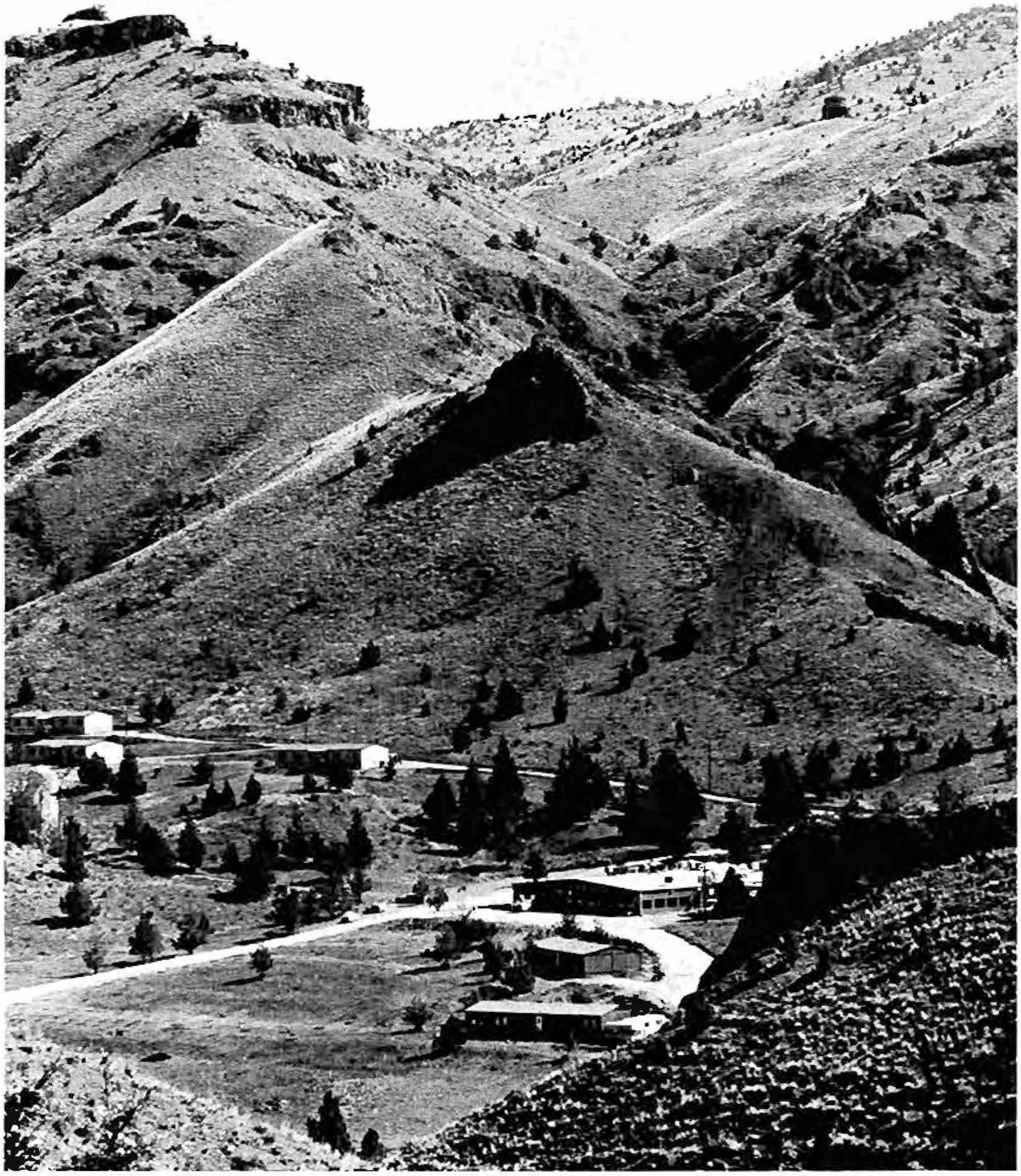
Age	1987	1992	1997	2002
0-19	510	512	433	379
65 and over	0	34	84	139
Total	510	546	517	518

Table 4. Projected Age Distribution of Rajneeshpuram, Oregon: 1982-2002





POPULATION CHANGES	1982 — 1987	1987 — 1992	1992 — 1997	1997 — 2002
TOTAL	2046	531	393	422
BIRTHS	16	31	42	50
DEATHS	0	22	52	81
MIGRANTS	2030	522	403	453



LAND USE REQUIREMENTS

residential
commercial
industrial
community services
recreation
open space

172.2

IV. LAND USE REQUIREMENTS

INTRODUCTION

This section summarizes and discusses the present uses of the land within Rajneeshpuram. In the discussion, issues are raised regarding the future quality, quantity and spatial requirements of these uses.

At the present time little land within the City is being used for purposes characteristic of most developed urban areas - parks, commercial, industrial or community facilities and services, for example. The planning for such uses in an established city can be linked to projections based on existing population and economic base activities, suitability of land, the community social structure and comparisons with other Oregon cities.

Because Rajneeshpuram is a new city there are conditions with direct implications on land use projections and allocations that must be recognized:

- since most of the land in the City is undeveloped, no measurable trend or history of development can be identified from which to base projections;

- the cooperative lifestyle adopted by most of the City's residents has no relevant precedent in new town planning, so again no historic base line can be derived from earlier new town planning experience in the United States or elsewhere;

- the natural environment and the residents' expressed desire for an ecologically balanced community has dictated a pattern of development that in itself is unique;

- the development will occur as an intentional, planned community because of single ownership and common goals.

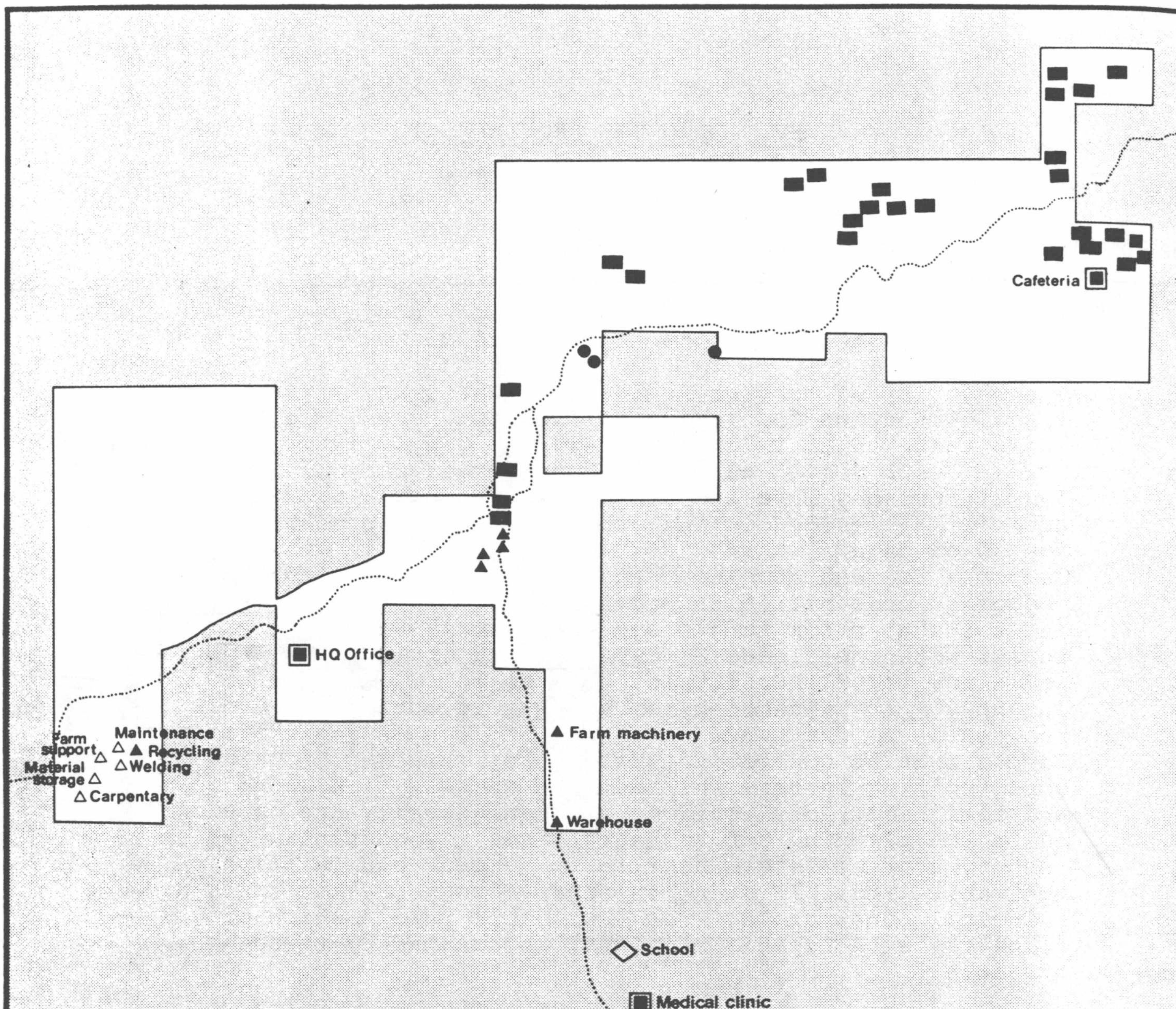
IV. LAND USE REQUIREMENTS

1. RESIDENTIAL

The purpose of this part of the Comprehensive Plan is to determine the amount of land required to meet the housing needs of the approximately 3,700 persons projected to be living in Rajneeshpuram to the year 2002.

The majority of current residential units in Rajneeshpuram are 1,848-square-foot 28' x 66' modular homes. There are 32 of these units in place within the City. Twenty-seven are in Jesus Grove and five in Desiderata Canyon. Generally, six persons live in each unit. See next page for a map. of existing residences and other buildings in Jesus Grove. Map 30 on page 177 shows the five residences in Desiderata Canyon. To meet housing needs, the statewide planning goals encourage communities to provide "adequate numbers of housing units at price ranges and rent levels which are commensurate with the financial capabilities of Oregon households and allow for flexibility of housing location, type and density." In Rajneeshpuram, housing is furnished to most residents, so for these persons price ranges and rental levels must be considered affordable. However, housing opportunities in terms of adequate numbers of housing units and flexibility of location, type and density are considered in the planning for Rajneeshpuram. In addressing these issues, a prime determinant is the amount and location of buildable land. In Rajneeshpuram, topography and soils are principal constraints. See "Buildable Lands", which clearly illustrates the spatial limitations created by these constraints.

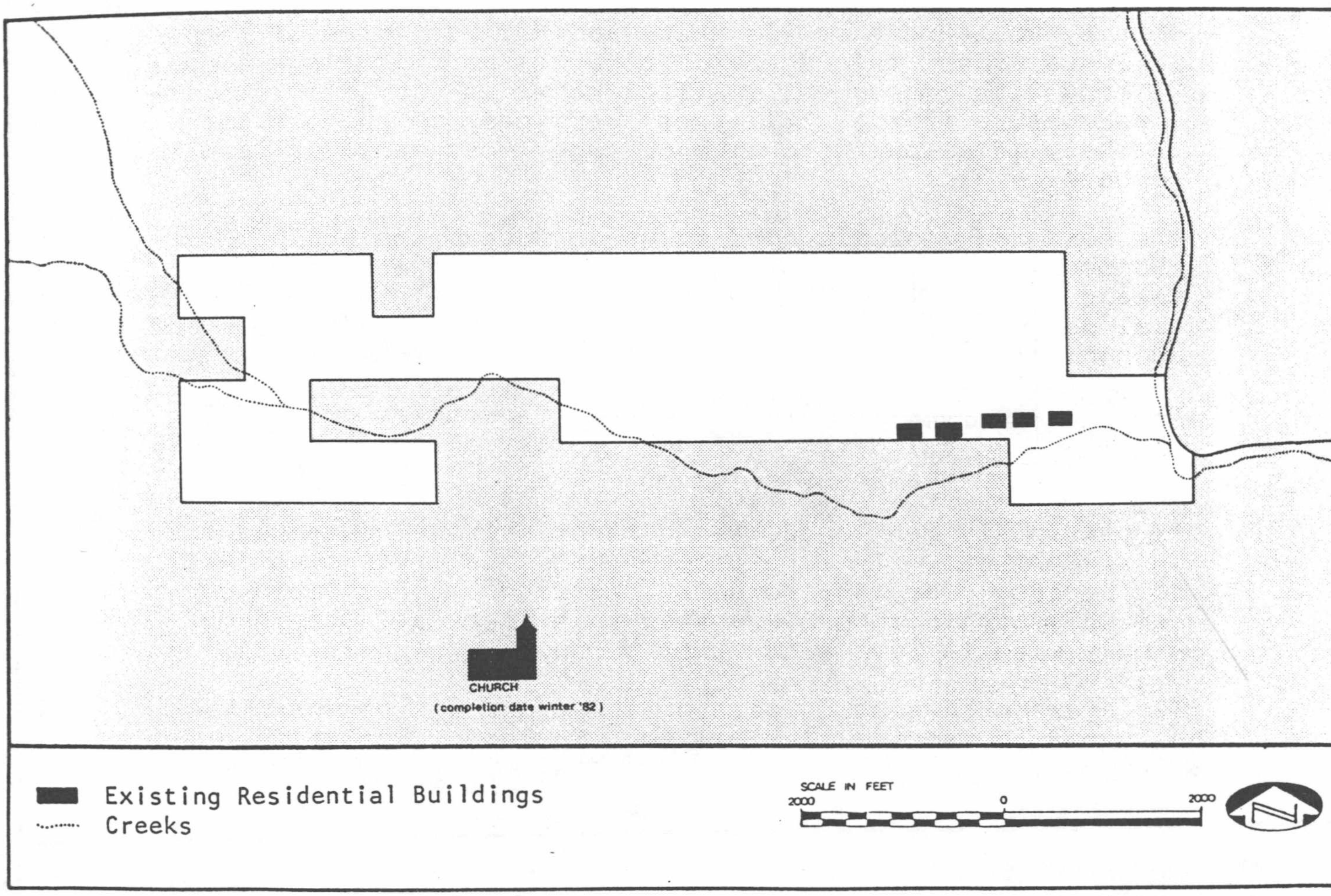
The citizens of Rajneeshpuram have chosen to create an ecologically balanced and energy-efficient community. In considering the location and siting of housing, solar access and orientation will add another constraint to the design solution. Solar water and space heating, whether the systems are active or passive, will aid in the national effort to reduce both dependence on foreign energy supplies and energy consumption and costs within the City. Further, the planning process, in addition to allocating sufficient land for residential uses, must consider the relationships with other uses competing for suitable well located sites. Only in new town planning do the opportunities exist actually to implement these relationships in a logical and balanced manner.



- Residential (Existing)
- Greenhouse
- Community Support (Existing)
- Community Support (Permitted and Planned for Summer 1982)
- Shops and Storage (Existing)
- Shops and Storage (Permitted and Planned for Summer 1982)
- Creeks

DESIDERATA CANYON - Existing and Permitted Buildings

Map 30



The first determination of future residential land uses was made by projecting the existing development density. The 32 modular housing units presently located in the City are occupied by 186 persons. These units are on individual sewage systems with a net density of approximately one acre per unit. To house a population of 3,713 at this occupancy and density would require 633 units and 633 net acres of land. In Jesus Grove, this scenario consumes an inordinate amount of land with consequent inefficiencies in providing the infrastructure (roads, utilities, services) to support it. Further, it allows no choice of type (occupancy) or density of housing.

The soil and geologic conditions in Gautam the Buddha Grove and Desiderata Canyon make the installation of individual sewage systems virtually impossible, so the present residential development scenario was rejected on environmental and economic grounds.

The next determination assumed that the number of persons per dwelling unit will decline, thereby allowing more flexibility of housing types.

As previously mentioned, the current average household size is six persons. It is expected that this arrangement will not be ideal for many persons. Married couples could conceivably want more privacy than this affords. Others may simply wish to live with fewer persons or with friends.

Two average household sizes,of three and six persons, were selected to provide flexibility. Three development densities were selected: low (three units per acre); medium (five units per acre); and high (10 units per acre).

When the two average household sizes were combined with the three densities, five development options were made available that can be translated into a variety of housing types: single family detached, single family attached, garden apartments and a range of clustered housing limited only by the abilities of the designers and the site conditions.

These five options were allocated to each Planning Area, using as criteria the amount and characteristics of the buildable land, suitability for servicing sites and population distribution.

The results of the above assumptions are shown on the table entitled "Residential Land Requirements" on the following page.

RESIDENTIAL LAND USE REQUIREMENTS

PLANNING AREA	POPULATION DISTRIBUTION	÷ PERSONS PER UNIT	= DWELLING UNITS	÷ UNITS/ ACRE	= NET ACRES	X CONVERSION FACTOR*	+ GROSS ACRES
GAUTAM THE BUDDHA GROVE							
RESIDENTIAL AREAS	400	3	133	3	45	1.4	63
	300	6	55	3	19	1.4	27
	400	3	133	5	27	1.4	38
	270	6	45	5	9	1.4	12
	390	2	195	10	20	1.4	28
	1790		561		120		168
AREAS OTHER THAN RESIDENTIAL	300	3	100	(10)	(10)	(1.4)	(14)
DESIDERATA CANYON							
RESIDENTIAL AREAS	250	3	83	3	28	2.5	70
	170	6	28	3	10	2.5	25
	120	3	40	5	8	2.5	20
	80	6	13	5	3	2.5	8
	620		164	5	49		123
AREAS OTHER THAN RESIDENTIAL	60	3	20	(10)	(2)	2.5	(5)
EXISTING	30	6	5	1	5	1.0	5
JESUS GROVE							
RESIDENTIAL AREAS	300	3	100	3	33	2.0	66
	180	6	30	3	10	2.0	20
	150	3	50	5	10	2.0	20
	114	6	19	5	4	2.0	8
	744		199		57		114
EXISTING	156	5.8	27	1	27	1.0	27
TOTALS	3700		1076		258		437

* see Buildable Lands
() not included in totals for Residential Lands

From the preceding table, two additional statistics have been extracted for the purpose of comparing Rajneeshpuram with existing communities. The first is the number of developed residential acres per 100 persons and the second is the number of persons per acre of developed residential land. The comparison of these data for Rajneeshpuram with similar data from other Oregon cities of comparable population determined that the proposed amount of land and densities are generally consistent with those of existing developed cities. Residential uses of land in five comparably sized Oregon cities were obtained from comprehensive plans on file with the Land Conservation and Development Commission's office in Portland. Additional data on residential land uses was excerpted from a land use survey of 33 Oregon cities prepared by the University of Oregon's Bureau of Municipal Research and Service.

These comparisons are shown below.

RESIDENTIAL LAND USE IN SELECTED OREGON CITIES

CITY	SURVEY DATE	ACRES	ACRES PER 100 PERSONS	PERSONS PER ACRE
Independence	1979	237	5.5	18.2
Oakridge	1977	248	7.1	14.1
Sandy	1978	332	12.0	8.3
Stayton	1978	366	8.9	11.2
Tillamook	1980	213	5.5	18.2
33 Oregon cities	1961	-	4.9	20.4
Average of 5 cities		279	7.8	12.8
RAJNEESHPURAM	-	258	6.9	14.3

Source: Comprehensive Plans on file with LCDC, Portland, Oregon; University of Oregon, Bureau of Municipal Research and Service.

The Residential Land Use Requirements table on page 179 translates population and household size into 1,076 dwelling units on 258 acres of land for a net density of 4.17 units per acre. At present, all land within the city is in single ownership. Given this situation, division of land into conventional lots for siting of housing is not necessary. Rather, this affords the opportunity to site housing on the most favorable parts of the land because the arbitrary imposition of lot lines is not a determinant. The density of four units per acre does not mean that each unit will occupy 10,000 square feet of land. The density is an overall average for all residential land. For example, clustering might cause a five-acre site to have twenty units on one to two acres with the balance remaining open. Or, the same five-acre site might have fifty units on it but when included with all residential land and an average taken, the density would still be four units per net acre.

Housing opportunities in terms of availability and affordability are limited in Rajneeshpuram, where nearly every unit is occupied by people involved with the construction, management and operation of the City and the surrounding land of Rancho Rajneesh. The existing housing scarcity is viewed as temporary. As the infrastructure is put in place the economy will expand and the construction activity will stabilize, allowing increases in the housing stock and consequent housing opportunities to catch up with demand. The zoning ordinance contains provisions allowing mobile homes in residential districts, assuring this choice of housing a place within the community. If demand indicates that a market is available, one or more mobile home parks may be established within the City consistent with applicable state regulations and local procedures.

IV. LAND USE REQUIREMENTS

2. COMMERCIAL

A viable community contains a spectrum of land uses. Commercial uses are considered among the most important land uses in the community for several reasons: they provide employment, they increase the tax base favorably compared to the cost of the services they require, they provide visual character to the city through design and density as well as a hub of activity from which other uses radiate out or relate, and they provide goods and services in locations convenient to the population. At present there are no commercial activities in the City. The nearest facilities are in Antelope, 18 miles away, and in Madras, 53 miles from Rajneeshpuram.

Historically, poorly designed and located commercial activities become visual, environmental, security and safety problems for a city. Conflicts with surrounding uses, congestion on abutting roads, vehicular safety hazards due to improper siting and inadequate off-street parking, loading and unloading areas and the non-separation of ingress and egress often have created problems that required long-term and expensive solutions. A new town creates an opportunity to address these known problems in an enlightened fashion. Through good development standards and land use planning these problems are anticipated and addressed at the outset when changes are easily accommodated.

At present, while conflicts exist only as potentialities, it is possible to provide for the orderly development and integration of a range of commercial activities with the growth of the City. The range of options in size, location, relationships to other uses, the environment and the economic diversity and activities of the City must be considered. The amount and location of land for commercial uses will accommodate present and future needs for a variety of commercial enterprises consistent with population growth, goals of the community and the economic character of each planning area. The majority of commercial activities will be grouped in one location to provide ease and convenience of access for visitors, guests and the residents of the City. This clustering or grouping will provide a sense of spatial identity, establish architectonic quality and create a feeling of a town center for the city.

The primary site of commercial activity will provide services and facilities such as hotel and motel accommodations, automobile service stations, a reception area, eating and drinking establishments, and personal services such as barber and beauty shops, travel agencies, shoe repair, laundry and drycleaning. Also to be provided will be clothing, stationery, book, music, liquor, wine and tobacco shops. Various food stores and amusement and entertainment facilities will be required to provide for those needs locally and to create the desired feeling of being at the community's center of activities.

Other commercial areas providing limited or specialized shopping will be located to respond to the unique economic functions of the three planning areas comprising the City, and will be interspersed with other activities for convenience and consequent energy conservation. These areas will have outlets for the goods they produce, such as arts and crafts shops, art galleries, book stores, ice cream parlors, vegetable stands, cheese and wine shops and convenience store shopping.

The final form these commercial areas take will embrace site development criteria that minimize alterations to the natural terrain and impact on vegetation and wildlife, avoid unnecessary encroachment on views, and make the best possible use of topographic and climatic conditions.

Commercial land use needs have been determined by examining the proposed economic activities and functions of the city. To assist in the translation of these needs into land use requirements, a study of land use activities in five Oregon cities in the same population range as Rajneeshpuram was undertaken. Additionally, data from a similar study of 33 Oregon cities was incorporated to broaden the statistical base. The results are shown in the table on the next page entitled "Commercial Land Use in Selected Oregon Cities."

The percent of developed commercial land in the five cities was obtained from surveys conducted within the past five years and ranged from 5.9% to 12.8%, while acres-per-100 population were between 1.1 and 2.9. For the 33 Oregon cities surveyed in 1961, the percent of developed land was 4.1% and there were .57 acres per 100 population. These low figures probably represent a time when strip commercial development, franchise operations, shopping centers and the impact of suburbanization had barely begun their inroads into the cityscape. This assumption is supported when two other broadbase land use studies are examined. The first is the singular study, "Land Uses in American

COMMERCIAL LAND USE IN SELECTED OREGON CITIES

CITY	SURVEY DATE	ACRES	PERCENT OF DEVELOPED LAND	ACRES PER 100 POPULATION
Independence	1979	49	7.8	1.1
Oakridge	1977	61	11.7	1.7
Sandy	1978	81	12.8	2.9
Stayton	1978	55	5.9	1.3
Tillamook	1980	59	9.8	1.5
33 Oregon cities	1961		5.1	.57
Average of 5 cities		61		1.7
RAJNEESHPURAM		88		2.0

Source: Comprehensive Plans on file with LCDC, Portland, Oregon, and the University of Oregon, Bureau of Municipal Research and Service.

Cities," by Harland Bartholomew. In this study published in 1955, 53 "Central Cities," ranging in population from 1,740 to 821,960, were surveyed. The results showed that 3.32% of the developed land was in commercial uses. This represented .23 acres per 100 persons. A study by the National Commission on Urban Problems, published in 1968, contained land use data obtained in the mid-60s. These data showed that commercial land use in 102 cities of 100,000-plus population was then 4.1% of the land area and .54 acres per 100 population. The later study more nearly approximates the 1961 Oregon study (4.1% and .57 acres per 100 population) and illustrates the increase between the mid-50s and mid-60s in developed land devoted to commercial uses.

Now, nearly 20 years later, commercial land use as a percentage of all land uses has in some examples tripled. This phenomenon represents the increased affluence of the general population and the introduction of new products and services to satisfy demands that did not exist 20 years ago. Since Rajneeshpuram will not have any shopping centers or strip commercial development, and because of its distance to any other commercial development (Madras, 53 miles; The Dalles, 83 miles), a balance between the immediate post-World War II pattern of commercial development and the more contemporary automobile-oriented pattern was selected. Three additional factors were considered in determining the selected ratio: tourism, the educational aspects of the community's economy and the three distinct geographic areas of the City. The commercial facilities will be used by the visiting population as well as the permanent residents. The estimated 200 daily visitors and the rotating population of 500 program participants would yield a total population for commercial activities of 4,400. Commercial land use will be developed at the rate of 2.0 acres per 100 population. This ratio converts to 88 net acres of land for commercial use in Rajneeshpuram.

3. INDUSTRIAL

The land uses in this category are primarily light industry, cottage industry, utilities and warehousing, with specially designated areas for sewage facilities. Acreage requirements developed in this section will provide space for development of uses that will allow for the broadening of the economic base of the community.

The economy of Rajneeshpuram is planned to be diversified and balanced. Agriculture is a cornerstone but alone it will not provide full employment on a year-round basis or a balanced economic base because of the limited amount of agricultural land. In recognition of this, the preceding chapter, Socio-Ecomonic Potential, has identified other resources for economic development. The highly educated, skilled and motivated residents of Rajneeshpuram are one of the city's important resources. The beginnings of light industrial operations already exist in Rajneeshpuram as support facilities for the farm operations. For example, there are mechanics' shops to repair all types of vehicles from automobiles to road graders; there are plumbing, heating, ventilating and air conditioning, carpentry, welding, painting, auto body, woodworking and electronic shops that could be expanded into industries producing export goods. Other specialist facilities such as a printing plant will offer employment as well. The farm operations offer a multitude of opportunities to market value-added processed products such as cheese, wine, dried fruits and vegetables. There is a high potential for year-round, labor-intensive employment in light manufacturing, fabricating and assembling operations. Detailed and specific market studies and product development programs will reveal opportunities for the creation of new industries, and the planning process must anticipate this and respond by providing areas in the City in which to locate them.

Contemporary land use planning practice suggests industrial parks for environmentally desirable and energy-efficient industries. According to an Urban Land Institute publication, the general requirements for industrial locations are:

- fast, easy and convenient access to good transportation facilities including rail, highway and air;

- reasonable location with respect to labor supply, raw materials sources and markets;

- an adequate amount of suitable land free from foundation and drainage problems with a sufficient reserve for future growth;

- an adequate and reliable supply of utilities: water, waste disposal, power and fuel;

- protection from the encroachment of residential or other land uses;

- location that minimizes obnoxious external effects on neighboring non-industrial land uses.

These requirements have been considered when siting the industrial areas at Rajneeshpuram. Land must be provided for vehicle and machinery repair shops, parts storage and parking. The warehouse and workshop areas in Jesus Grove are existing uses that could be expanded and considered a workshop area based on their present use. A 15.4-acre sewage treatment facility site is capable of further expansion in its isolated location. However, because of its single-purpose use, it is excluded from consideration as industrially developable land. There is a farm maintenance and storage area presently being developed in Jesus Grove that includes a gas station, a recycling center, a welding shop, a carpentry shop and an open storage building, all of which have permits or zoning approval. A storage building has been proposed for the same area. This area is delineated by present permitted construction and totals about 14 acres.

On a smaller scale, cottage industries are those arts and crafts created and produced for use by residents of the city and for sale in small shops, work places and studios. Some examples are woodcarving, furniture making, weaving, clothing, pottery, drawing and painting, jewelry, sculpture, photography and stained glass. Although furniture making is the only existing craft and its entire production is for use within the City, the skills and talents of the residents of Rajneeshpuram offer a unique opportunity to develop an artisan and craftspersons "community within a community" where the highest level of creativity can be achieved.

A study of land uses in other Oregon cities (see table on page 190) shows that the percentage of developed land in industrial areas ranges from less than 3% to more than 14% and acres-per-100 population is between .4 and 2.0 acres.

The 1961 study of land use in 33 Oregon cities indicated that an average of 11.4% of the developed land and 1.6 acres-per-100 population in these cities was used for industrial purposes. Based on the four criteria enumerated in the introduction to this chapter, the economic diversification objectives of the City and the above information, 1.9 acres per 100 population or 70 net buildable acres of the developed land will be required for Industrial Use classification purposes based on an estimated population of 3,700 residents by the year 2002.

The ratio selected is on the higher end of the scale of the cities studied. This is justified because existing farm-related uses and utilities are included in this category even though they do not contribute directly to the broadening of the City's economic base. Also, the City is isolated by almost 100 miles from the nearest industrial areas of any size. Therefore it will have to rely on itself to provide these services, since it doesn't have the convenient option of going to a nearby industrial center.

In addition to the 70 acres of net buildable land required for industrial type uses, as determined above, the 15.4 gross acre sewage treatment site must be added to the industrial land required. Because of the relative distribution of land suitable for industrial uses and the location of need (i.e., farm vehicle repair facilities should be located at Jesus Grove), it was assumed that 60% of such land will be located in Gautam the Buddha Grove and that 40% will be distributed between Desiderata Canyon and Jesus Grove. Therefore, the calculations of gross acres are arrived at using the conversion factors from buildable lands:

70 acres x 60% x 1.4 = 58.8 gross acres in Gautam the Buddha Grove

70 acres x 40% x 2.0 = 56.0 gross acres in Jesus Grove and Desiderata Canyon

Plus 15.4 acres for sewage facility = 130 total gross industrial acres in the City.

The following table, "Industrial Land Use in Selected Oregon Cities", provides comparative data on industrial land uses in five Oregon cities within the same population range projected for Rajneeshpuram and similar data from 33 Oregon cities.

INDUSTRIAL LAND USE IN SELECTED OREGON CITIES

CITY	YEAR OF SURVEY	ACRES	PERCENT OF DEVELOPED LAND	ACRES PER 100 POPULATION
Independence	1979	88	14.1	2.0
Oakridge	1977	15	2.8	0.4
Sandy	1978	19	3.0	0.7
Stayton	1978	75	8.1	1.8
Tillamook	1980	64	10.6	1.6
33 Oregon cities	1961	-	11.4	1.6
RAJNEESHPURAM	-	70		1.9
Average of 5 sities		52		1.3

Source: Comprehensive Plans on file with LCDC, Portland, Oregon, and the Bureau of Municipal Research and Service, University of Oregon, Planning Bulletin #2, January 1961.

IV. LAND USE REQUIREMENTS

4. COMMUNITY SERVICES

The land use classification Community Services includes facilities for education, health, municipal administration and culture. Two services unique to the social structure of the City, food and domestic, will also be discussed and their future land use requirements determined.

EDUCATION

The closest school district to Rajneeshpuram, the Antelope School District, educates children through the sixth grade. Students above that level are sent to Madras on a tuition basis. The superintendent of the Wasco Education Service District concluded in a letter to the Wasco County Planning Commission dated February 26, 1982 "...the needs of the students, parents and citizens of the Rajneeshpuram ranch would best be served by a private school located in their own community as opposed to the possibility of either an existing private or a public school."

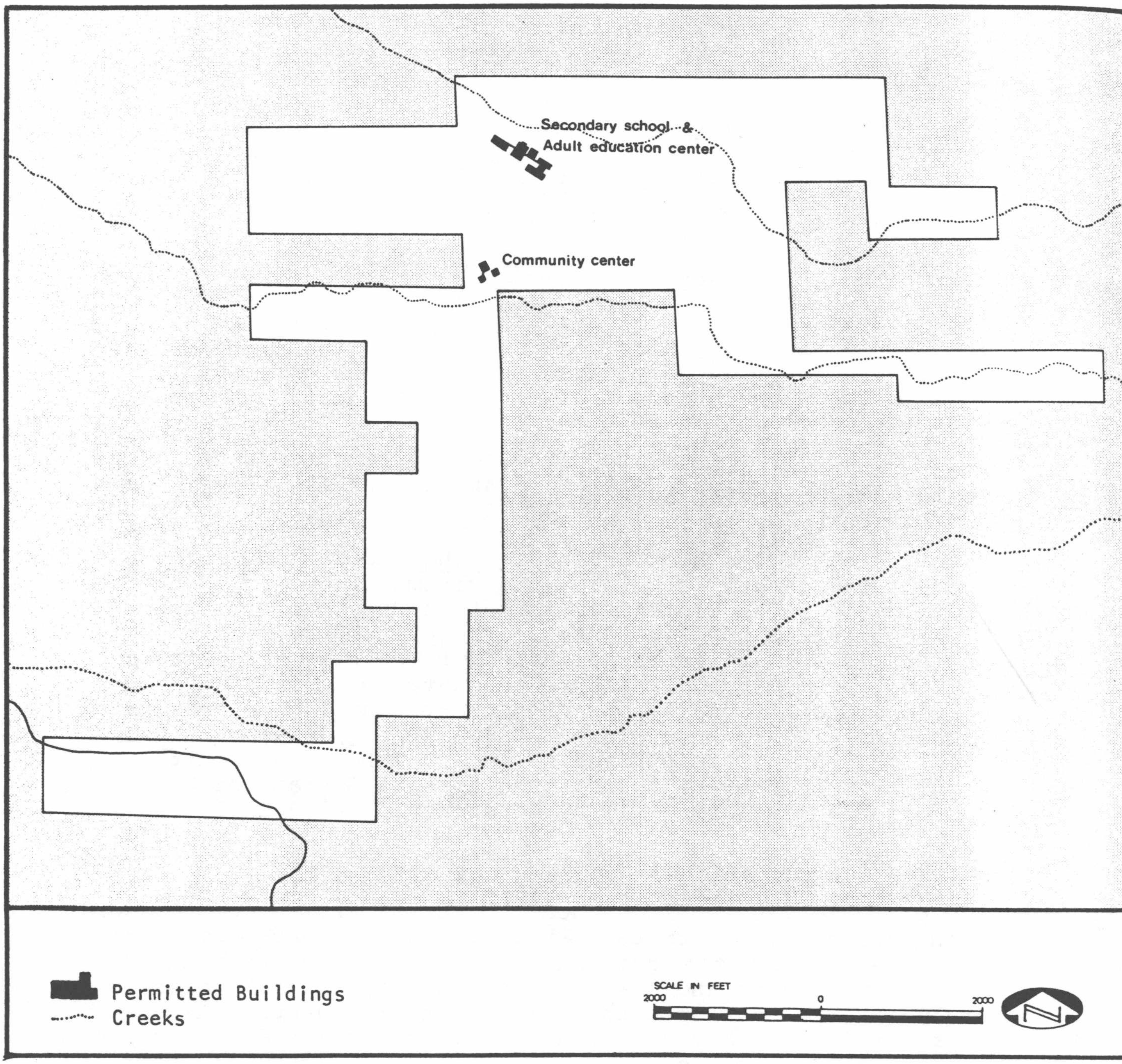
The residents of the City addressed this issue when they sought and received approval for an elementary school to be located in Jefferson County just south of the City limits near Jesus Grove. This 8,000-square-foot school will be designed to accommodate up to 100 students. Additionally, a zoning and building permit was granted by Wasco County on April 5, 1982 for a 28,600-square-foot secondary school and adult education center. This facility will be built on a 32-acre site in the Gautam the Buddha Grove planning area. See Map 31 on the following page.

At present, educational programs are offered for kindergarten through grade 12. In 1982, as many as 35 children were enrolled in the unlisted, independent school. Four certified teachers provided a favorable pupil-teacher ratio. Of these 35 students, 18 were children of residents living in the City, on other parts of Rancho Rajneesh or in Antelope. The remaining students were children of visitors or summer workers.

The Center for Population Research and Census at Portland State University prepared population projections for the City of Rajneeshpuram for the years 1982, 1987, 1992, 1997 and 2002. The table on page 193 compiles these data for the school age population.

GAUTAM THE BUDDHA GROVE - Permitted Buildings

Map 31



CITY OF RAJNEESHPURAM

SCHOOL AGE POPULATION 1982-2002

YEAR	AGE	TOTAL
1982	5-19	18
1987	"	476
1992	"	583
1997	"	518
2002	"	437

Source: The Center for Population Research and Census, Portland State University, 1982.

Referring to the book Urban Planning and Design Criteria by De Chiara and Koppelman, the minimum recommended number of pupils in an elementary school is 250 with a minimum site of seven to eight acres. The planned elementary school referred to earlier is adequate for the next three to five years. The City will assure adequate space in Gautam the Buddha Grove for a second elementary school on approximately 4 acres of land when demand projections indicate the need is imminent. The approved secondary school and adult education center being designed for the Gautam the Buddha Grove planning area will be constructed in 1982/83.

The adult education program will offer courses in religious studies, philosophy, interpersonal communication, self-exploration, psychology, health, verbal skills, biological and ecological sciences, mathematics, business, computer skills, mechanical drawing, physical education including dance, and arts and crafts. The facility will be open to all interested people as well as City residents. As the original secondary school and adult education center expand to include more programs, an estimated 15 acres of additional land will be required.

Also, it is projected that there will be an average of 500 persons in addition to the regular students participating in the variety of adult educational programs mentioned. These participants will be attracted by the unique scope of programs, which may be scheduled for a period of from a few days to a month or more. These participants will require short-term housing. The 500 participants will require 31 acres for housing at an estimated density of 16 persons per gross acre.

HEALTH

The City of Rajneeshpuram is served by an emergency medical facility capable of managing and stabilizing acute trauma cases. It is staffed by a licensed nurse practitioner under set protocol with two Oregon licensed physicians. There are five licensed nurses serving the clinic part time and two laboratory technologists full time. The facility is housed in a 24' x 66' structure in Jefferson County about ½ mile south of Jesus Grove. It contains an emergency room, two examining rooms and a recovery room in addition to administration and reception areas. Recent additions include an X-ray facility, a small laboratory and a mini-dispensary. The clinic is served by two well equipped emergency vehicles (ambulances) operated by the Rajneeshpuram Rural Fire Protection District. The first priority for health care is to ensure that adequate, well equipped and staffed medical facilities are easily accessible to the residents of the City. Next, a continuing program of education aimed at preventing any deterioration of health will be a cost-effective supplement to the health maintenance system in the City.

The present clinic is limited by size, staff, facilities, equipment and location and cannot fully serve the projected population. This health system, while adequate for the emergency needs of the current population, faces several problems. To illustrate this, the Emergency Medical Services section of the Comprehensive Plan for the Southern Planning Unit of Wasco County states: "The emergency services are inadequate. Four ambulances cannot possibly cover the 2,400 square miles of Wasco County." The Comprehensive Plan for Jefferson County does not address emergency medical services. It is 53 miles from Rajneeshpuram to a 40-bed hospital (non-JCAH approved) in Madras; 83 miles to The Dalles General Hospital, with 120 beds, to the north; and 93 miles to St. Charles Hospital, to the south in Bend. For all of these trips, the first 15 miles is over a dirt road; the next 12 to 19 miles is over a road - Tao Road (the former Muddy Road) - that in winter is often difficult and sometimes impassable for short periods. Air evacuation is a possibility, but even this poses problems. The two air ambulance services operating out of Portland would require an hour to get to Rajneeshpuram under the best conditions, and it would be a further 30 to 60 minutes before the patient could arrive at the treating facility. There are aircraft at Rajneeshpuram capable of transporting patients; however, they are not designed for medical care. It would be a difficult and painful choice in an emergency situation between waiting with a critically ill patient for an aircraft from Portland or gambling on flying out in an aircraft not optimally equipped for medical purposes.

Another set of problems not adequately addressed by the current system is the need for routine medical care by residents of Rajneeshpuram. A simple situation such as a suspected wrist fracture, while not an emergency, requires an uncomfortable 100-mile round trip for the patient, which is inefficient and unnecessarily painful. A much more critical situation such as a suspected neck fracture would render this trip potentially fatal.

The nearest communities with physicians and pharmacy facilities are Madras, The Dalles and Bend. For obvious reasons, the distances involved make using these facilities impractical. As the community grows and diversifies, acquiring residents of older and younger ages, the medical needs will expand from the current focus on emergency situations to a more comprehensive spectrum of community health services. As has been observed elsewhere in this Plan, Rajneeshpuram contains an unusually high proportion of highly qualified specialists. This is as true in the medical field as in other areas of expertise. Current residents of Rancho Rajneesh include three US-licensed physicians, two nurse practitioners, fifteen US-licensed registered nurses, seven emergency medical technicians and a wide variety of workers experienced in the ancillary medical fields such as laboratory technicians, radiologic technicians, psychiatric technicians and medical records specialists. The physicians tend to be from university backgrounds, have specialist qualifications, and are board-certified in their specialties. Some were members of medical school faculties. It is expected that the US-qualified medical workers residing at Rajneeshpuram will obtain the appropriate Oregon licenses.

The special problems of rural health care at Rajneeshpuram demand that flexibility be designed into plans for any medical facility. The medical problems facing the community may range from heavy machinery accidents to cold-weather injuries to pediatric infectious disease. The health care planning also must consider the usual diseases of populations. The total health care needs of the community can be met in the most cost-effective way through centralization of the health maintenance and delivery system. The establishment of a health care facility with a general medical and surgical bed count related to the number of residents in the City will be required. This facility should include an emergency room, an operating theater, an out-patient clinic, an intensive care unit, laboratories, examination rooms, an X-ray facility, a dental facility and a separate or attached family practice office center. An entire medical system will be provided for Rajneeshpuram.

It is estimated that approximately 20 acres will accommodate the facilities that have been described in this section.

CULTURAL

This element of Community Services addresses the land use requirements for the cultural facilities of Rajneeshpuram. These facilities are a community center, meditation facilities and a religious retreat center.

Zoning approval has been granted for the community center site in Gautam the Buddha Grove. This facility, which is presently being designed, will include a theater, a day-care center and exercise rooms in its first phase of development. Subsequent phases will include a cafeteria, music studios, a restaurant, a theater, a bar and disco, isolation tanks, a game room, a convenience store and an emergency medical clinic. The campus-style design of the first phase was selected after careful study of specific site conditions including solar orientation, view, slopes, natural vegetation, drainage, potential availability of utilities and the planned road network. Based on preliminary concept designs, the first phase of development will require a site of about 10 acres to accommodate the structures, parking, landscaping and site preparation. In subsequent development phases, the carrying out of the established design concept and site analysis will require an additional 15 acres.

During the First Annual World Celebration held at Rajneeshpuram in July 1982, group gatherings were held in the 2.02-acre solar greenhouse located in Jesus Grove. Jesus Grove was chosen because of the existence of an adequate infrastructure (water, sewer, roads, electricity, cafeteria) to support the festival activities. A building concept has been proposed for a meditation hall to accommodate future large gatherings. This facility will require a 15-acre site.

The third cultural facility to be discussed in this element is a religious retreat center in Desiderata Canyon. This facility will be used by guests and residents as a secluded, meditative retreat. There will be a main lodge with sleeping and meeting rooms and dining facilities. Cabins for participants in this program will be carefully interspersed throughout the site. The average density of development will be low (approximately one acre per unit) and in keeping with a quiet, secluded and scenically beautiful site of about 25 acres. A church of 18,000 square feet has also received zoning approval from Jefferson County for a site south of Desiderata Canyon. See Map 30 on page 177 for location.

FOOD

Reflecting the communal living pattern of many of the residents at Rajneeshpuram, food services now are centrally located in the 10,000-square-foot cafeteria/community building located in Jesus Grove. A recently completed addition added 4,000 square feet to the dining area. Six serving lines provide 1,000 vegetarian meals per day. Location of the cafeteria is shown on Map 29 on page 176. The well equipped, modern and sanitary kitchen contains the following equipment:

- 1 bakery oven (500 loaf/day capacity)
- 1 tractor trailer size walk-in cooler
- 2 tractor trailer size walk-in cooler/freezers
- 1 large grill
- 2 six-burner stoves over ovens
- 1 double convection oven
- 1 three-door pizza oven
- 1 ice machine
- 4 residence-sized refrigerators
- 1 coffee machine
- 1 four-tap beer dispenser
- 3 cheese slicers
- 2 dishwashers

With an expanding population base, the present facility will be outgrown in 1983. Its location would require ever increasing commuting times as the Desiderata Canyon and Gautam the Buddha Grove planning areas develop.

The social concepts favored by many of the residents of Rajneeshpuram suggest centralization of food services in locations convenient to population concentrations. Rajneeshpuram's corporate limits delineate three distinct planning areas. Efficient provision of food services suggests that dining facilities be located in each of these areas. By providing these facilities close to population and employment, transportation time and energy costs will be reduced. Air quality will be enhanced as the need for extensive travel over unpaved roads at meal times would be reduced, thereby decreasing particulate matter in the air. Based on the size of the present site (five acres) an additional 15 acres will be allocated to develop three more cafeterias that will be phased in as required. The total of 20 gross acres will be required for food service, support facilities, parking and site amenities. Site selection criteria will consider views, access and circulation, availability of utilities, topography, soils and drainage.

DOMESTIC

These services, which can be described as "all those things a housewife would do," provide a support service to most of the population of Rajneeshpuram. Responsibilities include food purchasing and preparation, cleaning of facilities (i.e. housing, offices), shopping, the laundering and repair of clothing and the purchase of furniture and kitchen equipment.

While domestic work is viewed traditionally as low-paid unskilled labor, at Rajneeshpuram that distinction does not exist. The domestic worker frees other workers from those tasks, saving them several hours per day that they can devote to equally productive, essential, albeit different work. For example, the domestic worker frees the engineer and the heavy equipment operator, and they in turn design and construct the roads used by the domestic workers. The domestic staff operates from decentralized supply and equipment storage areas throughout the community. No specific acreage requirement has been allocated to this service.

ADMINISTRATION

Municipalities require facilities and land to provide the services required by law or by the citizens of a community. These requirements as they relate to the administration of the City will be discussed here.

At the time of the writing of this Plan, Rajneeshpuram has just held municipal elections, so the formal establishment of municipal functions has just begun. The City Council has appointed a City Attorney, a City Recorder and a Community Development Director. These appointees report directly to the City Council. The Plan will allocate sufficient land for the construction of a municipal building to house these appointed officials, the Mayor and Council, a reception area, an information office, and the Council Chamber. The latter space could be a multi-purpose room suitable for other functions as well. General office space for the Community Development and engineering functions as well as record storage will add to the overall building size and consequently to the site requirements. It is estimated that a three-acre site will be sufficient for the first three to five years of the municipality's existence. Expansion after that time will be addressed in the Major Plan update.

The Rajneeshpuram Rural Fire Protection District will provide fire protection and prevention services, under agreement, to the City. Two centrally located three-acre sites for storage of fire fighting vehicles, administration and communications will be allocated in the Land Use Plan. These sites will have direct access to the arterial road network serving the community.

Land will be needed to construct facilities for the administration of Rancho Rajneesh farming, for industrial, business and educational programs, and for the staff of Rajneesh Neo-Sannyas International Commune. These functions will require an estimated 18 acres. The total Community Services land requirements, expressed in gross acres, are summarized in the table on the following page.

CITY OF RAJNEESHPURAM
COMMUNITY SERVICES LAND USE REQUIREMENTS

Education	
Secondary School	25 acres
Expansion of Educational Facilities	15
Elementary School (planned)*	
Elementary School (proposed)	4
Housing for Participants in Educational Programs	31
	82 acres
Health	20 acres
Cultural Facilities	
Community Center	10 acres
Expansion of Community Center	15
Meditation Hall	15
Religious Retreat Center	25
	65 acres
Food and Domestic Services	20 acres
Administration	
City Center	3 acres
Ranch and Commune Administration	18
Safety and Emergency Facilities	6
	27 acres
Total Land Requirements for Community Services expressed in gross acres	214 acres

*This site is not within the City limits

IV. LAND USE REQUIREMENTS

5. RECREATION

Prior to the development of the Comprehensive Plan, no land within the City had been designated specifically for park or recreation uses. Informal games of soccer and touch football are played in the parking lot at the cafeteria, and dances are often held in the cafeteria. Swimming, horseback riding, bicycling and hiking are available but these activities take place mostly outside the City limits. The first organized attempt to learn the recreational needs of the residents occurred in June 1972, when the Interim Committee for Citizen Involvement (ICCI) asked the residents of Rajneeshpuram and those living outside the City and in Antelope to respond to a questionnaire designed to determine their recreational preferences. Sixty-six percent of those surveyed, or 160 persons, responded. A copy of the questionnaire with the tabulation of results appears in the appendix to Volume 1.

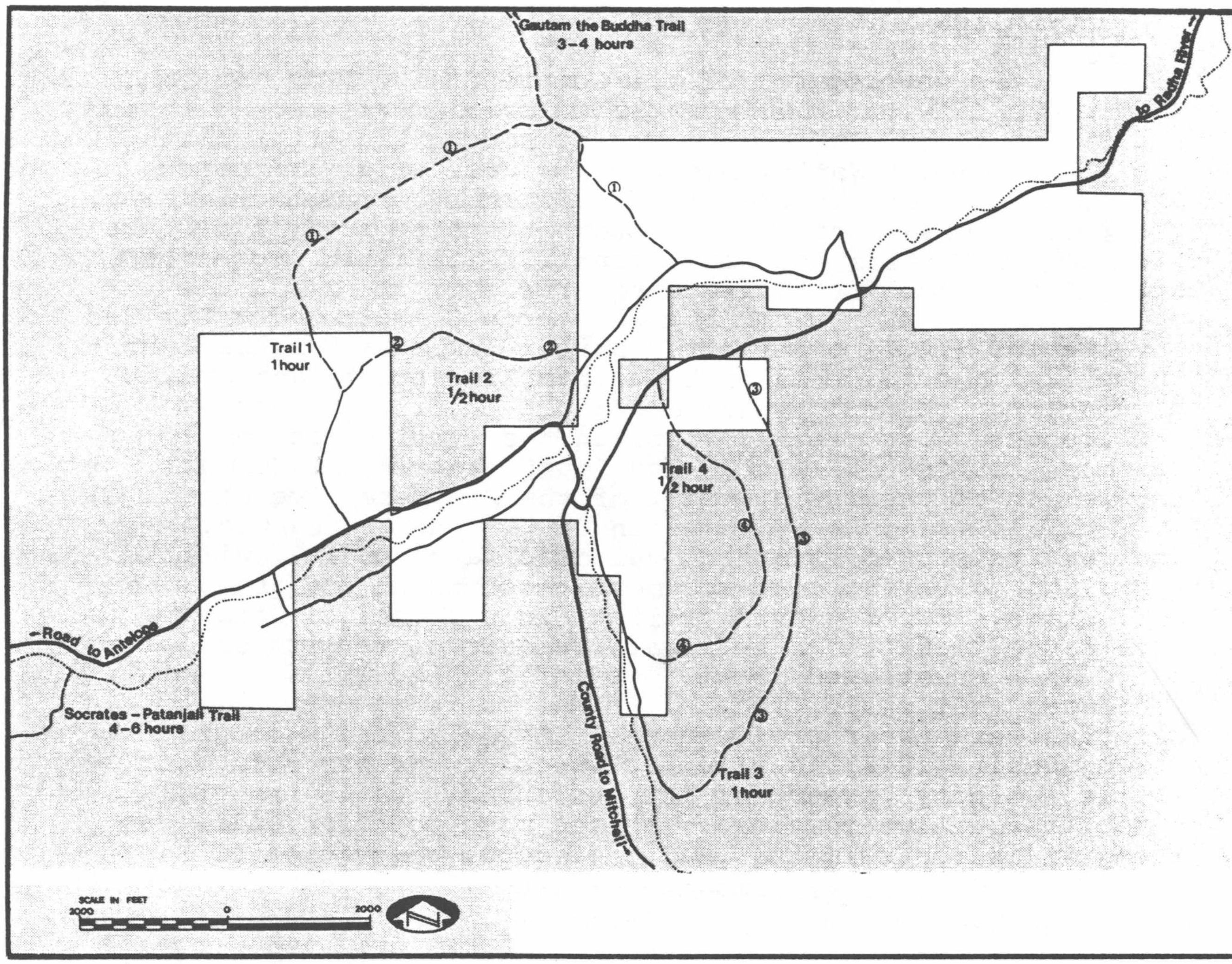
The results showed swimming, horseback riding, hiking and bicycling to be the most popular recreational and sports activities. Inner growth choices, in order of preference, were dance, meditation retreats, relaxation tanks and t'ai chi. When questioned about arts and crafts, the residents indicated that music, theater group, pottery, drawing and painting were their preferences. They also expressed a strong desire (84%) to attend classes in various sports or skills. Ninety percent of the respondents would use an indoor recreation complex, with the most popular facilities being an indoor swimming pool, hot tubs, a movie hall, a jacuzzi and sauna baths.

Present recreational opportunities and proposed improvements will match very closely the residents' needs and desires as determined by the above questionnaire. In response to the desire for outdoor swimming in a lake, Patanjali lake (formerly known as Mays Reservoir), a 20-acre reservoir located outside the City limits on Rancho Rajneesh land ten miles south of Jesus Grove, has been developed for swimming and canoeing. It was opened in July 1982. The expressed desire for horseback riding is currently met with the 20 horses now housed at Jesus Grove. The agricultural development program will add 40 more horses within two years.

Fully marked hiking trails (see Map 32, next page) were developed for the First Annual World Celebration in July 1982. They vary in length of travel time from one-half hour to six hours. Additionally, the opportunities for hiking and climbing over

JESUS GROVE - Existing Hiking Trails

Map 32



unmarked trails are almost limitless on the more than 76,900 acres of Rancho Rajneesh and Federal Bureau of Land Management (BLM) land surrounding the City. One hundred eighty bicycles were purchased in June 1982 for use by the residents as well as by visitors for the Celebration. These bicycles provide a recreation resource, and in addition reduce transportation costs and increase communications within the City.

Future Annual World Celebrations will be planned for areas of the City that can provide the necessary support facilities such as transportation, communications, power, water, sanitary facilities and food preparation facilities. An estimated 45 acres will be required for this purpose.

The secondary school to be built in the Gautam the Buddha Grove Planning Area will incorporate an arts and crafts program in both regular and adult education programs. This facility has been described in the application for zoning approval on file with Wasco County and in the Community Services element of this part of the Comprehensive Plan. The community center building in Gautam the Buddha Grove, which has received zoning approval from Wasco County, will also have facilities to complement the arts and crafts classes held in the school and will include a theater with a stage for concerts and a physical fitness center with saunas and exercise rooms.

A sports center is also proposed for Gautam the Buddha Grove. Much of the indoor recreational needs of the city will be met there. Uses programmed for this facility are a solar-heated swimming pool and exercise facilities; locker rooms with showers, steam baths, a sauna and exercise rooms. The gymnasium will accommodate basketball, squash, racquetball, gymnastics and martial arts.

In addition to asking which recreational activities and facilities the residents prefer, the questionnaire posed an open-ended question: "Are there special or unique places on the ranch or in the City area which you would like to see set aside for recreational use?" This prompted a range of responses from "flat areas for horseback riding" to "a lake to go sailing." The responses were indicative both of the variety of interests among the population and the meaningful recreational opportunities the countryside provides.

Gautam the Buddha Grove, which includes a tributary of Gautam the Buddha Creek, was identified as one such area. The Buildable Lands Map on page 126 identifies that part of Gautam the Buddha Creek within Gautam the Buddha Grove as open space. One section, the steepest area of the Gautam the Buddha Creek tributary, is a 50-acre, unbuildable natural area where several overlooks and meditation areas, benches and tables and seasonal refreshment stands can be located. All of Gautam the Buddha Creek and its tributaries in Gautam the Buddha Grove will remain as open space, perhaps with bicycle and pedestrian pathways integrated in some places. The Radha River is already a popular place for visiting, swimming and some limited boating activities. Designated as a Scenic Waterway under the Oregon Scenic Waterway Program, the Radha River will continue as an actively promoted recreation opportunity for uses that respect its unique characteristics as a scenic attraction. The Radha River portion of the John Day Scenic Waterway is within two miles of the City, but the City is not visible from the river.

Other natural drainage areas will be designated by policy as open spaces where pedestrian pathways, bikeways, and in some instances equestrian trails can be developed. Careful design and engineering of these trails could contribute to the already established stream bank erosion control program in the city.

Desiderata Canyon was selected by some respondents to the questionnaire for treatment as a special or unique area. There are unbuildable areas along Desiderata Creek, which runs through the Canyon, providing opportunities for camping, hiking, nature study and possibly development of a "swimming hole." Two other geographic areas were singled out in the questionnaire as unique. Kabir Reservoir, a completely silted-in reservoir in the Jesus Grove area at the confluence of Kabir and Farid creeks, will be studied further for its recreational potential. It will not be required for irrigation. Heraclitus, a prominent hillside overlooking the cafeteria, is accessible by foot and vehicle and is a popular spot just for enjoying the views. This too will be studied further.

A balanced recreation program provides areas and facilities for a variety of interests and age groups. Each planning area will have land set aside for parks in addition to the recreation areas and open spaces already discussed. These neighborhood-scaled parks will in some cases offer playground equipment for children and passive areas for adults designed with special features to reflect the character of the planning area in which they are located. To determine the future parks and recreation land requirements for a population of 3,700, the National Recreation and Park Association (NRPA) standards were used as guidelines. One such guideline suggests that 25% of all lands in new towns be devoted to parks, recreation lands and open space. The Open Space element of the Plan delineates 50.1% of Rajneeshpuram as open space. This apparently generous NRPA standard has already been exceeded in Rajneeshpuram for Open Space alone. Other more specific guidelines suggested by NRPA are necessary to calculate future park and recreation land needs.

Park and recreation land needs were calculated at two levels of activity, neighborhood and community. Additional lands were added for camping, recreational vehicle parks and festival facilities. The NRPA standard for an average neighborhood park is 10 acres. The recommended standard for a community park is from 20 to 100 acres. The standard for camping areas is 10 acres per 1,000 population. Approximately 37 acres will be allocated for tent, cabin and recreational vehicle campgrounds. The following table summarizes the allocations arrived at above.

CITY OF RAJNEESHPURAM
PARK AND RECREATION LAND USE REQUIREMENTS

TYPE	STANDARD	ACRES
Neighborhood Parks	To be located in each planning area: 3 @ 10 acres each	30
Community Park	To be located in Gautam the Buddha Grove and to include a planned sports center	20
Festival Facilities	N/A	40
Nature Study, Scenic Overlooks, Urban Park	To be located on small sites in natural and scenic areas and commercial areas	18
Combined Camping and Recreation Vehicle Park	10 acres/1000 Population and Recreation Vehicle Park	37
	TOTAL (GROSS ACRES)	145

6. OPEN SPACE

The largest single use of land in Rajneeshpuram is for Open Space. Of the 2,135.5 acres within the City limits, 1,010.5 acres, or 50.1%, are designated as non-buildable lands. Generally, the Open Space classification is applied to areas where slopes exceed 30%, soil conditions are poor, and to natural drainage channels and water courses. (For a more complete discussion of Open Space, see "Natural Features and Open Space" and "Buildable Lands.") All non-buildable lands in Rajneeshpuram have been designated as Open Space. The Open Space distribution is summarized below.

Acres of Open Space

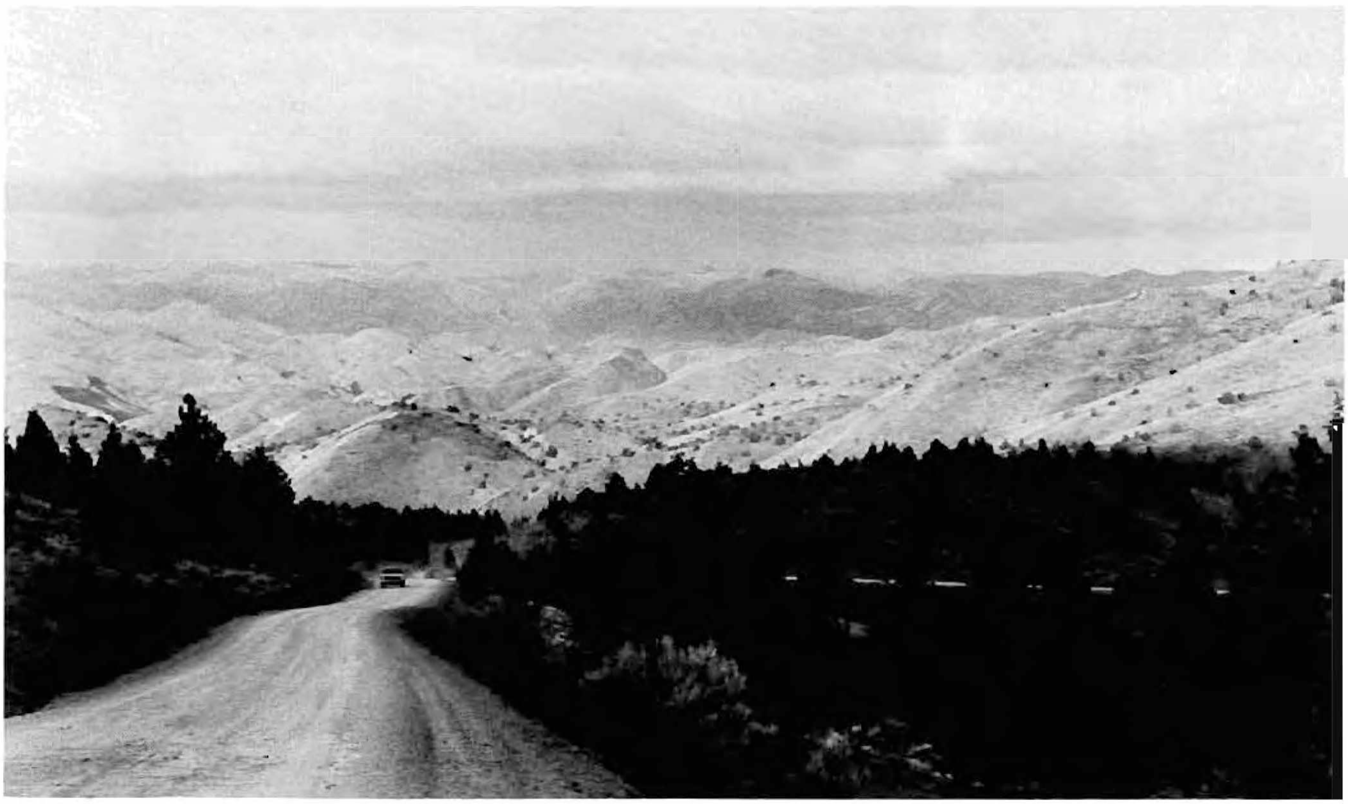
Gautam the Buddha Grove	158 gross acres
Desiderata Canyon	246 gross acres
Jesus Grove	633 gross acres
Road	33.5 gross acres
City	1,070.5 gross acres

The ratio of Open Space (in gross acres) per 100 population is 1,070.5 acres ÷ 3,700 = 28.9 acres/100 people. This ratio far exceeds any standards for Open Space and indicates the desire in the community to protect substantial areas from development or encroachment by human activity. It also demonstrates that the terrain is highly variable and rugged. This Open Space resource, in most cases, will be untouched. In some cases, where specific conditions will allow, the Comprehensive Plan suggests that natural resource conservation and management programs that could include wildlife sanctuaries and research and observation facilities be allowed in these areas. These programs and facilities would be integrated into the overall educational programs of the community and be available to residents, visitors and guests. Pedestrian, equestrian and bicycle pathways as well as roads and utility easements may be designed for some of these areas.

The Open Space set aside within the City, in addition to the largely untouched land surrounding the City limits, serves as a buffer in many areas and preserves scenic views.

SERVICES AND FACILITIES

transportation
communications
water supply
sewage disposal
electric power
storm water and drainage
solid wastes
safety and emergency



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V. SERVICES AND FACILITIES

INTRODUCTION

Design is the essential thread running through the following chapters that cover the services and facilities existing and planned for Rajneeshpuram; design concepts that not only consider what appear to be the more practical aspects of demand, load and distribution capabilities of various utility systems, but that also attempt to recognize the interdependence of these services and integrate their functioning with the whole harmonious vision of life in Rajneeshpuram.

V. SERVICES AND FACILITIES

1. TRANSPORTATION

HISTORY OF EXISTING ROAD SYSTEM

Traversing the lands that surround Rajneeshpuram by horse or off-road vehicle, one encounters the remains of numerous old road traces. The primary access road to Rajneeshpuram, Tao Road, was built for the federal government. On it, troops were transported from Portland to the John Day mining country. They forded the Radha River at Rancho Rajneesh before proceeding eastward. This road development was a boon to the Rancho Rajneesh area. Eventually the developed road became a public right of way and its maintenance was taken over by Wasco County.

A road to Mitchell, an important population center in pioneer days, was also developed. Today Sufi Road remains a Jefferson County maintained road through Rancho Rajneesh. Eventually an improved route to eastern Oregon was developed through the southern part of the ranch. Known now as Bheeka Road, it is also maintained by Jefferson County.

PRESENT ROAD NETWORK

A survey of the condition, driving characteristics and maintenance status of the present road network is described below. Some of these roads lie outside the City but are included because of their potential effect on City operations. Existing roads are shown on Map 33, next page. The following roads are county maintained:

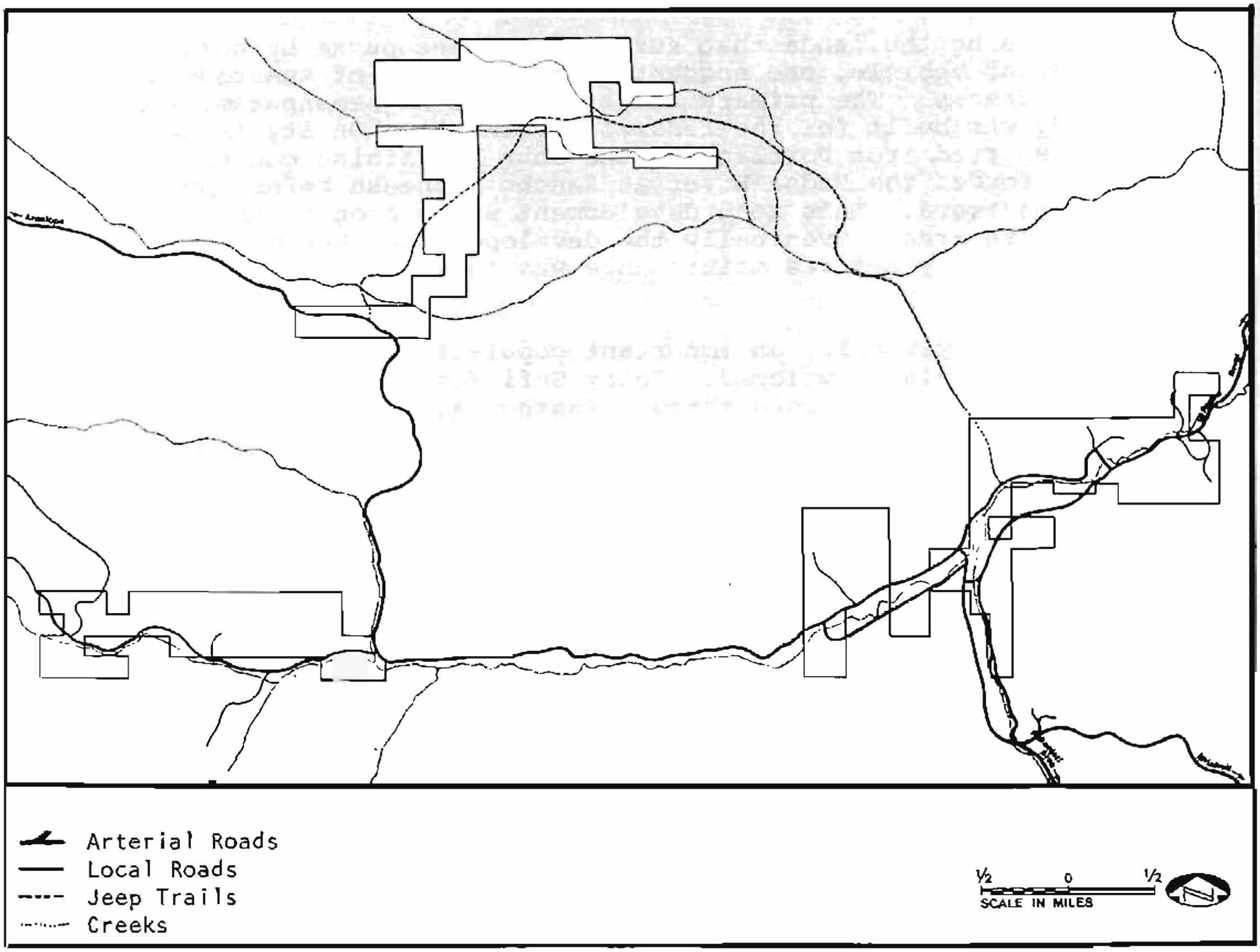
Tao and Yoga Roads

Tao Road is that portion of Wasco County Road No. 305 running from the entrance of Rancho Rajneesh to Jesus Grove. Yoga Road is a continuation of Tao Road, connecting Jesus Grove to the beginning of Sufi Road. These roads have a maximum grade of 13%; the surfaces are select earth, and drainage is achieved with lateral ditches and culverts at interception points. The roadbeds average 16 feet in width with a 32-foot maximum. They traverse mountainous to rolling terrain at elevations from 1,500 to 3,600 feet. Average safe travel speed is 25-30 mph under favorable driving conditions.

At the time the current residents began coming to Rancho Rajneesh, these roads had been little used. The lands were under absentee ownership and were not operated. There were sections

CITY OF RAJNEESHPURAM - Existing Roads

Map 33



of the roads where only one-way 15-mph traffic was safe. In the fall of 1981, Wasco County and Rancho Rajneesh jointly improved the roads. Select quarry material was used to widen and surface them. During the winter of 1981-82, a 24'-wide cattle crossing was built at the ranch entrance to reduce the hazard of stray livestock on the roads.

In the spring of 1982, five rock outcroppings were blasted away between the entrance to Gautam the Buddha Grove and Desiderata Canyon, eliminating some very hazardous short-radius turns. It also allowed widening of the road to the county standard of 32 feet at those points.

Sections of road remain within and near the City that are extremely steep or in other ways hazardous to traffic. Since portions of the road system lie outside the urban boundaries, a continuing cooperative program with Wasco County to improve the driving characteristics of Tao Road and Yoga Road is desirable. Elimination of the 13% gradient area and short sight-distance turns is of primary importance. Eventually the entire length of both roads should be widened to 32 feet with truck-passing lanes.

At this writing, Rancho Rajneesh has begun construction of a dam intended to store water for irrigation purposes. This dam, located between Desiderata Canyon and Jesus Grove, would have inundated part of Tao Road. As a part of that project, the road was realigned above the estimated high-water mark of the reservoir and a mile of the road was improved. In the process, a very short-radius 15-mph turn has been eliminated.

Sufi Road

Sufi Road in Jefferson County is maintained by that county. It begins about one mile south of Jesus Grove and runs southeasterly up a rocky canyon, then down along an intermittent stream. It terminates at Bheeka Creek Road, on which one may continue to the town of Mitchell. According to the Jefferson County roadmaster, Sufi Road is maintained twice annually, in the spring and fall. The physical standards of the road are minimal. It is one lane only, with turning radii speeds of 5 mph, and turnouts for oncoming traffic. It has an unimproved earth surface and is impassable at times during the winter.

Siddhappa and Bheeka Creek County Roads

The Siddhappa and Bheeka Creek Roads along the southern border of Rancho Rajneesh run intermittently in and out of the Ranch boundaries. They are Wasco and Jefferson County maintained rights of way. Their physical characteristics generally exceed those of Tao Road and Yoga Road. They are characterized by an improved earth surface and provide access to the City of Rajneeshpuram from the south and various other entrance sites into Rancho Rajneesh.

Yoga Road

Yoga Road runs southerly about eight miles from a Sufi Road cutoff 1/2 mile south of Jesus Grove. It goes to Patanjali Lake and on to Bheeka Creek Road, providing an additional emergency egress from the City to outside arterial roads. Patanjali Lake is a small pleasant body of water presently used for recreational purposes. In order to have convenient access, the road to it was improved. During a three-week period in June 1982, about 15,000 cubic yards of rock and earth were blasted and moved. The road follows the gentle slope of Kabir Creek. It is 32' wide (two driving lanes plus 2' to 4' shoulders). It has wide-radius turns and an average safe driving speed of 25-30 mph under favorable driving conditions.

New Roads Constructed in the Jesus Grove Area

Roads have been constructed for access to residential and farm ancillary buildings in the Jesus Grove area. They generally parallel existing roads on the opposite sides of the valley. Three one-mile roads have been built that provide not only additional access for normal use but also emergency access. Their physical characteristics are: 24' road width, horizontal and vertical alignment generally suitable for 30 mph driving speeds, lateral ditches and culverts at points of runoff interception, and surfaces of phyllite select material mixed with crushed rock.

Hydrology and runoff investigations indicated the need for two 120"-diameter corrugated metal pipes for roads crossing Kabir and Farid Creeks. These were installed and carefully bedded and backfilled. Upstream and downstream rip-rap erosion protection was also placed at the culverts.

ROAD SYSTEM NEEDS, MAINTENANCE AND CONSTRAINTS

Safe, reliable all-weather roads are a necessary part of the City development. An improved driving surface will correspondingly increase driving speeds. As a result, sight-distance standards will have to be improved. There are several locations where short sight distance occurs on existing roads. Crest vertical curves, short-radius turns and encroaching excavation slopes will need correction.

From January until June 1982, a rock crusher equipped with a fogging system to reduce floating dust was operated at Rancho Rajneesh, and approximately 50,000 cubic yards of crushed rock was stockpiled at the quarry. Quarry rock has been used for all recent road surfacing. Preliminary tests indicate that the material is of high quality and very durable. It is also suitable for the production of asphalt concrete pavement. High-quality pavement for future City roads can be produced from this material.

As the soils of Rancho Rajneesh contain a high percentage of clay, dust becomes a problem in some areas. Research was done by the Commune to find an economical and effective way to control the dust problem. Seven miles of roadway, mostly within the Jesus Grove area, have been treated with lignum sulphanate for dust control, surface and sub-surface stabilization, and erosion control; the surfaces have become remarkably hard as they dry out. It is claimed that the initial application will last for one year if rejuvenated periodically by water trucks. The second season will require only 50% of the original quantity of chemical, because the soil becomes stabilized from eight to 12 inches in depth due to the penetration qualities of this product. Only the surface area needs to be renewed in subsequent years.

Constraints to road construction at Rajneeshpuram exist. The terrain varies from hillsides to bottom land with many year-round and intermittant creeks to cross. Soil types vary from basalt rock to clay. Accordingly, highway designers are carefully selecting earthwork configurations and layout of road patterns to avoid sites better suited to building or agriculture. Excavation slope ratios will vary from 1/2 horizontal to one vertical in rock, to 1/2:1 in soils. Fill slopes will generally be 2:1. Special consideration will be given to highway construction in clayey areas including flattened cut-and-fill slopes, underdrains, toe ballasting and subexcavation. When possible, clayey and slide-prone areas will be avoided entirely. The goals of highway cross-section development will have a minimum impact on the view, on safety, and on the economy of maintenance.

Transportation is of prime concern at Rajneeshpuram. Existing development is spread out because of narrow, steep-sloped valleys; therefore, the forthcoming development in Gautam the Buddha Grove will require a City road system that extends almost 10 miles in length.

INTERCOMMUNITY TRAFFIC

During the development of the past year, the major road access system into Rajneeshpuram has experienced a sharp increase in traffic. The roads affected are Tao Road (Wasco County Road #305), 12 miles; that section of Siddhappa Road (3 miles) that is north of the Tao Road intersection; and that section of the Antelope-Clarno Road (4 miles) that is west of the Siddhappa Road intersection. Much of the added traffic on the above 19-mile stretch of road was a consequence of the lack of adequate communication facilities at Rajneeshpuram and the need for frequent round trips to the nearest telephones in Antelope. Added to the communication-related traffic was the need for daily commuter traffic to transact commercial business at nearby towns, a use that will diminish as commercial outlets become established at Rajneeshpuram. Traffic originating in Rajneeshpuram with destinations beyond Antelope is expected to be relatively light compared with the City's population. The majority of purchasing for City residents will continue to be done communally and in bulk. For the projected future population anticipated for Rajneeshpuram, this will greatly reduce supplier traffic when compared with a city of similar size. A further reduction in intercity traffic is being achieved by means of a Commune transportation office that insofar as possible consolidates through carpooling the arrangements of those traveling to points away from the ranch.

An example of this capability was demonstrated during the festival in July 1982, when more than 5,000 people, many from foreign countries, visited and left the City within a period of a few weeks. But service was provided to and from Redmond and Portland airports, virtually eliminating the need for automobile traffic. In fact, there were no more than 300 visitor vehicles during the festival and the impact on local traffic was not significant.

In summary, a certain increase in traffic on access roads to Rajneeshpuram seems inevitable, but the factors noted above are expected to mitigate the impact.

TRANSIT SYSTEM

The present transit system serving the City has been developed by the Commune to provide transportation for City residents and farm workers to and from work, to serve passenger needs to and from other communities and transportation depots and to serve nearby public recreation areas such as the Radha River. It also provided transportation for visitors during the recent First Annual World Celebration.

Service has proved very effective in meeting the needs described above, even under the heavy additional load imposed by the Celebration. Additional benefits have also been experienced: because the public transit system is dependable, few residents own or otherwise depend on private vehicles for transportation and this reduces vehicular use and congestion on City streets; the need for parking space has been reduced; gas consumption is less; and both noise and air pollution are limited. The transit system has developed an extremely flexible use of its fleet, which includes both 60-passenger buses and light passenger vehicles. Rajneesh Investment Corporation presently owns 50 buses. The type of vehicle used on scheduled runs varies according to the load demands that have been experienced in the past. This system will continue to meet existing transit needs of Rajneeshpuram and will be expanded as the City grows.

A regularly scheduled bus service also runs between the City and Antelope 19 miles away.

BIKEWAYS

There are as yet no designated bikeways in Rajneeshpuram although bicycles are a growing form of transportation. In addition to personally owned bicycles, 180 bicycles were purchased by Rajneesh Neo-Sannyas International Commune to provide alternate transportation during the First Annual World Celebration. These bicycles are presently available to and being used by City residents to conduct ranch activities and supplement bus and car transport. The need for safe and aesthetic bikeways is clear.

WALKWAYS

Aside from the recreational foot trails that enter part of Jesus Grove, no designated paths or walkways exist within the City. From the standpoint of effective design location there may be an advantage in allowing natural "short-cut" pedestrian routes over undeveloped ground to become defined and then insofar as possible aligning walkways and public paths with the natural flow pattern. Such a natural system is already beginning to show itself in the Jesus Grove area.

AIR TRANSPORTATION

The existing airport at Rajneeshpuram is located at Jesus Grove just west of the present headquarters area. The airport runway lies parallel to and just south of Tao Road, and has a northeast/southwest orientation.

The airport has the following characteristics:

- Latitude: 44^{O}-50'
- Longitude: 120^{O}-28½'
- Elevation: 1,570' MSL
- Usable length: 3,900'
- Surface width: 48'
- Landing runway number: 22
- Departure runway number: 04
- Surface: earth

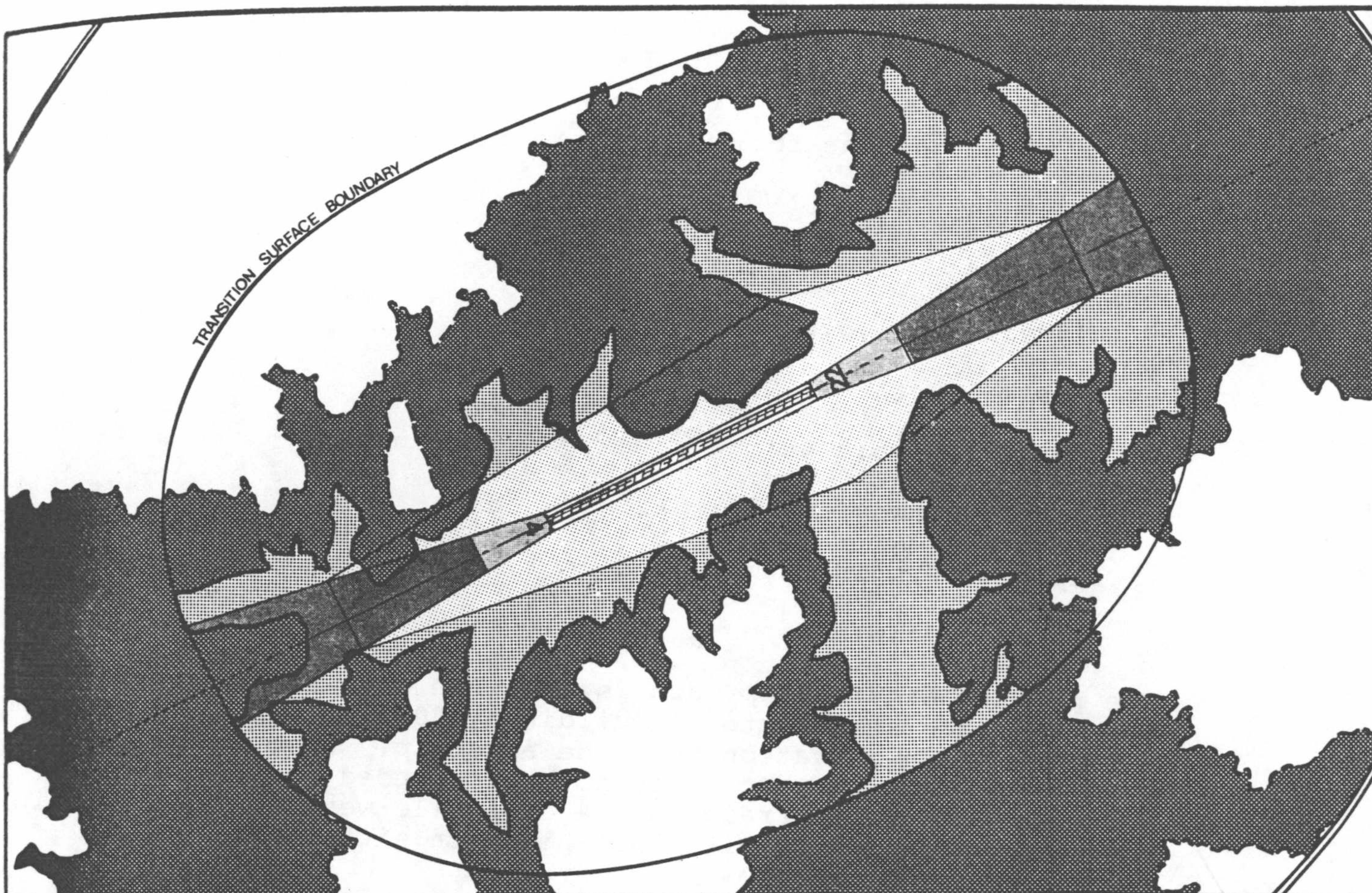
The primary landing approach is from the east and directly over the old ranch headquarters' buildings, 300 yards east of and 50 feet higher in elevation than the airstrip. From the west, landing is possible but it is not recommended for pilots unfamiliar with the terrain, as .4 of a mile west of the airstrip the valley constricts with 200' hills on either side of the creek.

The presence of the airstrip will impose some limitations on nearby construction and vegetation. (See Map 34 on next page.)

Running along the flat bottom of Farid Creek Canyon, the runway has hills 550' high on either side. There are also some natural formations that encroach on the airstrip, affecting takeoff, landing and degree of permissible error. (See Figure 9, next page.) Lateral clearance is limited to about 80' from the centerline of the airstrip by Devateertha Rock, a 250'-high, nearly vertical outcropping just north of the Tao Road. To the south of the airstrip, Farid Creek has cut a 15'-deep, and in some places a 100'-wide swatch through the alluvial valley, eroding to within 60' of the airstrip centerline at some points.

The valley is very protected and there are no real prevailing winds at this relatively low elevation. There are, however, buffeting winds associated with storms, and late afternoon breezes from the river.

The runway has recently been regraded to provide a smooth firm earth surface, and Runway Lighting and Visual Approach Indicators (VASI) have been installed. The runway will be paved with asphalt concrete by summer 1983. Plans are also



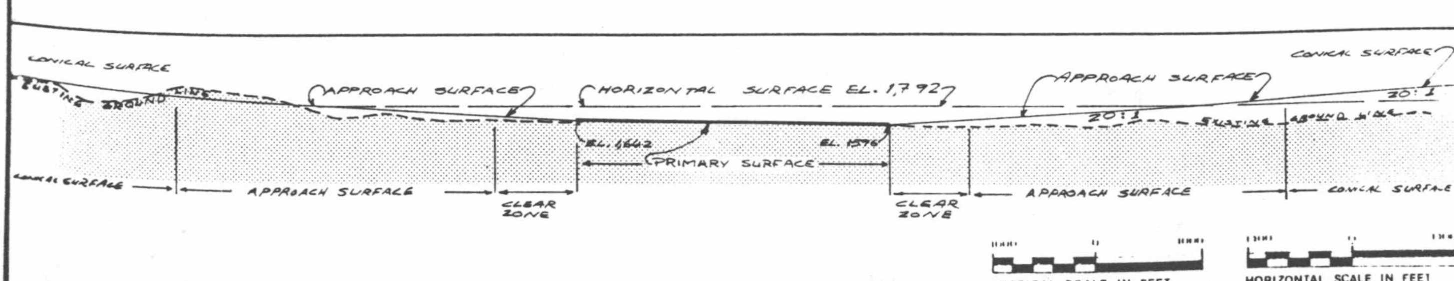
SCALE IN FEET
2000 0 2000

- Primary Surface (Runway - elevation 1,642 ft.)
- Clear Zone (no construction)
- Approach Zone (slope 20:1)
- Horizontal Surface (150 ft. above runway elevation - 1,642 ft.)
- Transition Surface
- Conical Surface
- Outside Conical Surface (or projections into conical surface)
- Conical Surface Boundary
- Centerline of Runway
- Projections into Conical Surface (boundary line)

Ref: Airport Master Plan FAA Advisory Circular AC 150 5070-6 (Feb 1971)
Ref: Objects Affecting Navigable Airspace FAR Part 77 (1975)

Airstrip Control Surface Profile

Figure 9



being prepared for an 80' x 100' airplane hangar/repair building.

The airport is registered with the Oregon Department of Transportation as a private airport. Presently, the airport serves several functions for the community. Rajneesh Neo-Sannyas International Commune houses two twin-engine planes at the airport and uses them for business and emergency purposes. The planes are also available for fire location and supervision work, as well as emergency rescue operations. For the First Annual World Celebration in the summer of 1982, arrangements were made to use the airport to air-evacuate patients to central Oregon hospitals. Also, the airstrip is occasionally used by contractors and suppliers visiting the City.

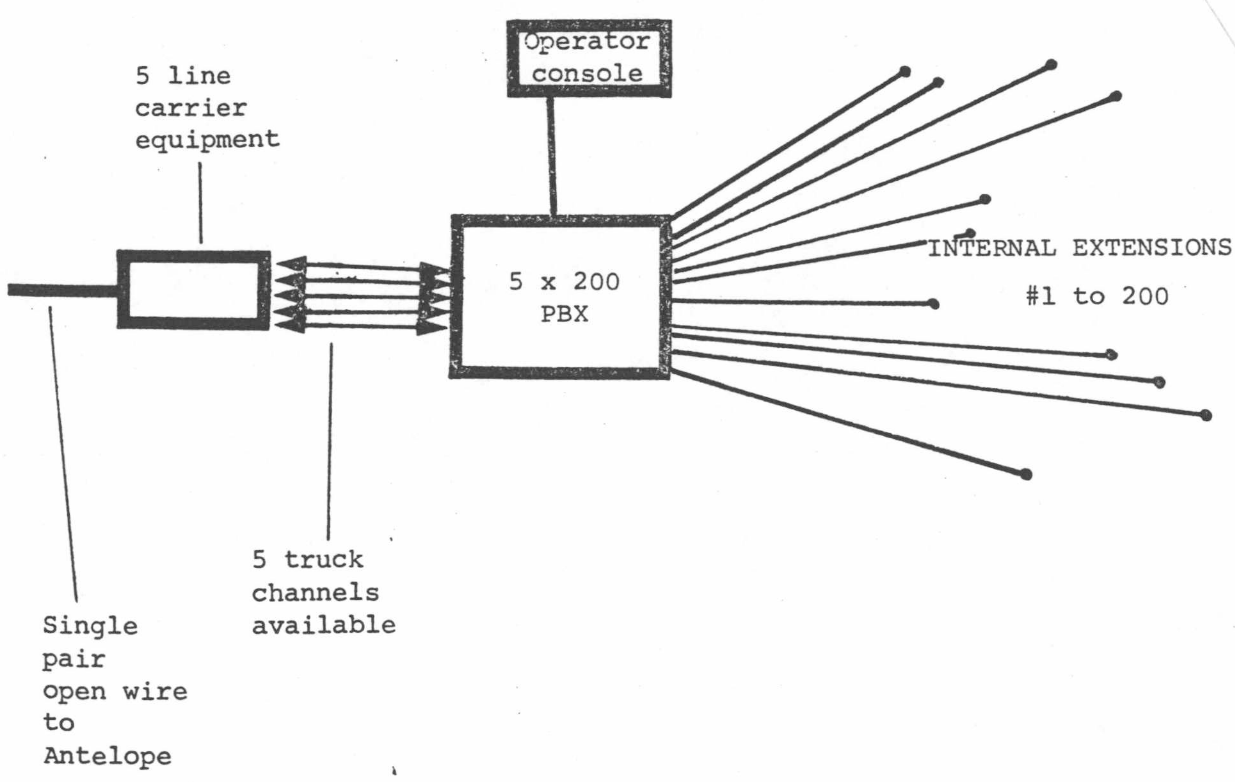
V. SERVICES AND FACILITIES

2. COMMUNICATIONS

In July 1981 there was only one telephone on Rancho Rajneesh, and it was on a six-party line. Today there is the beginning of a sophisticated telephone system as well as a four-channel internal radio system. Communications in and out of the ranch are still severely limited, however, by the number of outside trunk lines available.

EXISTING TELEPHONE SYSTEM

The telephone system at the moment is wholly owned by Rajneesh Neo-Sannyas International Commune. The network consists of a central computer-controlled switching station (Mitel SX-200 PABX/216 Generic) to which all trunk lines and all internal extensions are connected. The Mitel SX-200 is a highly efficient electronic Private Automatic Branch Exchange (PABX) capable of numerous automatic functions including many station programmable options and retention and storage of trafficking information. The switchboard is operator controlled. (See diagram below.)



The distribution system is a buried cable network using Premium Quality 22-gauge gopher-protected REA-approved cable. See Map 35 on the next page for existing cable route in Jesus Grove.

The telephone system is excellent in terms of internal communications. It connects 130 phones and has the capacity for 70 more. There is also a 24-hour central communications and emergency number.

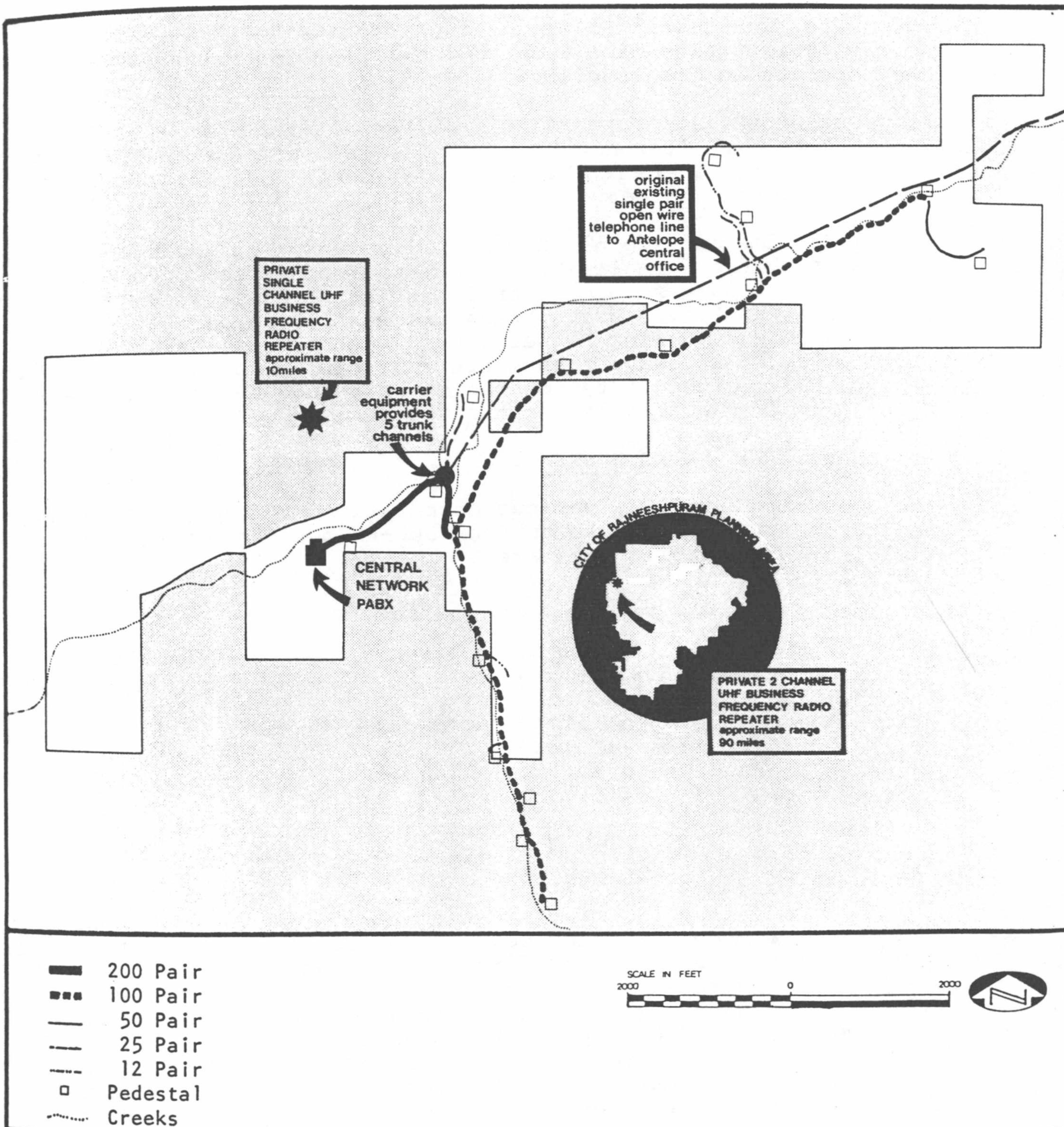
Outside service is much more limited. The incoming trunking facilities are limited to one pair of aerial open wires, capable of only five carrier channels, which is grossly inadequate for the City's use. Plans are being made and negotiations are underway to link Rajneeshpuram with outside networks via either microwave transmitters or cables to the town of Antelope. Within a few months there should be up to 50 carrier channels available for the City.

INTERNAL RADIO SYSTEM

As of July 1982, various corporations of Rancho Rajneesh are licensed to operate on four UHF-FM business frequencies. The frequencies used are:

	Transmit	Use	Receive
Freq. #1	461.850 Mhz.) 466.850 Mhz.)	General	461.850 Mhz.
Freq. #2	461.550 Mhz.) 466.550 Mhz.)	General	461.550 Mhz.
Freq. #3	461.700 Mhz.)	Restricted	461.700 Mhz.
Freq. #4	461.500 Mhz.) 466.500 Mhz.)	Emergency	461.500 Mhz.

Frequency #3 will use the simplex mode (direct unit-to-unit communication), while frequencies #1, #2 and #4 use the repeater mode. Simplex mode means that two radios are transmitting and receiving directly back and forth, without the aid of a repeater. The simplex mode is used only when the two units are within direct range of each other. The repeater mode is used to amplify the signal and extend its range. It consists of a two-way radio located at a high elevation, a hill or mountain, which can receive a transmitted signal and simultaneously rebroadcast the signal, amplified, over a broader area.


original existing single pair open wire telephone line to Antelope central office
PRIVATE SINGLE CHANNEL UHF BUSINESS FREQUENCY RADIO REPEATER aporoximate range 10miles
carrier equipment provides 5 trunk channels
CENTRAL NETWORK PABX
CITY OF RAJNEESHPURAM PLANNING AREA
PRIVATE 2 CHANNEL UHF BUSINESS FREQUENCY RADIO REPEATER approximate range 90 miles
200 Pair
100 Pair
50 Pair
25 Pair
12 Pair
Pedestal
Creeks
SCALE IN FEET
2000
0
2000

There are two 90-watt Motorola Micor UHF repeaters located at Adinath Point (elevation 4,154 ft.) with high gain base tower. They operate on frequencies #1 and #4.

At Jesus Grove, at approximately point 2,158, there is a 30-watt Motorola Flexar Base/Repeater station operating on frequency #2. The Micor repeaters on frequencies #1 and #4 are capable of covering a wide area, reaching as far as the City of Bend to the south, and partially into The Dalles to the north. Frequency #4 is Rajneeshpuram's emergency frequency, which will serve to coordinate any medical, fire or rescue operations that may occur.

Also, there is currently licensed access to the Community Repeater on Grey Butte (Grey Butte Repeater #3) in South Central Oregon, and future access many be arranged to the Mount Hood Community Repeater, which would link Rajneeshpuram directly to Portland and the Klickatat Ridge Community Repeater, creating a solid radio link with The Dalles area.

The community uses the radio system for an emergency alert monitoring system (33 individual Tone Coded Pagers in the field) by which medical and fire teams can be paged individually or collectively and given instructions at any time of the day or night.

The total number of radios and monitors in the field is 114. The existing radio equipment should be sufficient to serve the anticipated needs of the community for the next 24 months. After that it will probably be necessary to expand the system to include dispatcher-controlled networks serving principal agencies in Rajneeshpuram, including security, medical, fire, city services and possibly others.

3. WATER SUPPLY

The water supply for Rajneeshpuram must be designed to provide adequate water for agricultural, domestic, light industrial, construction and firefighting uses. There is evidence of adequate water reserves, both ground and surface, for all uses within the Rajneeshpuram watershed. (See "Water" section of Setting and Natural Environment, Volume 1.)

The crucial role of the City is the supervision of the orderly and rational design, construction and maintenance of the water facilities; to ensure the present adequacy for all uses to maintain this level of service as controlled growth occurs; and to review all system changes and improvements for compliance to the City land use plans and accepted engineering practices.

THE PRESENT SYSTEM

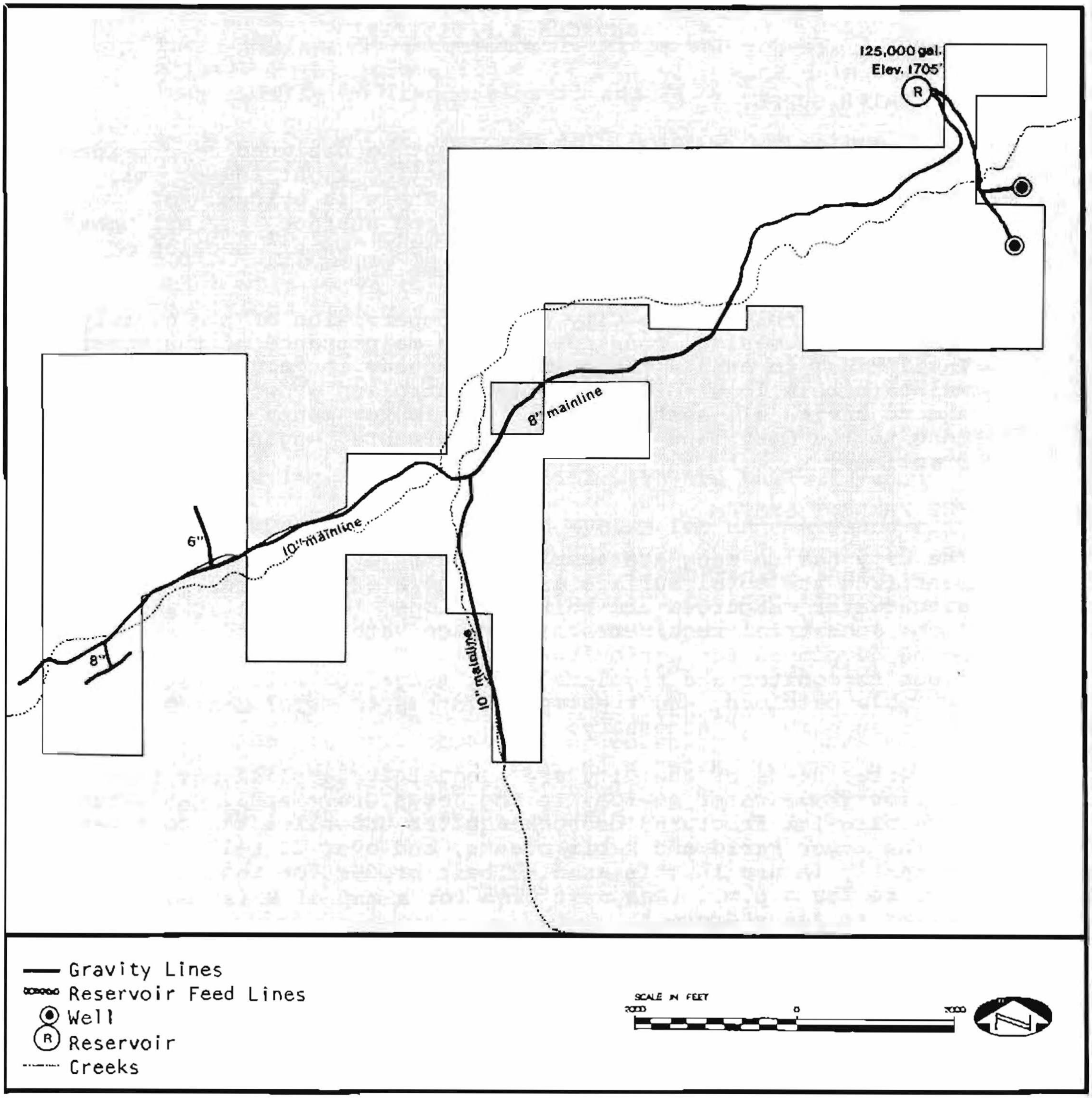
The City has an adequate supply of water available for development from the total surface and groundwater resources. Shallow groundwater resources are being developed for domestic and light industrial requirements; surface water resources are being developed for agricultural use. The City plans to continue to monitor and regulate water usage and will construct suitable catchment and treatment systems to supplement groundwater supplies if necessary.

The water needs of the City are adequately supplied now from shallow groundwater sources in the Jesus Grove area. An extensive alluvial fractured bedrock aquifer underlies the confluence of the lower Farid and Kabir creeks, and over 20 wells are currently in use in this area. Their production ranges from five to 250 g.p.m. (See next page for a map of existing water system in Jesus Grove.)

Development of groundwater resources in Gautam the Buddha Grove is well underway. Three production and evaluation wells have already been developed and are providing substantial flows of water. Hydrogeologic evidence and sustained pump tests indicate that adequate supples can be furnished through the development of multiple low-to-moderate production wells in the shallow fractured bedrock. These wells are described in more detail in the "Water" section of Setting and Natural Environment, Volume 1.

JESUS GROVE - Existing Central Water System

Map 36



Development of groundwater resources is also continuing in the Desiderata Canyon area. Drilling has shown that low yields are available from the fractured bedrock in the canyon. Multiple wells can be developed to tap this source and thus meet water requirements. Current exploration is directed at developing more permeable aquifers in the surrounding area. For example, test drilling has found water in favorable formations in the upland area of Desiderata Canyon and this potential source is being investigated. It is expected that low-to-moderate production wells can be developed in this area, from which water could be gravity fed to developed areas lower in the canyon. A new well is being developed in the shallow fractured bedrock along Farid Creek, upstream of Krishnamurti Dam. If required, additional water can be supplied from the Jesus Grove or Gautam the Buddha Grove areas.

EXISTING WATER USAGE

A lack of long-term data exists. However, use by the present population is well documented. Daily flows are an average of 75 gallons per capita per day in residences where no cooking is done and people are away all day. During the summer, due to household lawn and landscape water, the average rises to 100 gallons per capita per day. Ideally, landscape and garden watering will be from other than a potable water source. There are no commercial or industrial uses at present. The largest single user is the cafeteria, which uses 4,500 gallons per day.

Estimated peaking factors for present residence areas are 2.0 for maximum daily flow/AVG daily flow ratio and 4.0 for peak flow/AVG daily flow ratio. Total present system peak flow for domestic and cafeteria use is estimated at 300 g.p.m. with a total daily use of 25,000 g.p.d.

Water use per capita at Rajneeshpuram is significantly less than the established national average of 125 gallons per day per person. This is due in large part to residential water-saving plumbing fixtures, pressure-reducing valves, centralized eating at the cafeteria and the water conservation consciousness of the citizens. The current wells connected to the fire system produce 300 g.p.m., or a daily potential of 432,000 g.p.d.

PROJECTED WATER USAGE

In the past, most water demand projections have been based upon the direct extension of present use. These projections are often inaccurate due to the effects of changing demand patterns and population growth. The City may, however, project with some degree of certainty that per capita daily use will remain at 75 g.p.d. in the residences. With population growth, food service facilities will also expand in water usage. As a planning tool, a total of 80 gallons per person per day will be assumed - including food service, sanitary services at work places, industrial and other uses.

Projected industrial uses requiring water of any significance are food processing and a printing and photographic facility. As part of an overall water management program, surface water and processed wastewater will be made available for non-potable uses to minimize the use of high quality drinking water.

CONSERVATION

In the nation as a whole, per capita water usage has grown rapidly. All too often, water is viewed as an unlimited resource and many water utilities have concentrated on increasing water supplies to meet the increasing demand without actually evaluating the demand itself. In fact, there is a wide gap between the intelligent and efficient use of all natural resources and the rate at which they are still being consumed by the average American family. Conservation does not mean deprivation, and a good program of resource management can have minimal impact on living standards.

There are a number of ways commonly used to reduce domestic water usage. These include structural, operational, economical and social.

Structural methods include water-saving plumbing fixtures, pressure-reducing valves, and water reuse and recycling.

Operational methods include the detection of repair and system leakage, faulty plumbing fixture repair - such as leaking toilet float valves - and specific restrictions on some types of water uses, usually outdoor uses such as irrigation.

Economic methods include specific water usage pricing policies with penalties for waste and incentives and rebates for customers who conserve.

Social methods include making the public conscious of the importance of conservation, modifying local building codes to require the installation of water-saving devices, and promoting alternative landscape practices that use indigenous species that require less water or agricultural irrigation systems that apply water more economically than spray systems.

Structural, operational and social conservation methods are already being practiced at Rajneeshpuram. These measures will be continued and expanded as population grows.

STORAGE REQUIREMENTS

Provision of adequate storage of drinking water prior to distribution permits the economical use of pumps and the even distribution of water through the peak and non-peak demand periods. Generally, required storage capacity should equal the daily use plus the fire storage, plus emergency storage for periods of pump shutdown or system maintenance. Should surface water ever be used as a supply for domestic use, reservoir capacity will be required for the storage of of treated water prior to use.

Reservoir size is also related to the recharge capacity of the water source. In essence, the present water system uses the aquifer as an underground reservoir and transfers it to above-ground reservoirs. The rate at which water can be pumped from the ground, the reliability of such a system, and the proximity of the wells to demand and storage areas generally make above-ground reserves preferred. However, the below-ground reserves can be seen as reserves for system expansion when needed.

It is felt, for many reasons, that it is desirable to limit the number of wells to a smaller number of high-output ones supplying a community water system rather than numerous wells of varying output. Water quality and efficiency of pumping are more closely controlled in fewer wells. Also, as more hydrogeological data is collected for the Rajneeshpuram aquifer, it becomes possible to draw water from the richest areas and use the present domestic wells to monitor water tables. Small domestic wells can be preserved for auxiliary use.

The most compelling reason for a community water system is fire protection. A system of reservoir storage and main distribution lines is the most efficient and reliable system for obtaining this protection.

NEEDED FIRE FLOWS FOR EXISTING SELECTED MAJOR BUILDINGS (1982)

(School and Church outside City Limits)

NFPA Calculations

	Building	Flow (g.p.m.) Hydrant	Flow (g.p.m.) Sprinkler	Duration	Gallons Storage Hydrant	Gallons Storage Sprinkler
JESUS GROVE	School	500	750	60 minutes	12,000	45,000
	Storage Building	1,000	1,500	90 minutes	50,000	135,000
	Vehicle Repair	1,000			49,400	
	Aircraft Hangar	1,000			38,400	
GAUTAM THE BUDDHA GROVE	Adult Ed. Center	1,000			41,000	
	Community Center	1,000	750		22,500	45,000
DESIDERATA CANYON	Church	1,000	750		25,000	45,000

ISO Calculations

	Building	Gallons Per Minute	Duration	Total Water Storage in Gallons
JESUS GROVE	School	2,295	2 hours	275,400
	Storage Building	2,026	2 hours	242,400
	Vehicle Repair	1,771	2 hours	212,520
	Aircraft Hangar	1,152	2 hours	158,880
GAUTAM THE BUDDHA GROVE	Adult Ed. Center	3,000	3 hours	540,000
	Community Center	2,000	2 hours	240,000
DESIDERATA CANYON	Church	3,000	3 hours	540,000

Existing now in the Jesus Grove area is a fire protection system served by two primary wells providing up to 350 g.p.m. total, pumped by high-service submersible pumps into a 125,000-gallon reservoir. The main lines are 10-, 8- and 6-inch 200 PSI PVC pipe and currently connect to six fire standpipes and five A.W.W.A. fire hydrants.

Design calculations for water systems allowing for structural fire protection always involve much larger quantities than for domestic use alone. In Rajneeshpuram, fire flow needs are greatly in excess of domestic needs and will continue to be so. Therefore, fire flow requirements will govern most calculations of required water storage capacity.

A survey has been done on present and proposed ranch buildings in the Jesus Grove area and appropriate water supply determinations were made. (See table on preceding page.) Calculations are based on standard rules found in the codes and regulations of the NFPA Volume 12 and 13, and the recommended fire flow equations developed by the ISO NFPA standards are generally considered to be the minimum water supplies needed for life and safety and the ISO standards are the water supplies needed to minimize property risk and therefore insurance rates.

Generally speaking, ISO standards are more stringent (requiring more water) than the NFPA regulations. When considering water requirements for a water system, it is necessary to maximize life and safety and minimize insurance rates while keeping the water reservoir and pipes down to a reasonable rate.

PIPE SIZING

Water pipes are sized according to the relationship between flow required, the operating pressure of the line, friction losses and the recommended maximum veolocity in feet per second for the pipe being used.

PVC pipe is the most cost-effective pipe for this sytem. PVC 1120 SDR 21 (ASTMD-2241) is the standard pipe used for this purpose. The maximum recommended velocity for all plastic pipe is five feet per second. If water velocity exceeds this number, then excessive pressure loss and water hammer may occur, with the possibility of pipe failure increasing as the recommended velocity is exceeded.

Water systems for fire control must be reliable. Hydrant valves, which are very large and opened rapidly and then closed, as would be the case in a fire, set up the most demanding conditions for a pipe system. Therefore, manufacturer's recommended velocities and flow rates will be adhered to closely.

The Uni-Bell Plastic Pipe Association publishes the industry standard reference for plastic pipe design. Tables derived from the Hazen formula are found on page 203 of the handbook. The tables show the relationship of flow and velocity. For a flow rate of 750 gallons per minute, as is required by the school as a minimum for a sprinkler system, a pipe diameter of 8" is quite adequate. For a flow of 1,000 gallons per minute, as is required for hydrants at the storage building, aircraft hangar and vehicle repair, a 10"-diameter pipe is required. A 1,500 gallon-per-minute flow requires 12" PVC pipe. The largest pipe diameter used at Rajneeshpuram has been 10". The maximum permissible flow is 1,250 gpm for 10"-diameter PVC pipe. It can be seen that the flows recommended by the ISO far exceed the 1,250 gpm capacity of the 10" pipe.

The decision of what standard a proposed system aspires to is both an engineering and an economic one. The cost of providing a 2,000-3,000 gpm flow in both construction terms and materials may far outweigh the insurance savings. Reservoir capacities are more easily expanded. Based upon current experience and projected growth and the type of construction planned, it is recommended that 10"-diameter pipe be seen as the desirable maximum for main lines and 6"-diameter the desirable minimum. Properly designed systems using a number of reservoirs, branch lines and feeder networks will allow distribution for all purposes at a required flow and pressure within the design limits of 10" pipe.

WATER USAGE ASSUMPTIONS

The following assumptions were made in calculating water usage figures. Estimated water usage charts by City area and for the entire City are given on pages 239-242.

1. Residential Density. All residential areas will be developed at a minimum density of three units per acre. A possible density pattern is shown in the Residential Land Use Requirements chart on page 179.

2. Water Usage Per Capita. By measured use (see Water Usage Survey on the next page), residential per capita water consumption is set at 80 gallons per person per day. This number is quite typical if gardening and landscape irrigation, swimming pools and the like are excluded. It is a policy of the City to use surface or recycled water for irrigation and not use potable water. Also, no storm water will be drained into sewers.

WATER USAGE SURVEY

Magdalena Grove:

House #5 & House #7
Two trailers with 6 people per trailer = 12 residents
Average water use from 8/7/82 to 9/16/82 = 964 gpd
Divided by 12 residents = 80.3 gpc

Jesus Grove:

House #2 & House #3
Two trailers with 6 people per trailer = 12 residents
Average water use from 3/9/82 to 9/16/82 = 901 gpd
Divided by 12 residents = 75 gpc

Subhuti Grove:

Six trailers with 6 people per trailer = 36 residents
Average water use from 8/5/82 to 9/16/82 = 2,902 gpd
Divided by 36 residents = 80.6 gpc

3. Water Usage Per Acre. Water usage within an area is a function of persons per acre and not units per acre. For the three areas of the City, the people per gross acre of residential land is derived from the Residential Land Use Requirements chart on page 179.

Average Demand	Population		Gross Acres		Person/ Gross Acre		Gal./ Person/ Day		Gal/ Day/ Acre
Gautam the Buddha Grove	1,790	÷	168	=	10.6	x	80	=	850
Jesus Grove	744	÷	114	=	6.5	x	80	=	520
Desiderata Canyon	620	÷	123	=	5.0	x	80	=	400

These are averages, and the most extreme demands would occur in the following cases. These illustrate the areas which have highest density in each district. (See table on next page.)

Highest Potential Demand	Population		Gross Acres		Person/ Gross Acre		Gal./ Person/ Day		Gal./ Day/ Acre
Gautam the Buddha Grove	270	÷	12	=	22.5	x	80	=	1,800
Jesus Grove	114	÷	8	=	14.3	x	80	=	1,144
Desiderata Canyon	80	÷	8	=	10.0	x	80	=	800

or, to show the relationship between highest potential demand and average demand:

Gautam the Buddha Grove $\frac{1,800}{850} = 2.1$ (times average)

Jesus Grove $\frac{1,144}{520} = 2.2$ (times average)

Desiderata Canyon $\frac{800}{400} = 2.0$ (times average)

Thus, generally speaking, local demands, because of density, may be as much as twice the average.

4. Peaking Factors. Pipe sizing is based on assumptions about instantaneous peak flows. For residential usage, peak flows generally occur at certain times of the day when people often shower, cook, clean, etc. In larger cities, these peaks tend to occur at different times for different families because of work, school or other schedules. At Rajneeshpuram, nearly everyone works, nearly every day, beginning and ending at similar times. Because of this similarity of schedule, peaking factors for water consumption are rather high. In most cities, three to five are peaking factors commonly chosen on a community level. That is:

$$\frac{\text{Average Daily Flow}}{\text{1,400 minutes per day}} \times \text{Peaking Factor} = \text{Peak Flow in } \frac{\text{gal.}}{\text{min.}}$$

We have chosen to use six as a peaking factor for residential areas, based on similarity of schedule and measured flows at randomly selected residences in the City.

A peaking factor of four was chosen for Community Service DPAs, since there is a certain likelihood of concentrated useage for functions, such as communal dining or education programs. Commercial and Industrial areas are assigned a peaking factor of two, since the daily flow is spread statistically fairly evenly over approximately 12 hours every day;

or, in other words, the daily usage is concentrated in half the day and is therefore twice the average demand.

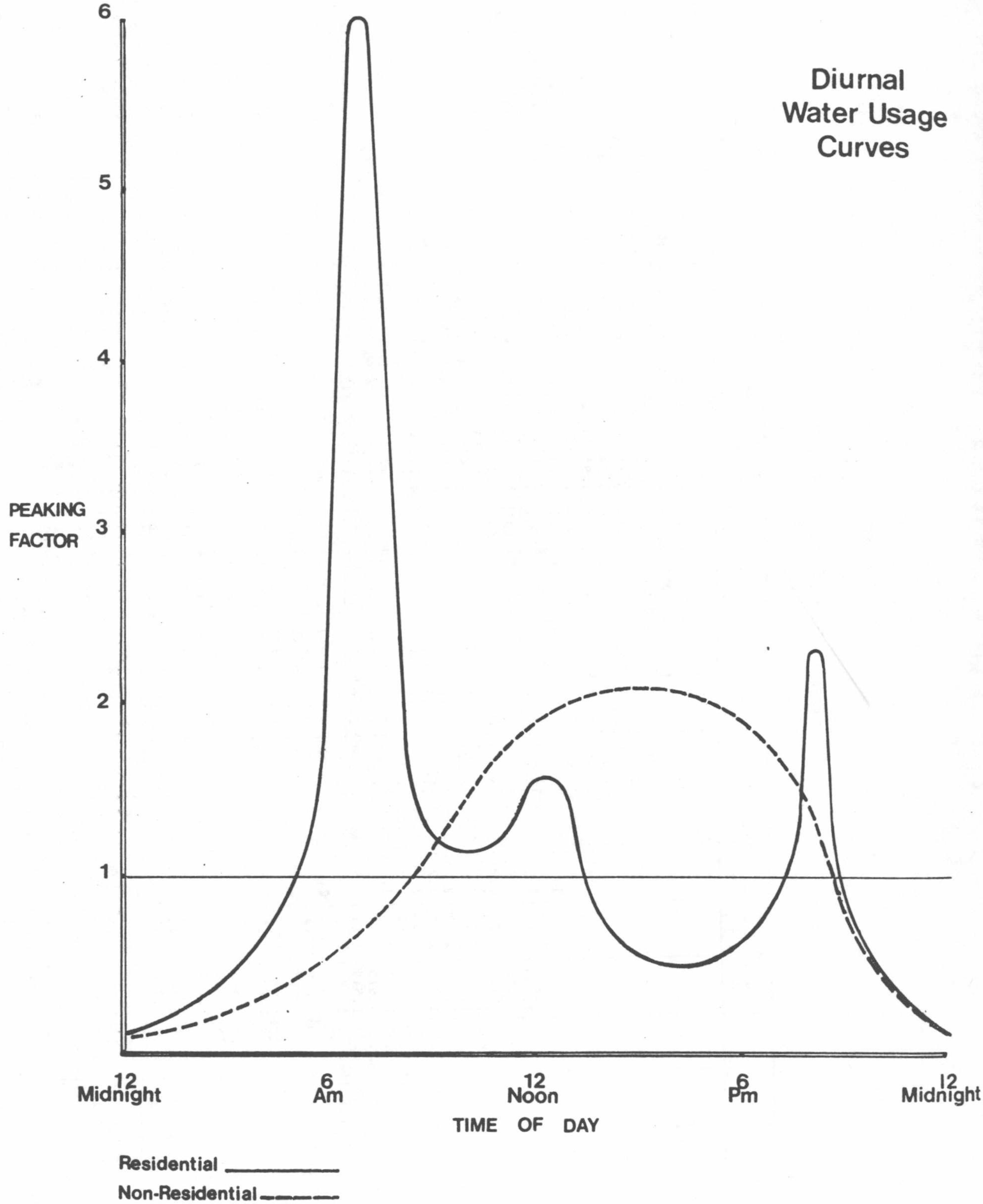
One further characteristic of peaking factors is that residential peak water usage occurs at different times of the day than commercial, industrial or community service peak flows. When adding cummulative peak flows in a line serving both residential and nonresidential areas, the lesser peak is added at 50% of its value to the greater peak. For example, if the residential cummulative peak flow along a particular mainline is 180 gpm and the nonresidential peak is 60 gpm, 50% of the 60 gpm (30 gpm) is added to the residential peak flow. So, the total peak flow = 180 gpm + 30 gpm = 210 gpm. This assumption is made because the peaks occur at different times and yet there is some nonresidential usage during peak residential periods. See "Diurnal Water Usage" diagram on the next page.

5. Minimum Pipe Sizes. For water lines, minimum size mains and distribution lines are determined up to a point by fire flow requirements. For residential areas, the minimum flow is 500 gpm. Assuming a maximum velocity in PVC of 5 feet per second, this fire flow requires a minimum of 6" mainlines to all residential areas.

For Industrial, Commercial and Community Service areas, minimum fire flow is 1,000 gpm, which requires a 10" pipe. For sewer main lines, the minimum dimension for effluent-only gravity lines is 6" because of the necessity to permit cleaning and to minimize blockages. Four-inch lines are the minimum permitted for individual service laterals.

6. Sizing Pipes. For water lines, the highest intensity usage is twice the average, so in adding peak flows along a run of pipe (when that toal reaches 250 gpm), the pipe size needs to be increased beyond 6". If the water line can handle twice the average peak flow, then it is assumed that any local concentrations will be accounted for. A similar assumption is made for nonresidential areas where a 10" fire line is required. The pipe size is increased beyond 10" to accommodate twice the average cummulative peak flow. By requiring this large safety factor, residual pressures during fire flows are maintained.

For gravity sewer lines, a 6" pipe will carry 177 gpm on a minimum .005 ft/ft slope, which is assumed to be the minimum slope. On the same basis of twice the average cummulative peak potable water flow, the size requirement of the sewer mains can bee calculated. For a chart of "Gravity Sewer Line Capacity," see page 237.


Diurnal
Water Usage
Curves
PEAKING
FACTOR
6
5
4
3
2
1
12
Midnight
6
Am
12
Noon
6
Pm
12
Midnight
TIME OF DAY
Residential
Non-Residential

GRAVITY SEWER LINE CAPACITY CHART

SLOPE	6		8		10		12		15		18		21		24		27		30		33		36	
ft/ft	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
.0006																	7.585	1.91	10.04	2.05	12.95	2.16	16.33	2.31
.0008													4.480	1.86	6.398	2.04	8.758	2.20	11.60	2.36	14.95	2.50	18.86	2.67
.0010													5.009	2.08	7.153	2.28	9.792	2.46	12.97	2.64	16.72	2.79	21.09	2.98
.0012									2.24		3.638	2.06	5.487	2.28	7.836	2.49	10.73	2.70	14.20	2.89	18.31	3.06	23.10	3.27
.0014									2.42		3.929	2.22	5.927	2.46	8.463	2.69	11.59	2.91	15.34	3.13	19.78	3.31	24.95	3.53
.0016									2.585	2.11	4.200	2.38	6.336	2.63	9.048	2.88	12.39	3.12	16.40	3.34	21.14	3.53	26.67	3.77
.0018									2.741	2.23	4.455	2.52	6.721	2.79	9.596	3.05	13.14	3.30	17.39	3.54	22.43	3.75	28.29	4.00
.0020							1.593	2.03	2.890	2.35	4.696	2.66	7.084	2.95	10.12	3.22	13.85	3.48	18.34	3.74	23.64	3.95	29.82	4.22
.0022							1.671	2.13	3.031	2.47	4.925	2.79	7.430	3.09	10.61	3.38	14.52	3.65	19.23	3.92	24.79	4.14	31.28	4.43
.0024							1.745	2.22	3.166	2.58	5.144	2.91	7.760	3.23	11.08	3.53	15.17	3.82	20.09	4.09	25.90	4.33	32.67	4.62
.0026					1.117	2.05	1.816	2.31	3.295	2.69	5.354	3.03	8.077	3.36	11.53	3.67	15.79	3.97	20.91	4.26	26.95	4.50	34.00	4.81
.0028					1.159	2.13	1.885	2.40	3.419	2.79	5.557	3.14	8.382	3.48	11.97	3.81	16.39	4.12	21.70	4.42	27.97	4.67	35.29	4.99
.0030					1.200	2.20	1.951	2.48	3.539	2.88	5.752	3.25	8.676	3.61	12.39	3.94	16.96	4.27	22.46	4.58	28.95	4.84	36.52	5.17
.0032					1.239	2.27	2.015	2.57	3.655	2.98	5.940	3.36	8.961	3.73	12.80	4.07	17.52	4.41	23.19	4.72	29.90	5.00	37.72	5.34
.0034					1.277	2.34	2.077	2.64	3.768	3.07	6.123	3.46	9.236	3.84	13.19	4.20	18.06	4.54	23.91	4.87	30.82	5.15	38.88	5.50
.0036					1.314	2.41	2.137	2.72	3.877	3.16	6.301	3.57	9.504	3.95	13.57	4.32	18.58	4.67	24.60	5.01	31.72	5.30	40.01	5.66
.0038					1.350	2.48	2.196	2.80	3.983	3.25	6.473	3.66	9.765	4.06	13.94	4.44	19.09	4.80	25.27	5.15	32.59	5.45	41.11	5.82
.0040			0.764	2.19	1.385	2.54	2.253	2.87	4.087	3.33	6.641	3.76	10.02	4.17	14.31	4.56	19.58	4.92	25.93	5.28	33.43	5.59	42.17	5.97
.0042			0.783	2.24	1.420	2.60	2.308	2.94	4.188	3.41	6.805	3.85	10.27	4.27	14.66	4.67	20.07	5.05	26.57	5.39	34.26	5.73	43.22	6.11
.0044			0.801	2.29	1.453	2.66	2.363	3.01	4.286	3.49	6.966	3.94	10.51	4.37	15.00	4.77	20.54	5.17	27.20	5.52	35.06	5.86	44.23	6.26
.0046			0.819	2.35	1.486	2.72	2.416	3.08	4.382	3.57	7.122	4.03	10.74	4.47	15.34	4.88	21.00	5.28	27.81	5.65	35.85	5.99	45.23	6.40
.0048	0.389	1.98	0.837	2.40	1.518	2.78	2.468	3.14	4.477	3.65	7.275	4.12	10.97	4.56	15.67	4.99	21.45	5.39	28.41	5.77	36.62	6.12	46.20	6.54
.0050	0.397	2.02	0.854	2.45	1.549	2.84	2.519	3.20	4.569	3.72	7.425	4.20	11.20	4.66	15.99	5.09	21.90	5.51	28.99	5.89	37.38	6.25	47.15	6.67
.0052	0.405	2.06	0.871	2.50	1.580	2.90	2.569	3.27	4.660	3.80	7.572	4.28	11.42	4.75	16.31	5.19	22.33	5.62	29.57	6.00	38.11	6.37	48.09	6.80
.0054	0.412	2.10	0.887	2.54	1.610	2.95	2.618	3.33	4.748	3.87	7.717	4.37	11.64	4.84	16.62	5.29	22.75	5.72	30.13	6.14	38.85	6.49	49.00	6.93
.0056	0.420	2.14	0.904	2.59	1.639	3.01	2.666	3.39	4.835	3.94	7.858	4.45	11.85	4.93	16.93	5.39	23.17	5.83	30.68	6.25	39.56	6.61	49.90	7.06
.0058	0.427	2.18	0.920	2.64	1.668	3.06	2.713	3.45	4.921	4.01	7.997	4.53	12.06	5.01	17.23	5.48	23.58	5.93	31.22	6.36	40.26	6.73	50.78	7.18
.0060	0.435	2.22	0.935	2.68	1.697	3.11	2.759	3.51	5.005	4.07	8.134	4.60	12.27	5.10	17.52	5.58	23.99	6.03	31.76	6.47	40.95	6.84	51.65	7.31
.0062	0.442	2.25	0.951	2.72	1.725	3.16	2.805	3.57	5.088	4.15	8.268	4.68	12.47	5.18	17.81	5.67	24.38	6.13	32.28	6.58	41.62	6.96	52.51	7.43
.0064	0.449	2.29	0.966	2.77	1.752	3.21	2.850	3.63	5.169	4.21	8.401	4.75	12.67	5.27	18.10	5.76	24.77	6.23	32.80	6.68	42.29	7.07	53.35	7.55
.0066	0.456	2.32	0.981	2.81	1.780	3.26	2.894	3.68	5.249	4.28	8.531	4.83	12.87	5.35	18.38	5.85	25.16	6.33	33.31	6.79	42.95	7.18	54.17	7.66
.0068	0.463	2.36	0.996	2.85	1.806	3.31	2.937	3.74	5.328	4.34	8.659	4.90	13.06	5.43	18.65	5.94	25.53	6.42	33.81	6.89	43.59	7.29	54.99	7.78
.0070	0.469	2.39	1.010	2.89	1.833	3.36	2.980	3.79	5.406	4.41	8.786	4.97	13.25	5.51	18.92	6.02	25.91	6.52	34.30	6.99	44.23	7.39	55.79	7.89
.0072	0.476	2.42	1.025	2.94	1.859	3.41	3.023	3.85	5.483	4.47	8.910	5.04	13.44	5.59	19.19	6.11	26.27	6.61	34.79	7.09	44.85	7.50	56.58	8.00
.0074	0.483	2.46	1.039	2.96	1.884	3.45	3.064	3.90	5.558	4.53	9.033	5.11	13.63	5.67	19.46	6.19	26.64	6.70	35.27	7.19	45.47	7.60	57.36	8.11
.0076	0.489	2.49	1.053	3.01	1.910	3.50	3.105	3.95	5.633	4.59	9.155	5.18	13.81	5.74	19.72	6.28	26.99	6.79	35.74	7.28	46.08	7.70	58.13	8.22
.0078	0.495	2.52	1.067	3.05	1.935	3.55	3.146	4.01	5.707	4.65	9.274	5.25	13.99	5.82	19.98	6.36	27.35	6.88	36.21	7.38	46.69	7.80	58.89	8.33
.0080	0.502	2.56	1.080	3.09	1.959	3.59	3.186	4.06	5.779	4.71	9.392	5.31	14.17	5.89	20.23	6.44	27.70	6.97	36.67	7.47	47.28	7.90	59.64	8.44
.0082	0.508	2.59	1.094	3.13	1.984	3.64	3.226	4.11	5.851	4.77	9.509	5.38	14.34	5.96	20.48	6.52	28.04	7.05	37.13	7.56	47.87	8.00	60.38	8.54
.0084	0.514	2.62	1.107	3.17	2.008	3.68	3.265	4.16	5.922	4.83	9.624	5.45	14.52	6.04	20.73	6.60	28.38	7.14	37.58	7.66	48.45	8.10	61.12	8.65
.0086	0.520	2.65	1.120	3.21	2.031	3.72	3.303	4.21	5.992	4.88	9.738	5.51	14.69	6.11	20.98	6.68	28.72	7.22	38.02	7.75	49.02	8.19	61.84	8.75
.0088	0.526	2.68	1.133	3.24	2.055	3.77	3.342	4.26	6.061	4.94	9.851	5.57	14.86	6.18	21.22	6.75	29.05	7.31	38.46	7.84	49.59	8.29	62.69	8.87
.0090	0.532	2.71	1.146	3.28	2.078	3.81	3.379	4.30	6.130	5.00	9.962	5.64	15.03	6.25	21.46	6.83	29.38	7.39	38.90	7.92	50.15	8.38	63.26	8.95
.0092	0.538	2.74	1.158	3.31	2.101	3.85	3.417	4.35	6.198	5.05	10.07	5.70	15.19	6.27	21.70	6.91	29.70	7.47	39.33					
.0094	0.544	2.77	1.171	3.35	2.124	3.89	3.454	4.40	6.265	5.11	10.18	5.76	15.36	6.39	21.93	6.98	30.02	7.55	39.75					
.0096	0.550	2.80	1.183	3.39	2.146	3.94	3.490	4.44	6.331	5.16	10.29	5.82	15.52	6.45	22.16	7.05	30.34	7.63	40.17					
.0098	0.555	2.83	1.195	3.42	2.169	3.98	3.526	4.49	6.397	5.21	10.40	5.89	15.68	6.52	22.39	7.13	30.65	7.71	40.59					
.0100	0.561	2.36	1.208	3.46	2.191	4.02	3.562	4.54	6.462	5.27	10.50	5.94	15.84	6.59	22.62	7.20	30.97	7.79	41.00					
.0102	0.567	2.89	1.220	3.49	2.212	4.06	3.598	4.58	6.526	5.32	10.61	6.00	16.00	6.65	22.84	7.27	31.27	7.86	41.41					

8. Residual Pressure in Water Lines. Residual pressures are calculated based on peak cummulative flows plus fire flow; that is, if a fire happens during a peak usage period, how much pressure will remain in the line. It should be more than 20 psi. There is called residual pressure, as compared to static pressure, which is higher and based solely on difference in elevation from reservoir to point of measurement. Neither the static pressure nor the residual head should be less than 20 psi or greater than 125 psi (unless pipe stronger than Class 200 PVC is used).

Residual pressure is computed by taking the static head and deducting all losses due to friction or the energy lost due to the movement of water through the distribution of pipe and valves. The friction losses were calculated by using the Williams and Hazen formula:

$$F = .2083 \ \frac{100}{c}^{1.85} \ \frac{Q^{\ 1.852}}{di^{\ 4.8655}}$$

where F = friction head in feet of water per 100 feet of pipe
di = inside diameter of pipe in inches
Q = flow in gallons per minute
C = constant for inside roughness of pipe (150 for PVC)

GAUTAM THE BUDDHA GROVE ESTIMATED WATER USE

DPA	ACRES	GPD/A	GPD TOTAL	AVG. DEMAND	FACTOR PEAK	PEAK FLOW
R 1	17.4	850	14,790	10	6	60
R 2	18.8	850	15,980	11	6	66
R 3	12.4	850	10,540	7	6	42
R 4	15.5	850	13,175	9	6	54
R 5	15.0	850	12,750	9	6	54
R 6	4.7	850	3,995	3	6	18
R 7	27.6	850	23,460	16	6	98
R 8	3,2	850	2,720	2	6	12
R 9	6.9	850	5,865	4	6	24
R 10	10.3	850	8,755	6	6	36
R 11	20.3	850	17,255	12	6	72
R 12	10.6	850	9,010	6	6	36
R 13	5.2	850	4,420	3	6	18
C 1	48.6	400	19,440	13	2	26
C 2	20.5	400	8,200	6	2	12
C 3	2.5	400	1,000	1	2	2
C 4	13.9	400	5,560	4	2	8
C 5	5.3	400	2,120	1	2	2
C 6	4.8	400	1.920	1	2	2
I 1	47.1	500	21,550	16	2	32
I 2	21.2	500	10,600	7	2	14
I 3	24.0	500	1,200	1	2	2
CS 1	19.4	500	9,700	7	4	28
CS 2	31.3	500	15,650	11	4	44
CS 3	32.6	500	16,300	11	4	44
CS 4	6.6	500	3,300	2	4	8
CS 5	26.4	500	13,200	9	4	36
CS 6	13.2	500	6,600	5	4	20
P 1	4.2	100	420	1	2	2
P 2	25.3	100	2,530	2	2	4
P 3	4.8	100	480	1	2	2
P 4	1.2	100	120	1	2	2
P 5	4.5	100	450	1	2	2
PC 1	15.7	500	7,850	5	6	30
PC 2	5.0	500	2,500	2	6	12
PC 3	2.4	500	1,200	1	6	6
PC 4	2.2	500	1,100	1	6	6
PRC 1	15,7	700	10,990	8	4	32
PRC 2	15.2	700	10,640	7	4	28
PRC 3	7.2	700	5,040	4	4	16

DESIDERATA CANYON ESTIMATED WATER USE

DPA	ACRES	GPD/A	GPD TOTAL	AVG. DEMAND	FACTOR PEAK	PEAK FLOW
R 1	4.3	400	1,720	1	6	6
R 2	4.3	400	1,720	1	6	6
R 3	7.5	400	3,000	2	6	12
R 4	4.6	400	1,840	1	6	6
R 5	7.6	400	3,040	2	6	12
R 6	8.5	400	3,400	2	6	12
R 7	9.6	400	3,840	3	6	18
R 8	8.0	400	3,200	2	6	12
R 9	6.0	400	2,400	2	6	12
R 10	8.0	400	3,200	2	6	12
R 11	15.5	400	6,200	4	6	24
R 12	1.8	400	720	1	6	6
R 13	12.3	400	4,920	3	6	18
R 14	4.8	400	1,920	1	6	6
R 15	1.6	400	640	1	6	6
R 16	2.5	400	1,000	1	6	6
R 17	4.9	400	1,900	1	6	6
R 18	6.6	400	2,640	2	6	12
R 19	2.9	400	1,160	1	6	6
R 20	6.5	400	2,600	2	6	12
C 1	8.7	400	3,480	2	2	4
I 1	14.0	500	7,00	5	2	10
CS 1	7.8	500	3,900	3	4	12
CS 2	11.9	500	4,760	3	4	12
CS 3	19.6	500	9,800	7	4	28
CS 4	3.6	500	1,800	1	4	4
P 1	1.9	100	190	1	2	2
P 2	3.9	100	350	1	2	2

JESUS GROVE ESTIMATED WATER USE

DPA	ACRES	GPD/A	GPD TOTAL	AVG. DEMAND	FACTOR PEAK	PEAK FLOW
R 1	5.2	500	2,600	2	6	12
R 2	5.9	500	2,950	2	6	12
R 3	3.5	500	1,750	1	6	6
R 4	2.3	500	1,150	1	6	6
R 5	3,5	500	1,750	1	6	6
R 6	11.7	500	5,850	4	6	24
R 7	6.6	500	3,300	2	6	12
R 8	7.5	500	3,750	3	6	18
R 9	3.6	500	1,800	1	6	6
R 10	12.0	500	6,000	4	6	24
R 11	11.7	500	5,850	4	6	24
R 12	11.7	500	5,850	4	6	24
R 13	13.4	500	6,700	5	6	30
R 14	7.8	500	3,900	3	6	18
R 15	14.5	500	7,250	5	6	30
R 16	6.5	500	3,250	2	6	12
R 17	7.3	500	3,650	2	6	12
R 18	2.5	500	1,250	1	6	6
R 19	3.0	500	1,500	1	6	6
C 1	7.8	400	3,120	2	2	4
C 2	2.8	400	1.120	1	2	2
C 3	10.4	400	4,160	3	2	6
C 4	14.4	400	5,760	4	2	8
I 1	15.4	500	7,700	5	2	10
I 2	1.5	500	750	1	2	2
I 3	14.4	500	7,200	5	2	10
I 4	3.1	500	1,550	1	2	2
I 5	10.3	500	5,150	4	2	8
I 6	1.5	500	750	1	2	2
CS 1	3.8	500	1,900	1	4	4
CS 2	15.8	500	7,900	5	4	20
CS 3	13.7	500	6,850	5	4	20
CS 4	7.6	500	3,800	3	4	12
P 1	2.8	100	280	1	2	2
P 2	1.7	100	170	1	2	2
P 3	4.9	100	490	1	2	2
P 4	3.0	100	300	1	2	2
PC 1	7.9	500	3,950	3	6	18
PC 2	3.8	500	1,900	1	6	6
PC 3	3.3	500	1,650	1	6	6
PRC 1	5.7	700	3,990	3	4	12
PRC 2	1.9	700	1,300	1	4	4

TOTAL ESTIMATED WATER USAGE FOR THE CITY: YEAR 2002

JESUS GROVE:

ZONE	ACRES	GPD/A	GPD TOTAL	AVG. DEMAND	FACTOR PEAK	PEAK FLOW
R	140	500	70,000	49	6	292
C	35	400	14,000	10	2	20
I	46	500	23,000	16	2	32
CS	41	500	20,500	14	4	56
P	13	100	1,300	1	2	2
PC	15	500	7,500	5	6	30
PRC	8	700	5,600	4	4	16
			141,900 GPD = 98 GPM			

DESIDERATA CANYON:

ZONE	ACRES	GPD/A	GPD TOTAL	AVG. DEMAND	FACTOR PEAK	PEAK FLOW
R	128	400	51,200	35	6	210
C	9	400	3,600	3	2	6
I	14	500	7,000	5	2	10
CS	43	500	20,260	4	4	14
P	5	100	540	1	2	2
			82,600 GPD = 57 GPM			

GAUTAM THE BUDDHA GROVE:

ZONE	ACRES	GPD/A	GPD TOTAL	AVG. DEMAND	FACTOR PEAK	PEAK FLOW
R	168	850	142,800	99	6	594
C	96	400	38,400	27	2	54
I	71	500	35,500	25	2	50
CS	130	500	65,500	45	4	180
P	40	100	4,000	3	2	6
PC	25	500	12,500	9	6	54
PRC	38	700	26,600	18	4	72
			266,300 GPD = 185 GPM			

TOTAL = 490,800 GPD = 341 GPM

4. SEWAGE DISPOSAL

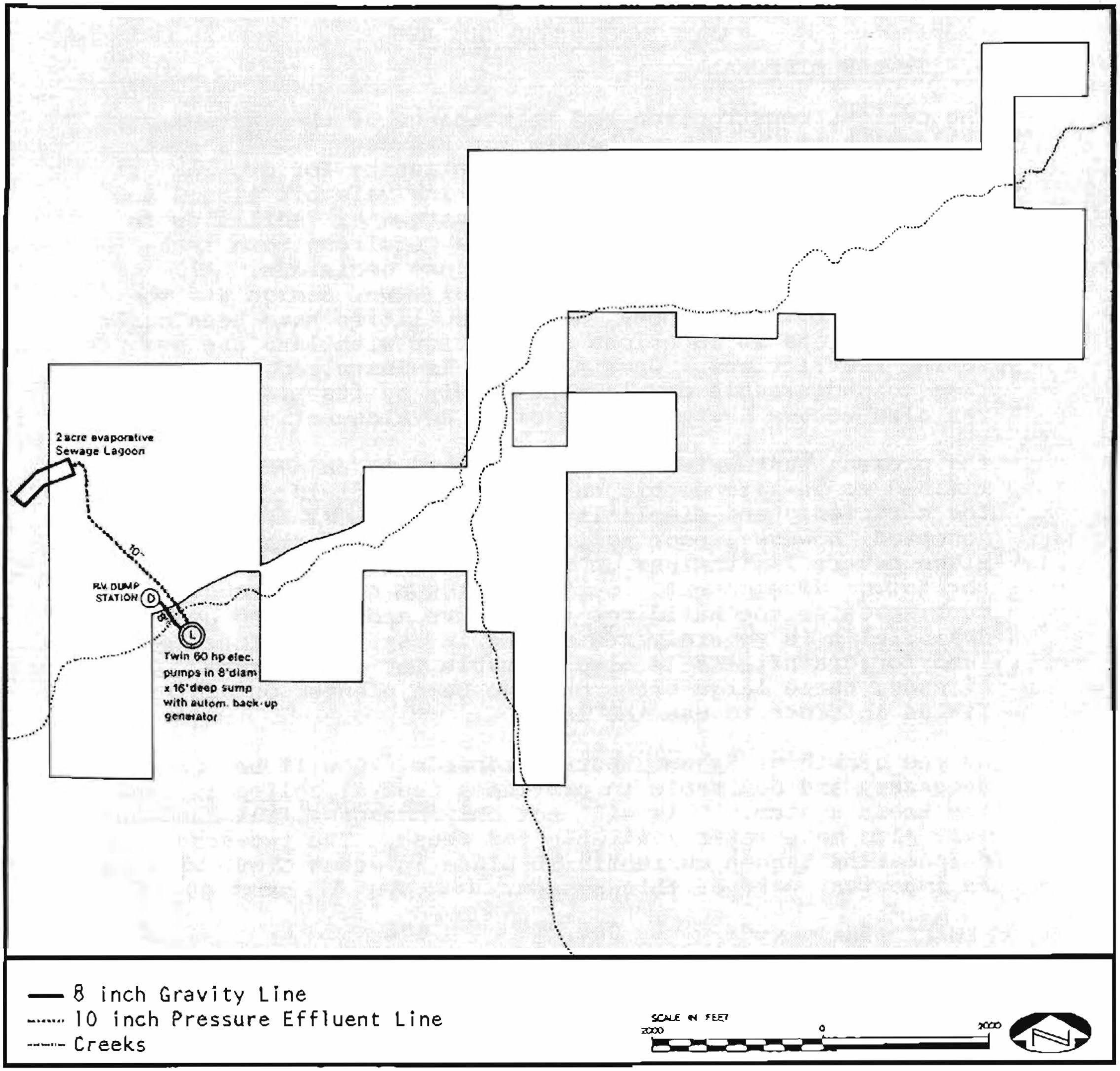
The design, construction and maintenance of the wastewater collection and treatment system for Rajneeshpuram is a key element of orderly and responsible planning for growth. It is also a primary method for recovering valuable liquid and solid resources. The planning of wastewater facilities in unsewered areas is a complex process requiring both technical evaluation and important land use decisions. All too often, due to the technical nature of sewer design and the presssure from developers, sewage facilities have been built to a scale and in locations in conflict with land use and zoning restrictions. Once a system is installed, it may give rise to undesirable development merely by its presence. It can also become a strong control on development.

The present wastewater treatment method in Rajneeshpuram is limited to on-site septic tanks with drainfield disposal. The efficiency and simplicity of these systems is well accepted; however, poor soils and a lack of suitable terrain place severe limitations on continued use of on-site systems for future development. Septic fields can often occupy as much space as the buildings they serve and the land used for drainfields is severely restricted in use. Often the best land for drainfields is also suitable for agriculture. Already, three large orchards have been planted on drainfields in order to use the land.

As the growth of Rajneeshpuram proceeds, it will become necessary and desirable to provide a central collection and treatment system. This will not only conserve flat land but will also make water available for reuse. The two-acre evaporation lagoon currently in place in Jesus Grove will be an important part of this system. (See Map 37, next page.)

SEWAGE TREATMENT

The transition from on-site to central treatment in Rajneeshpuram is a necessary step in the City's continued growth. The design of a City sewage treatment system is influenced by many factors, some of them unique to Rajneeshpuram. The following considerations are forefront in the design of a centralized treatment system:


2 acre evaporative Sewage Lagoon
R.V. DUMP STATION
Twin 60 hp elec. pumps in 8'diam x 16'deep sump with autom. back-up generator
8 inch Gravity Line
10 inch Pressure Effluent Line
Creeks
SCALE IN FEET
2000
0
2000

- Method and Leval of Treatment

  The effectiveness, efficiency and recycling potential of the system reflects a desire to use a technology that works well but does not over-treat. Many natural biological processes are receiving renewed attention in the field of waste treatment. Such systems are capable of treatment levels suitable for a wide variety of agricultural uses. Agricultural projects that have been carefully designed can often use partially treated wastewater as nutrient and produce a more fully treated product. The rural setting of Rajneeshpuram provides for this potential, whereas many urban areas rely on high power-consuming and chemical additive treatment plants to produce effluents of similar quality. In all cases, however, treatment will meet or exceed appropriate federal standards.

- Innovative Technology

  Standard technologies are readily accepted by the public and governmental agencies. However, they are often not efficient, require much maintenance, are inflexible and use excessive amounts of energy.

  Innovative technologies are potentially unreliable or unproved and are best tested in a controlled application of small scale. The advantages, however, may be low energy requirement, ease of operation and benefit to the environment. In between the proven and the unproven, the traditional and the innovative, there exists a wide variety of methods.

  The Environmental Protection Agency describes a curve of system reliability in the "Innovative and Alternative Technology Assessment Manual" that illustrates a method for defining the viability of new and innovative technologies. The evaluation of all alternatives always produces a compromise. This area of the curve is known as the "window of acceptable risk." In other words, when all options are studied some risks are acceptable when considered along with potential advantages. The community will seek systems that maximize the benefits of modern technological research and innovation without accepting excessive risk.

- Step-Wise Development

  There are also technical and economic advantages to developing central utility services in stages, especially in waste treatment. Development in stages allows for the introduction of new technology at a time after the initial design is complete but before the construction of the system is completed. If the needs of the community change, the system can correspondingly be adapted. Finally, in the process of using parts of the system much may be learned and improvements can be made if there is an open-ended design.

Often, a city commits itself to a large and expensive system based on current projections that change before the new system even goes into operation. The unpredictability of technology, economics and changing population needs, all point to flexible system design. In order to allow this flexibility, a staged development is proposed. This combines the advantages of central systems with the opportunity to make modifications that reflect new realities as the City grows. The City will also be a part of developing these new realities by encouraging experimental systems.

- Community Compatibility

  There are some local factors that must be taken into account. For example, the canyons and rolling hill topography must be carefully considered and planned for.

  While it is an unusual guideline for any technical development to seek to be compatible with the spirit of the community, it is absolutely relevant to this City. The high level of education of its citizens and their desire to explore and experiment make it possible to propose innovative solutions. The Environmental Protection Agency's program of Innovative and Alternative Technology has been an important part of this planning process. The spirit with which it has been conceived is very much in keeping with Rajneeshpuram policy and much can be done to facilitate valuable research on experimental systems.

PROPOSED SYSTEMS

Although it is recommended that drainfields be phased out, septic tanks serve a valuable function and their use is to be continued after central collection systems are installed. Their effectiveness in settling solids and primary anaerobic treatment allow the collection system to be reduced in size and slope requirements, and eliminate numerous maintenance problems associated with solids-carrying collection systems.

Greater flexibility also will be allowed in the design of the central treatment facility. Septage, or settled sludge, in the septic tanks will be pumped as needed and deposited at an approved land disposal site. Various uses for the septage are being evaluated. They include soil conditioning for forage crop production, composting and vermiculture (the use of worms to treat the septage and to produce castings, which are a valuable agricultural material).

The only long-term installation proposed in any of the City's systems is the transmission main line. This should be designed for the total projected needs. Laterals will be added only when needed to serve new construction. There are advantages in placing the ultimate line in at the beginning, such as:

- growth boundaries are well defined and the total projected need can actually be predicted. Therefore, the size can be predicted;

- the cost of labor and materials is rising, making it cheaper to put a slightly larger line in place to begin with;

- the excavation and construction for 4", 6" or 10" line does not change substantially.

In summary, a few principles - conservation, high treatment quality, economy of scale and suitability of technology, all of which are overall community goals - will dominate the design of the proposed system.

5. ELECTRIC POWER

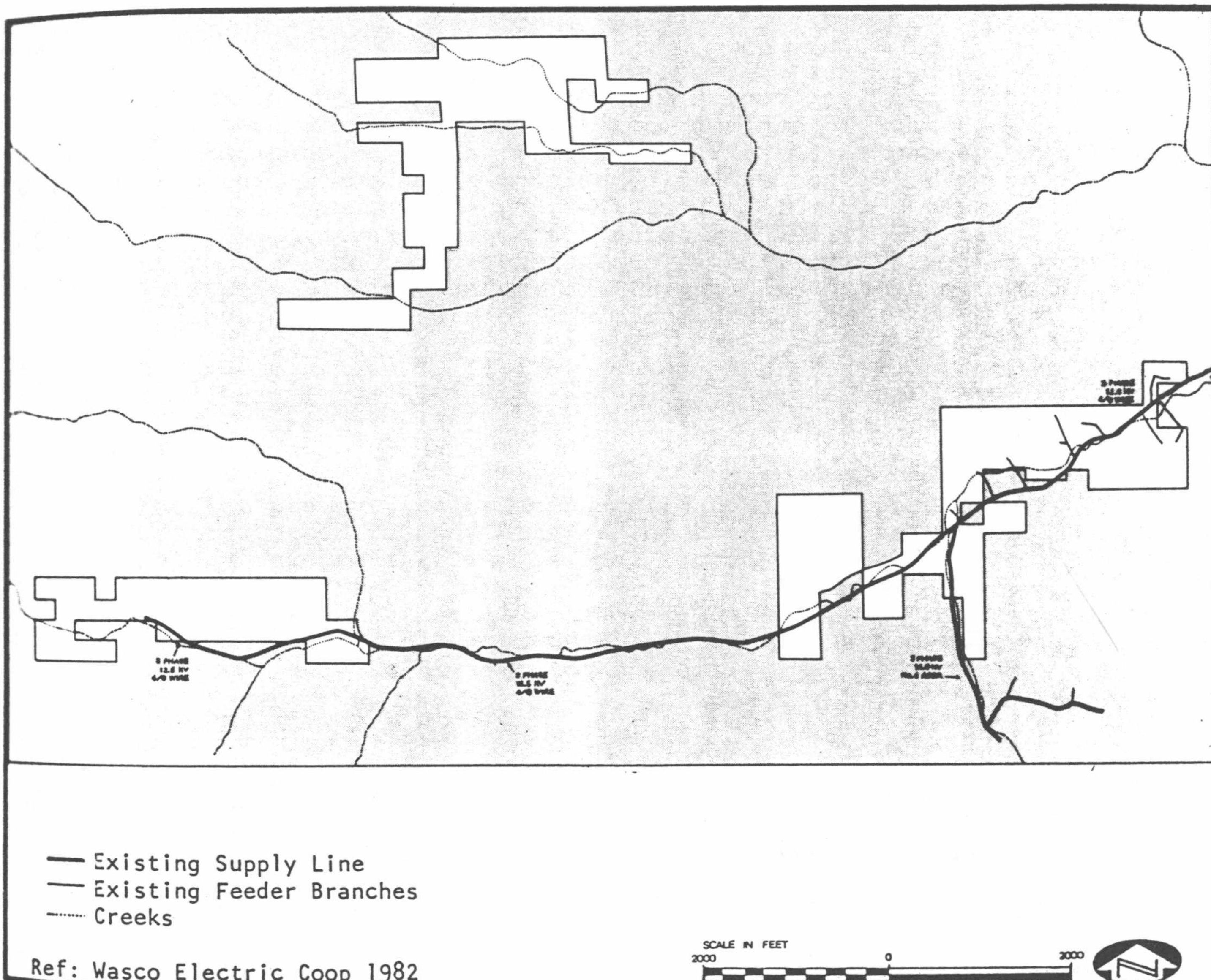
The present electrical needs are served by a 12,500-volt (12.5-KV) line from the substation in Antelope. The line runs east to Clarno, then south to the eastern bank of the Radha River, crossing the river near the mouth of Kabir Creek and running southwest along Kabir Creek to the Jesus Grove area of Rajneeshpuram. This line is 19 miles long and it is estimated that the present load on the system, exclusive of Rancho Rajneesh, is about 1,000 KW. The connected load on Rancho Rajneesh is presently about 2,000 KW, and growing at a rate of 400 KW per month, giving a total existing load of about 3,000 KW for the Clarno Basin system. Because of the length of the line and its small size, No. 4 copper in places, the capacity is reduced to approximately 50 amps for each of three phases by the time it reaches Rajneeshpuram. This capacity is insufficient for the projected requirements during the next twelve months. There is, however, a contract with Wasco Electric Cooperative, the supplier for this area, to construct a higher voltage (69-KV) transmission line from the Clarno vicinity to Rajneeshpuram with a substation facility of ten megawatts (10 MW) capacity. The new line from Clarno will be three-phase 266.8 MCM. It will be constructed to 115-KV standards, since the main transmission line at Clarno is expected to be upgraded from 69 KV to 115 KV in the next five to eight years. Rajneeshpuram's substation will be located opposite the old Ranch headquarters on a cut slope on the south side of the valley. The main 12.5-KV distribution lines each will have a capacity of approximately 3 MW. The expected completion date of this line and substations is November 1982. An engineering consultant firm reports no adverse findings in an environmental impact statement prepared for the installation. This line will take some of the present load from the Antelope line and will provide for the electrical needs of Rajneeshpuram in the foreseeable future. Distribution and service lines can easily be extended from this source to keep pace with projected load requirements, which are anticipated to be five items greater than present levels by 1990. This projection is based on a population of 2,000 according to a forecast by the Bonneville Power Administration.

The existing electrical distribution system is shown on Map 38 on page 251.

The following table summarizes typical electric power usage in the residential and commerical sectors of Rajneeshpuram for a five-month period in 1982.

LOCATION	MONTH	KWS	COST	INCLUDES A DEMAND CHARGES OF:
Cafeteria	March	12,840	423.90	(95.40)
	April	15,600	561.30	(163.80)
(10,000 sq.ft.)	May	16,920	594.30	(163.80)
	June	18,720	603.30	(127.80)
(festival)	July	27,480	908.70	(214.20)
Office and Warehouse Building	March	15,720	571.50	(171.00)
	April	14,640	508.50	(135.00)
	May	16,680	545.10	(120.60)
(15,000 sq.ft.)	June	18,120	602.70	(142.20)
	July	21,600	704.10	(156.60)
Residence #1	March	3,161	86.53	
	April	2,756	76.40	
(1,850 sq.ft.)	May	2,101	60.03	
	June	2,077	59.43	
	July	2,460	69.00	
Residence #2	March	3,794	102.35	
	April	3,899	104.98	
(1,850 sq.ft.)	May	3,562	96.55	
	June	2,750	76.25	
	July	2,474	69.35	
Residence #3	March	1,609	47.73	
	April	1,582	47.05	
(1,850 sq.ft.)	May	1,082	34.55	
	June	993	32.33	
	July	1,362	41.55	

CITY OF RAJNEESHPURAM - Existing Electric Distribution Lines Map 38



6. STORM AND WATER DRAINAGE

DESIGN CONSIDERATIONS

The basic objective of this storm runoff analysis is to provide information pertinent to the designs of structures in and adjacent to areas potentially affected by runoff. The principal items to be considered in the design of a structure to be built on a waterway include the flow to which the structure could reasonably be subjected within its estimated economic life, the inconvenience resulting from a flood of greater magnitude, and the safety of life and property that could be endangered by failure of the structure.

Currently, there is little accurate historical data about storm runoff to use as a design basis, other than old-timers' stories and the height of brush washed up against trees in some canyons.

For the present, calculations will have to depend on more regional, generalized data and on arithmetic methods until enough measurements can be made locally.

The Commune has installed several weather stations on the property (see Map 3 on page 25 for locations and types) and plans to acquire devices for streamflow measurement.

RUNOFF CALCULATIONS

The U.S. Soil Conservation Department recommends the use of a "probable" maximum of 1.6 inches of rainfall per storm. They also recommend a "CN" (curve number) factor of 75 to 85 for the type of soil cover encountered on the ranch. See Figure 10, next page, for CN=80. Peak discharge for an area also varies with the general slope of the basin. The following runoff calculation is an example using 1,800 acres.

Slope	Factor	Runoff
Moderate	CN 75	25 CFS
Moderate	CN 80	50 CFS

It can be seen that runoff varies widely with the choice of factors and that choice can only be made from experience in a given locale. Rajneeshpuram designers will continue to

PEAK RATES OF DISCHARGE FOR SMALL WATERSHEDS
TYPE I STORM DISTRIBUTION

SLOPES -- MODERATE
CURVE NUMBER - 80

24 HOUR RAINFALL FROM US WB TP-43, TP-47, & (Revised) TP-40

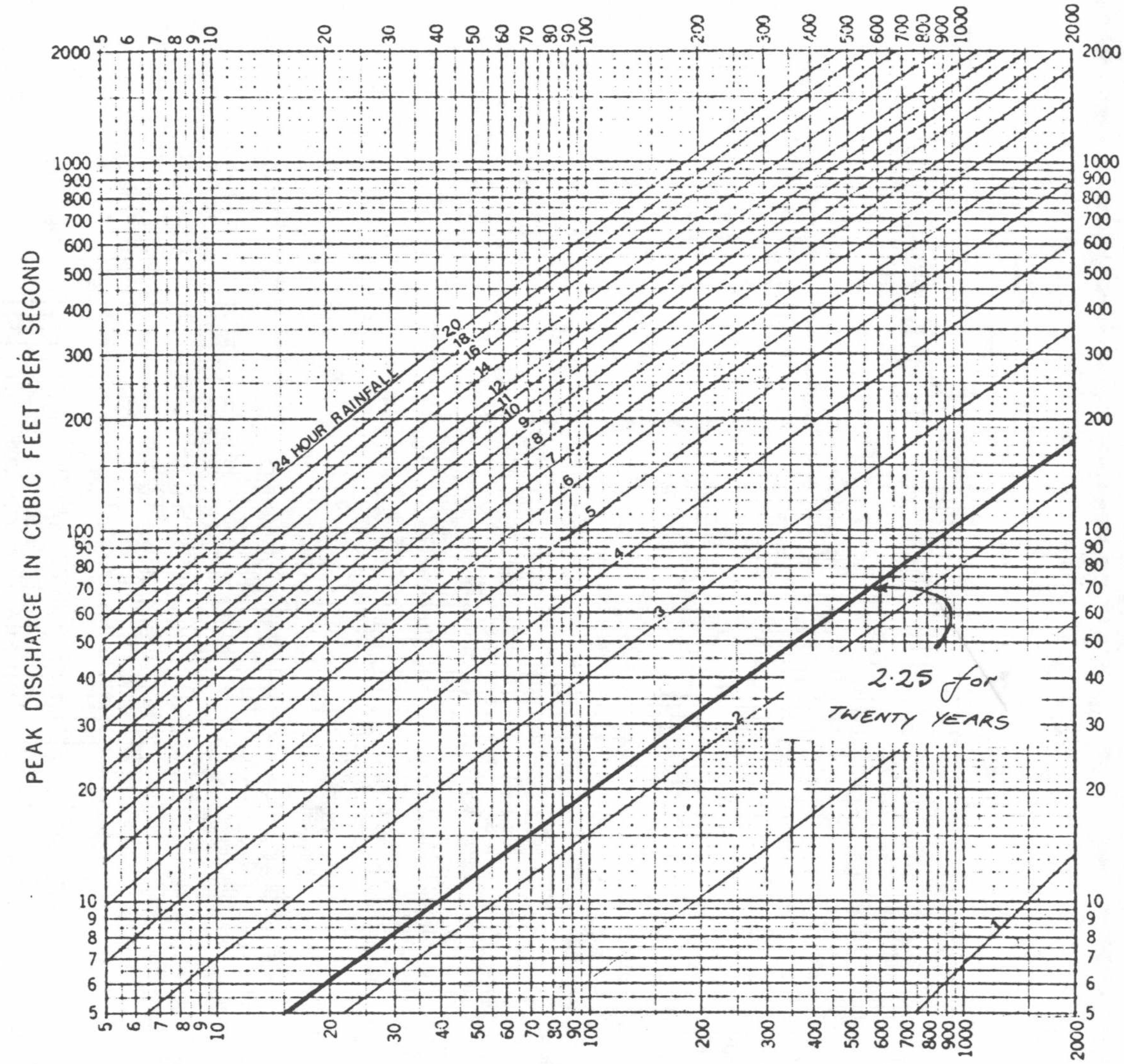
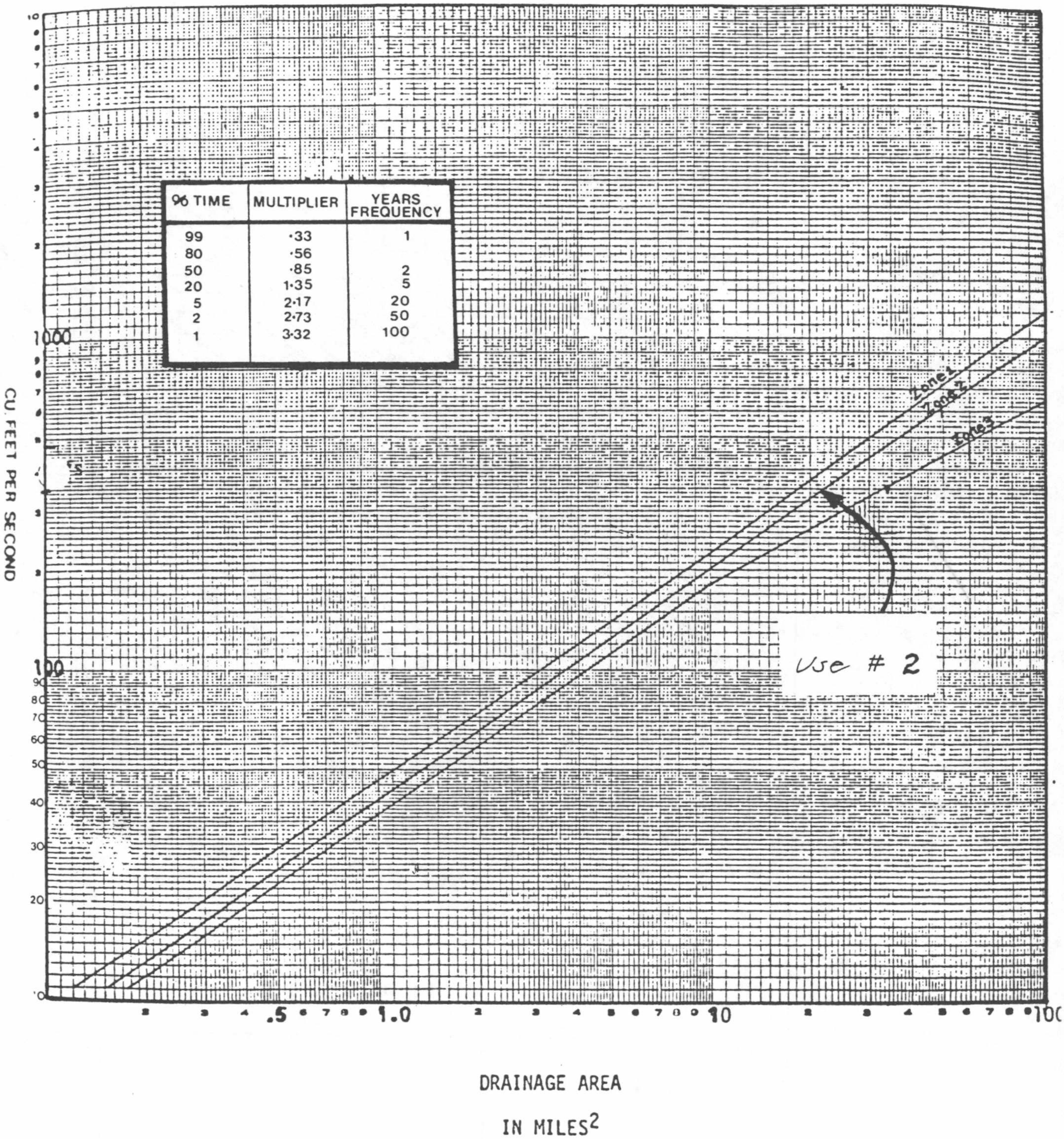


Exhibit 2-11

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING DIVISION - HYDROLOGY BRANCH	STANDARD DWG. NO. ES- 1026 SHEET 24 OF 39 DATE 6-1-71

Storm Runoff Chart (Large Watersheds) Figure 11



% TIME	MULTIPLIER	YEARS FREQUENCY
99	·33	1
80	·56	
50	·85	2
20	1·35	5
5	2·17	20
2	2·73	50
1	3·32	100

modify the runoff factors in future calculations as a result of experience.

The Oregon Highway Department's runoff curves for many of the tributaries to the Radha River are shown on Figure 11 on the previous page. It can be seen from the curve that an area twice the size does not increase the runoff by twice as much. This is generally attributable to the storm water delay time. That is, water that falls near to the point of measurement arrives within minutes, while water from the upper reaches may take hours to arrive. As the drainage areas for Rajneeshpuram are quite large, calculation methods that take this factor into account are more useful.

The geographic configuration of Kabir Creek is long and relatively narrow. It has a reservoir upstream that acts as a shock absorber. The time to peak flow is about 12 hours or more. On the other hand, the Farid Creek basin is relatively short and more nearly round, and time of peak flow is about 4 - 6 hours. Thus, varying with storm location, the flow rate below the confluence of Farid and Kabir creeks will vacillate and not necessarily be the sum of the peak flow rates of the two streams. The catchment areas that drain through each of the three areas of Rajneeshpuram are shown in Maps 15 and 16 on pages 67 and 68.

Maps 39, 40 and 41 on the following pages show the areas of the contributary drainage basins and anticipated runoff expressed in cubic feet/second (CFS) based on a 20-year frequency storm. The amount of runoff is determined using the Soil Conservation Service curves: moderate slopes CN 80". Where the area is shown in square miles, the Oregon Department of Transportation's "John Day River Basin Zone 2" was used.

As can be seen by the various catchment areas, the places at which storm runoff will have the greatest impact are:

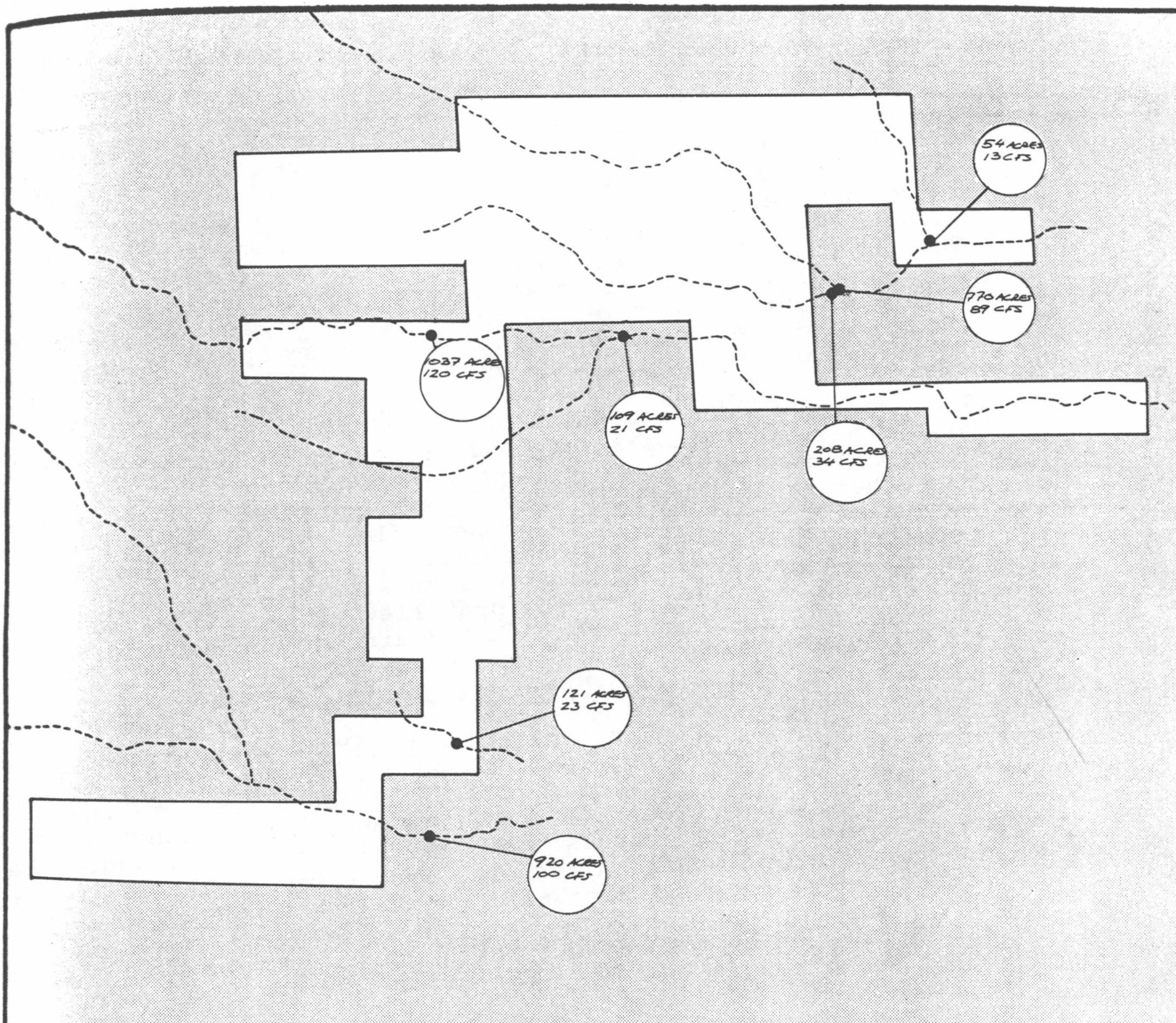
- the mouth of Desiderata Canyon. Both Hassan and Suzuki canyons empty into the rather small creek bed that runs the length of Desiderata Canyon, at or near its mouth.

- the steep rock walls within 100 feet of either side of the creek prevent building there, so the question is basically one of planning for nearly continuous accessibility by road through the entrance of Desiderata Canyon.

- in Jesus Grove, Kabir Creek, which drains 44 square miles, and Farid Creek, which drains 49 square miles, join just below the old ranch headquarters to create a combined

GAUTAM THE BUDDHA GROVE - 20-Year Storm Water Runoff

Map 39



---- Stream Flow Line

● Points of Measurement

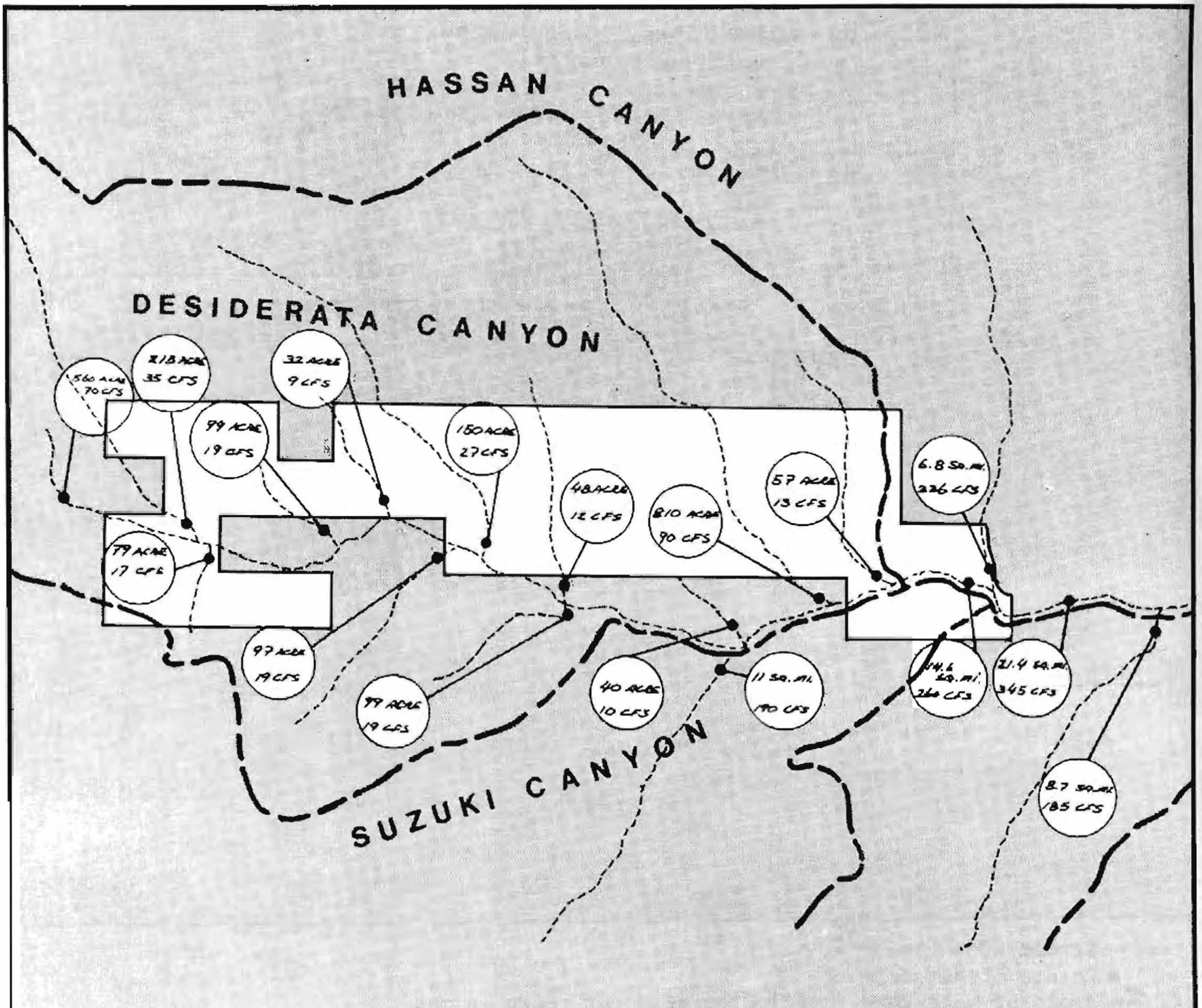
121 ACRES Areas of Watershed - including area not shown in map

100 CFS Estimated Runoff in Cubic Feet per Second

Ref: USGS Soil Conservation Service Engineering Division Hydrology Branch

SCALE IN FEET

2000 0 2000



---- Stream Flow Line

● Points of Measurement

Areas of Watershed - including area not shown in map

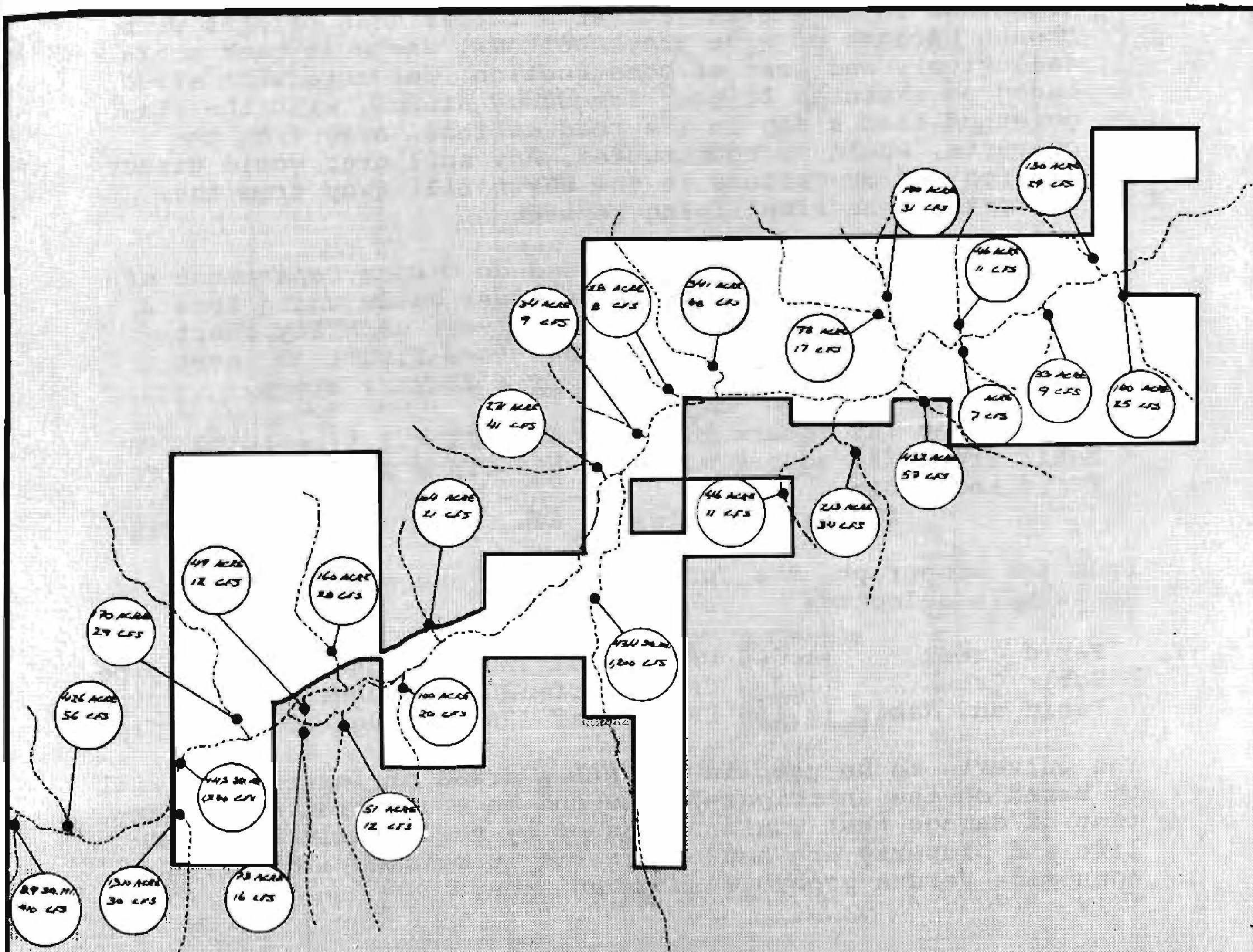
Estimated Runoff in Cubic Feet per Second

Boundary Line for Major Canyons shown

Ref: Oregon Dept. of Transportation Hydrology Department

JESUS GROVE - 20-Year Storm Water Runoff

Map 41



--- Stream Flow Line

● Points of Measurement

Areas of Watershed - including area not shown in map

Estimated Runoff in Cubic Feet per Second

Ref: Oregon Department of Transportation Hydrology Department

drainage basin of 93 square miles. For designing stream crossings in this area, culverts rather than bridges were chosen because of wide creek bottoms, unstable bank soils (alluvium), and cost of construction. Culverts were sized based on expected 20-year frequency storms, with the stipulation that a dip in the road surface, away from the culverts, would be constructed. Any spillover would direct erosion and/or failure in the earth fill away from the culverts, thus simplifying repair.

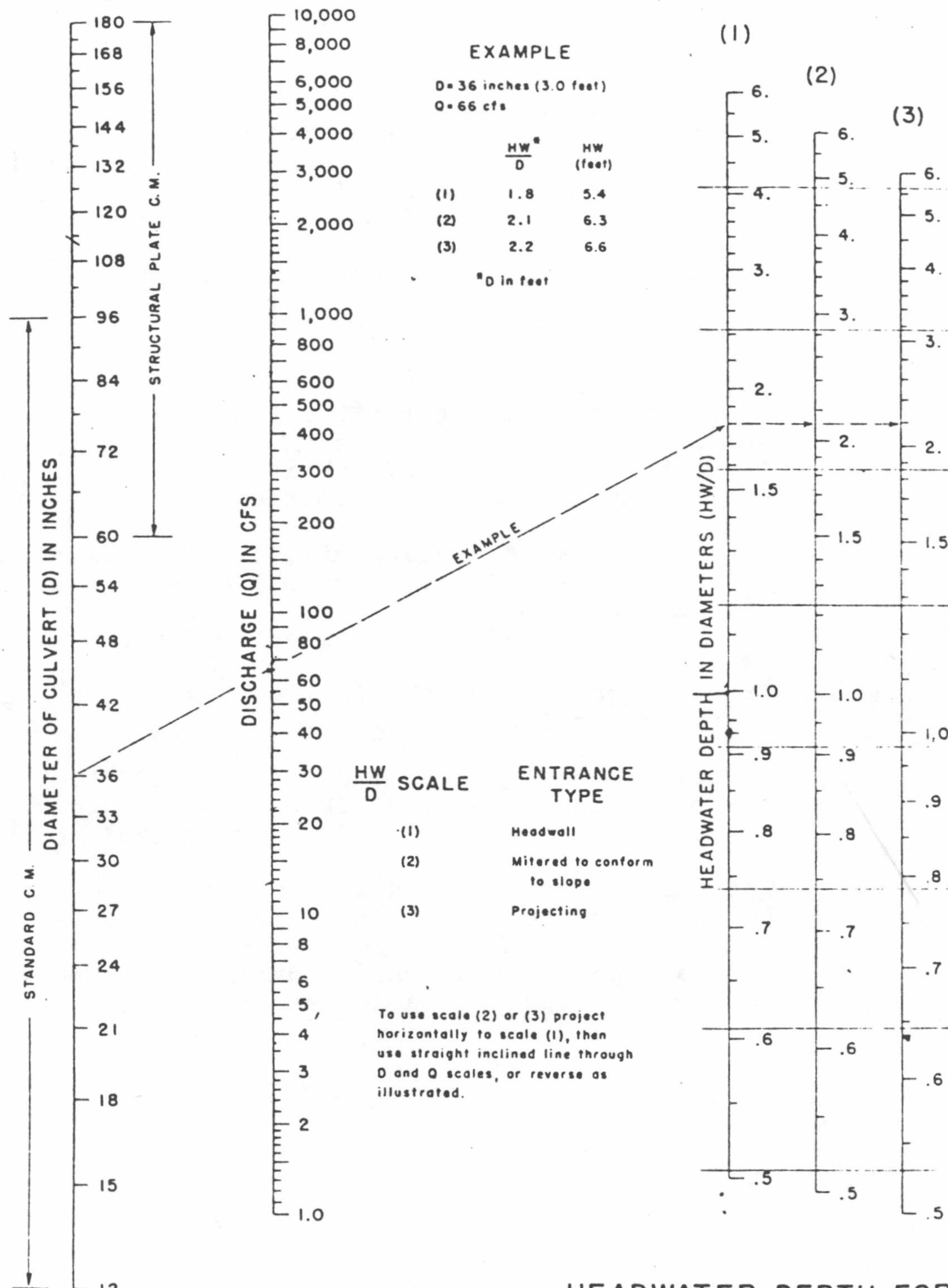
The following calculations are based on Oregon Department of Transportation chart for the Radha River Basin using Zone 2, shown in Figure 11 on page 255; the culvert capacity chart from the U.S. Bureau of Public Roads (see Figure 12, next page), and the design assumptions of a 20-year storm.

Farid Creek (49 square miles) = 600 CFS x 2.17 = 1,300 CFS
Kabir Creek (44 square miles) = 560 CFS x 2.17 = 1,220 CFS
Farid and Kabir
(96 square miles) = 990 CFS x 2.17 = 2,150 CFS

From the monograph, the following sizes and numbers of culverts were selected:

Farid Creek	(1,300 CFS)	2 of 120" corrugated metal pipe
Kabir Creek	(1,200 CFS)	2 of 120" corrugated metal pipe
Farid and Kabir	(2,150 CFS)	3 of 120" corrugated metal pipe

The culverts to be used in the other areas of lesser flow will be based on the anticipated flow and an evaluation of the extent of damage that would be caused by their failure. Where life and property are not endangered it becomes a question of economics versus probable inconvenience.



BUREAU OF PUBLIC ROADS JAN 1963

HEADWATER DEPTH FOR
C. M. PIPE CULVERTS
WITH INLET CONTROL

V. UTILITIES AND FACILITIES

7. SOLID WASTES

Currently, a four person house-to-house collection team gathers, sorts, recycles and disposes of all community domestic wastes. Equipment and facilities for this service include a city-type refuse collection truck, a recycling building (under construction) and a sanitary landfill.

Because of the unusual efforts made at Rajneeshpuram to recycle and reuse as many types of "waste" products as possible, these materials become productive once again and no longer fit the standard definition of "waste." However, for the purposes of this Plan, solid wastes include the following: food wastes, animal manure, packaging wastes, construction or demolition waste, used oil, chemical waste, and irreparable vehicles or machinery.

FOOD WASTES

Food wastes are separated from other wastes in both the cafeteria and the residences. They are used to feed chickens or are composted with other organic materials under hygenic conditions.

ANIMAL MANURE

Presently, animal manure is composted and used as fertilizer. When a prototype methane generator, now in the planning stages for use at the Rabiya Dairy Barn, becomes operational, the manure produced by the dairy herd will be collected and processed. The methane gas generated by this process will be used to heat and power the barn, and the residue will be distributed on the fields as compost.

PACKAGING WASTES

These include paper, cardboard, aluminum or "tin" cans and plastic and glass (green, amber, clear) containers. Each type of waste is stored in a separate bin at the source and then hauled to a recycling market, most often in Portland. All cardboard is "baled."

In the future, bulky items such as cans and paper will be compressed with a hydraulic compactor housed in the new recycling building.

CONSTRUCTION OR DEMOLITION WASTES

The wastes are either recycled or buried in a sanitary landfill. Wood items and lumber that no longer have any value to the first user are transported to a fixed location for recirculation. When they are no longer usable for any other purpose they are set aside for burning. Mixed demolition or construction materials or those that will not burn cleanly are buried in the sanitary landfill.

The landfill site is in Section 9, T9S, R19E in Jefferson County and is operated by the Commune. It is out of sight of Tao Road in a small valley of poor soil with little or no drainage problems. It is approximately 2½ acres with two trenches averaging six to eight feet in depth, 15 feet in depth, 15 feet in width and 400 feet in length. Only non-putresible demolition-type wastes are buried in this area, so there are no problems with odors or vermin. Refuse is layered with compacted earth in the prescribed manner.

USED OIL

Oil is collected in drums and sold. Car wash areas and especially vehicle steam-cleaning pits will have grease traps to catch the oil before it enters the sewage lines.

CHEMICAL AND HAZARDOUS WASTES

This category includes paints, vehicular wastes other than oil, photographic chemicals and solvents. Those wastes that are classified as hazardous will be stored in a locked shed near the lagoon and then transported in small lots to the hazardous waste dump in nearby Arlington. Other wastes will be treated as follows:

- paint cans are wiped as clean as possible with a paint brush and left to dry before burying in the landfill;
- organic solvents and alcohols are collected separately after they have been used to clean painting grea or engine parts, and are kept in an undisturbed container to allow the solids to settle. The solvents can then be poured off and reused several times. The solids and the unusable solvents are then placed in a heavy gauge PVC container with a leakproof lid and burned in a specially demarcated area near the landfill trenches;
- photographic chemical wastes are either concentrated developer, fixer) or diluted (wash water). The concen-

trated wastes are saved, the silver will be removed when there is enough to justify the procedure, and they are put into the toxic waste container and transferred to Arlington as described before. Evaporation pans enclosed in a small glass structure to increase the evaporation rate are planned for diluted water-soluble wastes. As a result, these wastes will be reduced in volume and added to the concentrated wastes.

IRREPARABLE VEHICLES AND MACHINERY

Old vehicles are kept for spare parts in an area out of public view. When they are no longer considered of value, they are hauled away and sold.

SEPTIC TANK PUMPINGS

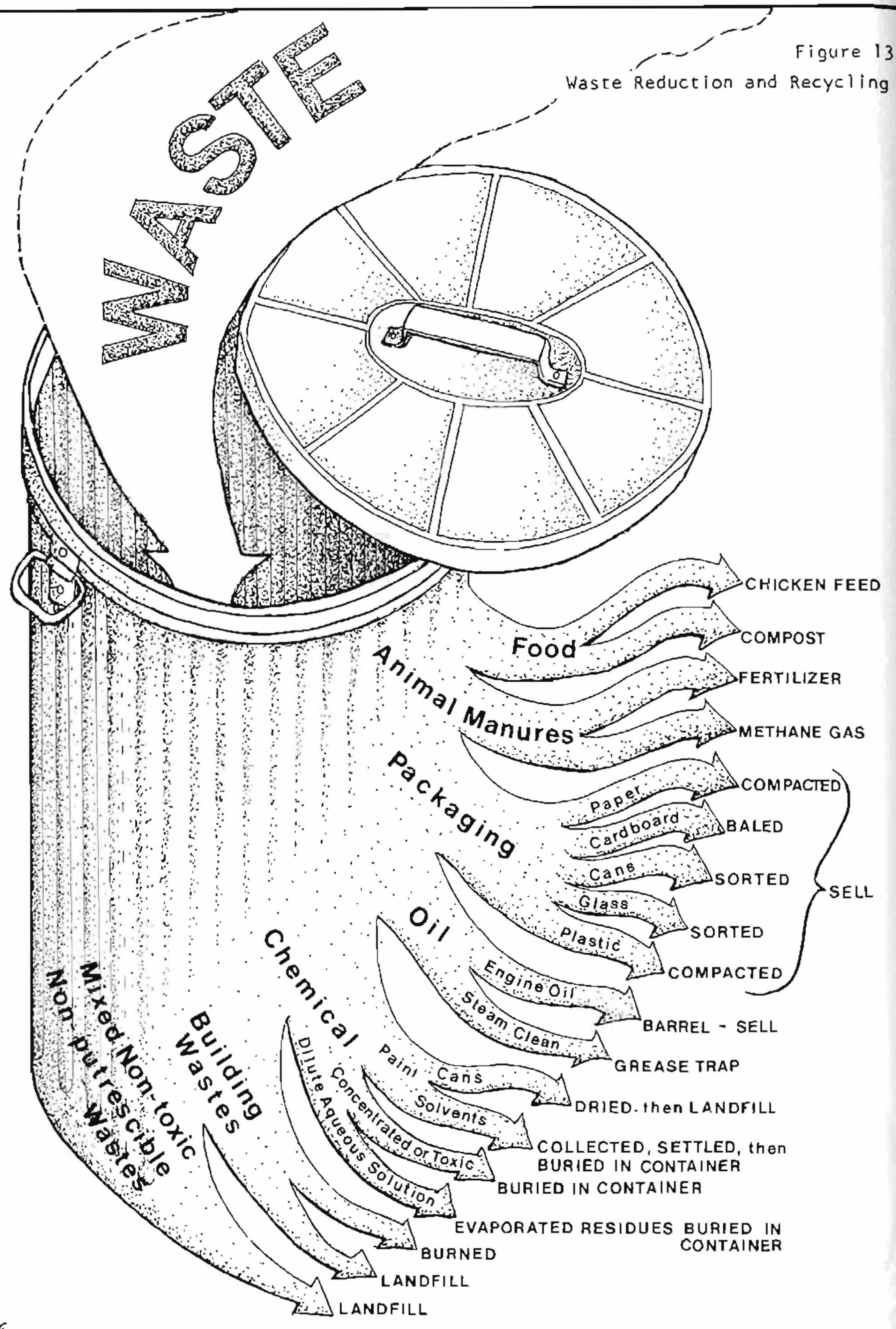
The present system of local septic tanks and drainfields will require septic tank pumpings in the future. These wastes will be disposed of in a manner approved by the DEQ at a site chosen in coordination with the DEQ and the County Sanitarian. A tentative site has been chosen in Wasco County, Section 21, T8S, R18E, which is removed from human activity, has little or no drainage problems and has good friable soil for the integration of the sludge.

SUMMARY

There is already in operation in the Rajneeshpuram community an excellent waste-management and recycling program. See Figure 13, next page, for a summary. Maximizing resonances and preserving the health and beauty of the land, the waste treatment program should easily expand to meet future requirements.

Figure 13

Waste Reduction and Recycling



V. SERVICES AND FACILITIES

8. SAFETY AND EMERGENCY

FIRE PROTECTION

In providing for its own needs, the community has worked from the very beginning to establish the highest quality emergency services including emergency medical, fire protection, and search and rescue operations. All of these services are presently being provided by the Rajneeshpuram Rural Fire Protection District.

GENERAL DESCRIPTION

Created on April 28, 1982, the Rajneeshpuram Rural Fire Protection District (RRFPD) is a municipal corporation formed under ORS Chapter 478. It is funded primarily by donations from the Rajneesh Investment Corporation, which is the sole landowner within the District. It is staffed by a Fire Chief, a Fire Marshal and approximately 60 volunteers from the community.

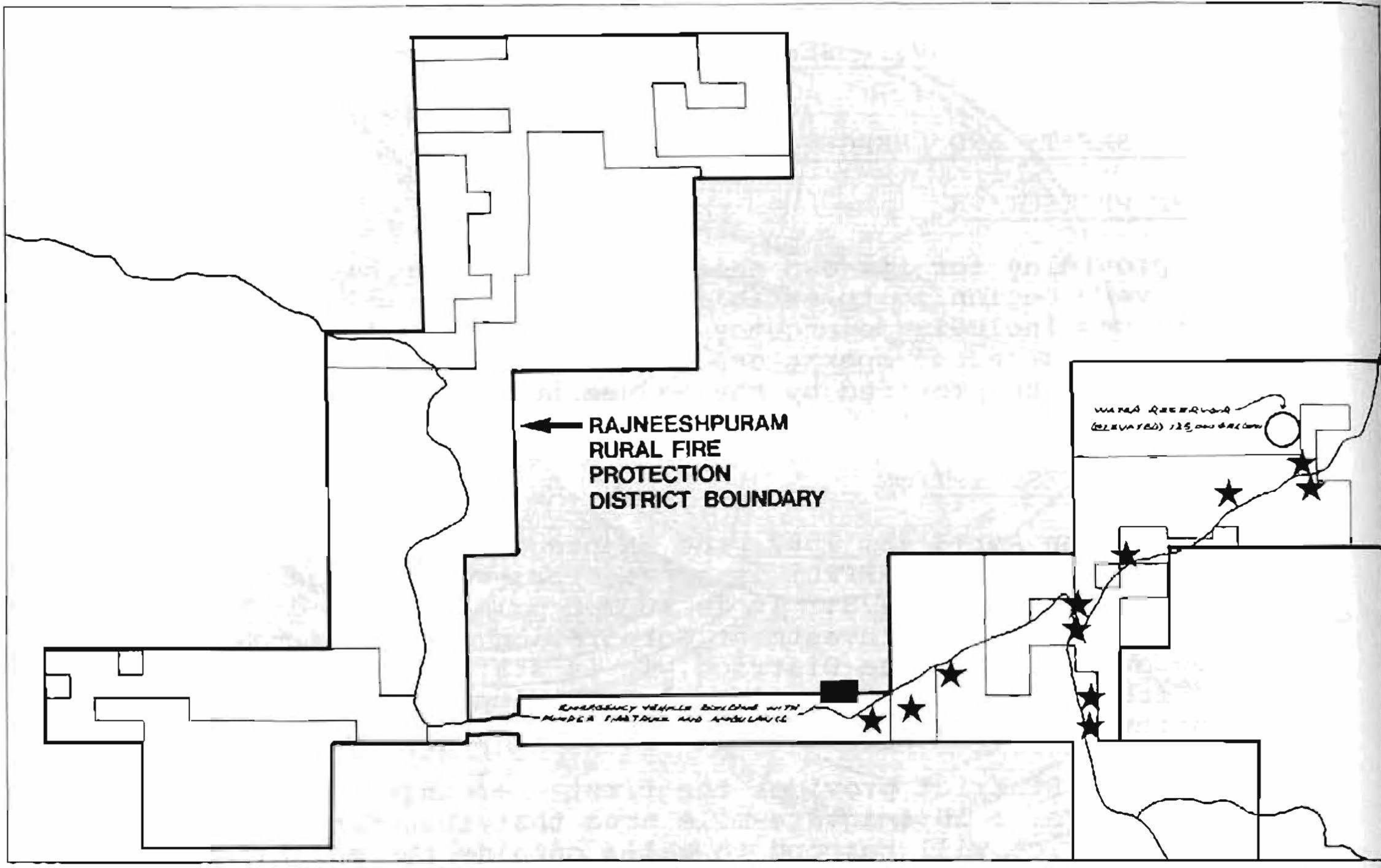
The Fire District provides the first emergency response capability for a 10.6-square-mile area that includes the City. The District will respond to calls outside the established District boundaries in accordance with a fee schedule established by the State Fire Marshal's office. To provide further protection the District has a mutual aid agreement with the Bureau of Land Management (BLM) to fight fires on and near the District. During the fire season, the District has agreed to staff the Stevenson Mountain Lookout Tower, located near the southern, more remote parts of Rancho Rajneesh.

FACILITIES

All emergency services are centered in Siddhartha, the Emergency Services Building, located on Tao Road near the Rajneeshpuram airstrip just west of the Jesus Grove area. It consists predominantly of a four-bay garage, which houses the existing fire apparatus, and a central tool cache for fire and rescue within the District.

The building also has office space, a workshop and an upstairs sleep-in area. At least three firemen are on duty during the day and two at night. The facilities of the ESB should be sufficient to service the District's operations in the Jesus Grove area for many years. See Map 42, next page.

CITY OF RAJNEESHPURAM - Fire Protection Facilities Map 42



EQUIPMENT

The Rajneeshpuram Rural Fire Protection District has equipment available for dealing with the full spectrum of emergency situations that may occur. For structural fires it operates and maintains a 1958 American La France 1,000-gallon per-minute pumper truck with a storage capacity of 500 gallons. It is equipped with breathing apparatus and other necessary accessories. In addition, two one-ton pickup trucks with 250-gallon slip-on pump units are now available to handle brush or structural fires. Also on hand is a large quantity of hand tools and water backpacks for brush fires.

A high-speed and versatile initial attack pumper is to be built this year in an all-wheel-drive pickup in order to provide for quick response to outlying structural and brush fires. Finally, several of the water tanker trucks within the community have been fitted for use as nurse tankers.

The Commune has made heavy machinery available to the Fire District for fire prevention and firefighting use. The equipment has already been used to cut fire trails, and in recent brush fires this equipment was brought immediately to the scene and proved to be of great benefit. In high fire risk situations (such as the Festival in July 1982) heavy machinery, including two graders and eight caterpillars, is put on alert and positioned strategically throughout the area. Because of the cooperation of the community, the District has no need to acquire and maintain its own heavy machinery.

EMERGENCY MEDICAL, SEARCH AND RESCUE SERVICES

The RRFPD, with the aid and cooperation of the community medical staff, staffs and operates two fully equipped Basic Life Support Ambulances. These ambulances are used for transportation within the District to the existing emergency medical facility, which is .4 miles south of the Jesus Grove area, or, if necessary, to the specialized facilities in either Madras, Bend or The Dalles.

Rescue equipment is stored and organized by type of situation, including rock climbing and river rescue. Packs are ready-prepared with food, water, first aid kits, flashlights, maps and other essential items, allowing for the quick and efficient departure of a rescue squad should the need arise. Always on call is a heavy-duty tow truck and a small four-wheel-drive pickup with oxyacetylene cutting equipment, air chisel and porta-power unit for auto extrication and other emergencies.

WATER SUPPLY

The community is presently undertaking large-scale projects to create a water supply system that fulfills all of its needs including fire protection. A 125,000-gallon storage tank feeding a five-mile-long 10" main pipeline was completed in June 1982. Presently, there are five hydrants and ten standpipes off this main which provide protection to about half of the District's structures. See chapter entitled "Services and Facilities: Water Supply" for a more detailed analysis of existing fire protection needs and capabilities in terms of water supply. Krishnamurti Dam, which is scheduled for completion in November 1982, will hold 1,030 acre-feet of water as a readily available source.

TRAINING

The volunteers from the community consist of well trained crews in both structural and brush fires, all aspects of emergency medical procedures, and search and rescue skills. These volunteers of the Rajneeshpuram Rural Fire Protection District have been trained in both classroom and field sessions. Training is ongoing with drills held up to two times a week in operation of apparatus, care and use of tools and simulation of emergency situations.

In cooperation with other agencies, controlled burns have been staged under the guidance of the BLM and the State of Oregon Forestry Department to enable the volunteers to experience conditions they can reasonably expect to meet in a rural department. A structural fire drill was staged by the Wasco Rural Fire District. Three of the District's chief personnel recently attended an interagency-sponsored training seminar in Bend and received certification from the National Wildfire Coordinating Group. The District, in coordination with the State Emergency Medical Services Division and the community medical staff, sponsored 13 members in EMT training and is intending to repeat the training periodically.

FIRE PREVENTION

A strong and lasting interest in fire protection and prevention has been shown by the community as a whole. Fire education talks and drills throughout the community have created a high level of individual awareness of the dangers of fire and the need for careful everyday habits.

COMMUNICATIONS

Communications are handled by a 24-hour communication center.

To provide guidance and to standardize action in an actual emergency, communications personnel follow an Emergency Procedure Manual developed by the RRFPD containing information relating to medical emergencies, fires, disorderly or missing persons, river rescue, backcountry accidents, air rescue and emergency paging procedure. Copies of this manual are situated in both of the main communication centers; they clearly outline the action to be taken should an emergency situation arise.

A radio paging unit operative within 30 miles of Jesus Grove is used to maintain constant contact with fire and medical coordinators. The first alert goes to the Fire Chief and Marshal who then, if required, page a skilled and alert crew of six people and, if needed, a second crew of six people who are specifically trained in firefighting.

PUBLIC SAFETY

Due to the limited size of the population and the nature of the activities around Rajneeshpuram, there is at present no need for formal public safety services. When assistance has been needed in the community, the services of the Jefferson or Wasco County Sheriffs' Departments have been used. The major problem with this arrangement is that response times vary from 30 to 90 minutes.

Rajneeshpuram attracts a number of tourists who visit every day. During the spring and summer of 1982, there have been 30 to 40 visitors on weekdays and 80 to 100 visitors a day on weekends. With increased publicity and growth, it is clear that some form of Public Safety Program will be necessary and beneficial for the welfare of the citizens of Rajneeshpuram and the population of neighboring areas.

The Rajneeshpuram Public Safety Department will initially develop a team comprised of the following members:

- 1 Public Safety Commissioner (who will be appointed by the City Council)

- 1 Deputy Commissioner

- 6 Officers/Dispatchers

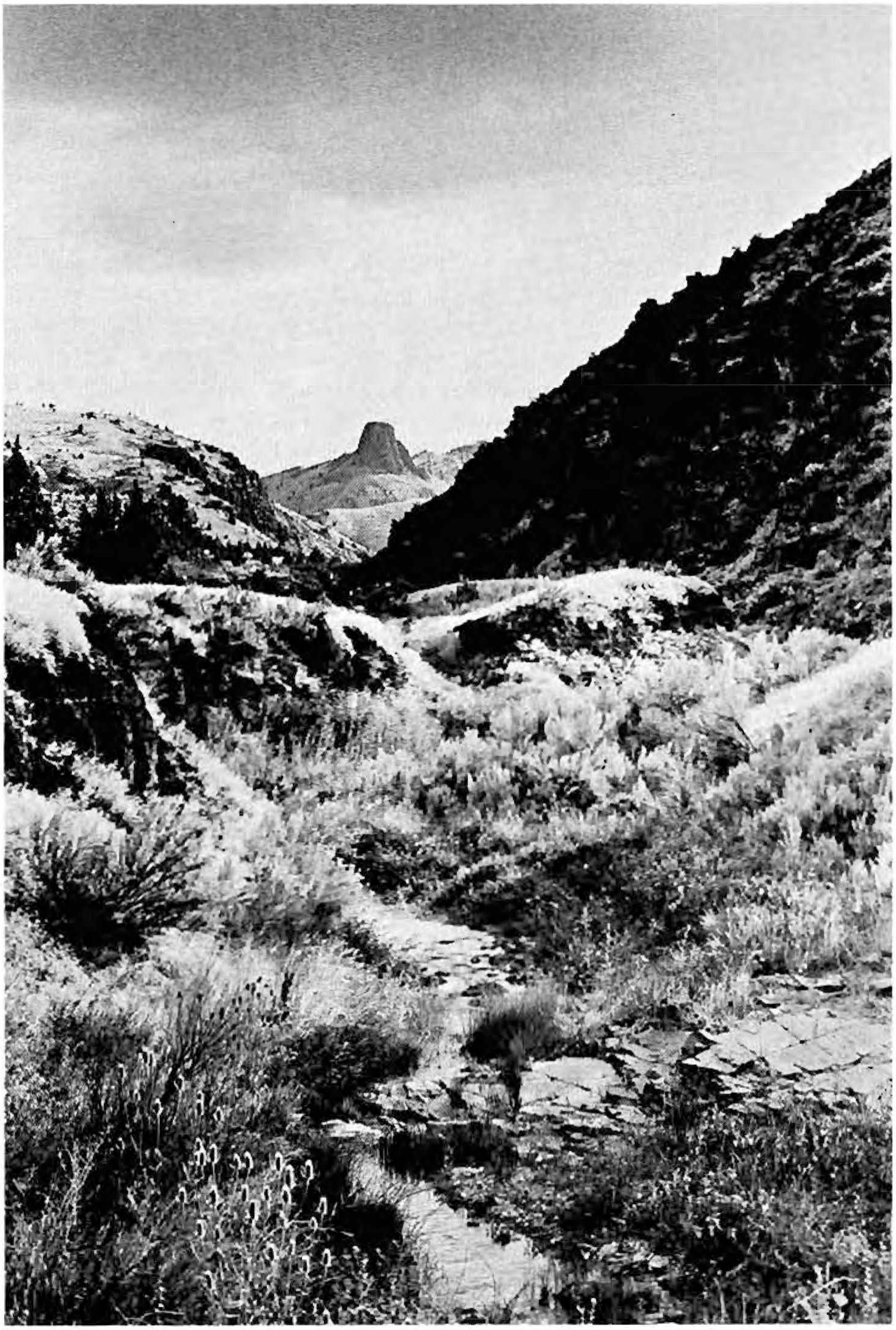
- 1 Receptionist/Secretary.

The training and development program will include staff attendance at a course offered by the State Board on Police Standards and Training. This will be followed by one or two months of on-the-job training at Rajneeshpuram with experienced Wasco and Jefferson County Sheriffs' Department personnel. If necessary during the training period, experienced public safety officers will be hired to provide safety services as an interim measure.

The major responsibilities of the Public Safety Department will include traffic control and safety, maintaining law and order (to be coordinated with county and state law enforcement personnel), emergency management (in cooperation with the Rajneeshpuram Rural Fire Protection District), and civil defense services (related to natural disasters and warfare activities). The Public Safety Department will provide 24-hour services. An emergency services communications center will be a central component of public safety services. All communications regarding emergencies will be channeled through this center.

CONCLUSION

The level of emergency and safety services available at the present is more than adequate for the existing rural environment. As development occurs, these services will increase accordingly.



ENERGY RESOURCES AND CONSERVATION

energy needs
renewable energy resources
conservation measures

272.2

VI. ENERGY RESOURCES AND CONSERVATION

INTRODUCTION

Reliance on imported forms of energy drains the local economy of capital generated from home-based industry and commerce. Current estimates indicate that 85% of the money spent on energy requirements leaves the local area. The primary sources for direct energy use in Rajneeshpuram are electricity, gasoline and diesel fuel, propane and fuel oil. Costs of these energy sources are increasing more rapidly than the rate of inflation. Minor petroleum shortages in the United States during 1973 and 1979 were early indicators of foreign supply uncertainties, and pessimistic forecasts of electrical energy shortfalls in the Pacific Northwest during the 1980's raise doubts about domestic energy supplies.

The cost/risk elements associated with imported forms of energy are focusing increased interest on the claim that the development of local renewable sources of energy can ultimately supply most if not all of a given community's energy needs.

VI. ENERGY RESOURCES AND CONSERVATION

1. ENERGY NEEDS

As discussed elsewhere, development at Rajneeshpuram during the past year has incorporated many features aimed at the efficient use of available energy resources and, insofar as possible, has supplemented primary energy supplies with renewable energy. Electricity will clearly be relied upon to supply the major energy needs of the City for a period of years despite the probability that costs per electrical unit will likely increase substantially - approximately 56% within the next year alone. Two conditions account for the present reliance on electricity to serve the City's major energy needs: (1) availability and (2) the relative infancy of alternate energy technology at present.

A great deal of effort has been and will continue to be directed at reducing the City's dependence on electrical energy and to increase the development and use of local renewable energy sources. The eventual scope of such use cannot be predicted at the present time given the state of alternate energy technology, the lack of necessary quantitative and qualitative data upon which to base estimates of local renewable energy resources, and the pace of the City's development.

Meanwhile, the need to use and conserve the existing electrical energy resource exists. If peak loads can be reduced by more even distribution of demand throughout use periods, both the potential for utilization and cost factors will be favorably influenced. (Of note is the fact that up to 30% of total monthly electrical charges for the commercial sector of Rajneeshpuram is accounted for in demand charges.)

Intermodal shifts - changing from incandescent lighting to flourescent lighting, for example, and using electricity for heat exchange systems rather than for conventional forms of resistance heating - will help conserve the resource itself. Such simple steps reflect the need for and value of end-use matching.

Simply stated, end-use matching enlarges the two-dimensional view of energy, in which available supply and cost are the main considerations, to include a third dimension - that of quality. Electricity, for example, can be seen as a high quality form of energy for which certain uses are uniquely suited - lighting and arc welding are examples. Space and water heating are low quality uses for which solar energy is rapidly becoming adapted. Since more than 70% of residential energy use in Oregon is for space and water heating, a significant potential exists for the substitution of solar energy for electricity in such low quality energy requirements. Moving in this direction will have the potential for ameliorating peak loading of the electrical system as well. For example, if solar energy and waste heat recovery systems are providing a sizeable share of the winter heat requirements for buildings, simultaneous and excessive demand will not be placed on the electrical resource.

At present, quantitative forecasts exist only for the electrical energy needs of Rajneeshpuram. These are projected through 1990 and show an increase five times greater than the 2000 KW present connected load. The estimate cannot take into account potential changes in energy technology or shifts in patterns of use due to economic constraint and/or user preference. It is interesting to consider, however, that under average insolation conditions 240,000 square feet (or about 5½ acres) of 100% effective solar collector could supply the entire City's electrical energy needs under projected average load conditions for 1990.

2. RENEWABLE ENERGY RESOURCES

SOLAR

Rajneeshpuram is fortunate in having abundant sunshine throughout the year. The annual average insolation of about 1200 BTU's/sq.ft./day on a horizontal surface is adequate for most means of conversion presently developed. Photovoltaics, while presenting technological feasibility, still are far from being cost effective, with peak watt costs around $10. Their potential for a more significant role will develop as their output costs decrease (current estimates as low as $3 to $5 a peak watt by 1985) and as prices for primary energy resources increase.

The incorporation of passive solar design in building construction requires no new technology to become practical, thus making it immediately available to utilize the solar energy resource. Passive design is considered a high level of design because of the physical comfort it affords, the potential for aesthetics, and low maintenance costs. The present high cost of concrete and the extensive labor requirement attached to this type of construction does present some difficulties. The installation of a nearby concrete batching plant is planned and will reduce construction costs of passive solar design in the future. Meanwhile, current building emphasis is on low-mass, superinsulated structures within the City.

The most efficient means of providing for future cost-effective active solar systems is seen as that which provides retrofit features in current construction. This is common practice on new construction in the City and includes the installation of piping to accommodate collectors.

WASTE MATERIAL

City garbage collection presently ranges between one to two tons daily. While this is not a large amount, burner systems that will produce usable waste heat are being considered. Cost analysis studies indicate that the break-even point for such systems is around four tons per day and such levels clearly will be reached with the City's expected growth. The increasing cost of maintaining sanitary landfills will also make the use of waste burners more attractive. The use of waste oil to provide building heat is being planned for two systems. In addition to producing heat, this method of recycling will eliminate disposal problems. Approximately 600 gallons per month of waste oil is collected from vehicles in the City. At present, waste wood and other burnable construction materials are collected at a recycling dump for reuse or for burning to produce heat. A local carpentry shop has in its plans a wood-fired boiler to heat the structure.

BIOMASS

The potential for development of energy from biomass materials in the City does not appear to be significant at the present time. Two biomass energy systems being planned or considered for nearby agricultural land that may indirectly influence the City's energy supply are (1) a methane system for the Rabiya Dairy Barn and (2) the possible production of ethanol from grain.

HYDRO

Preliminary engineering studies show the feasibility of small-scale hydroelectric generation within or near the City. These estimates vary greatly, however, as there is a lack of local streamflow data; gauging stations to be installed as part of the City's water management program will begin to develop such information. The dam under construction at Farid Creek is being fitted with the necessary hardware should the decision be made to install generation facilities at a later date.

WIND

No adequate windspeed measurements exist for the local area although the City's climate monitoring program provides for the development of windspeed data. The nearest available locations (Redmond, Madras, Pendleton) for wind data show only moderate velocities of 9 to 11 mph, generally considered marginally cost effective for generation of power.

GEOTHERMAL AND GROUND SOURCES

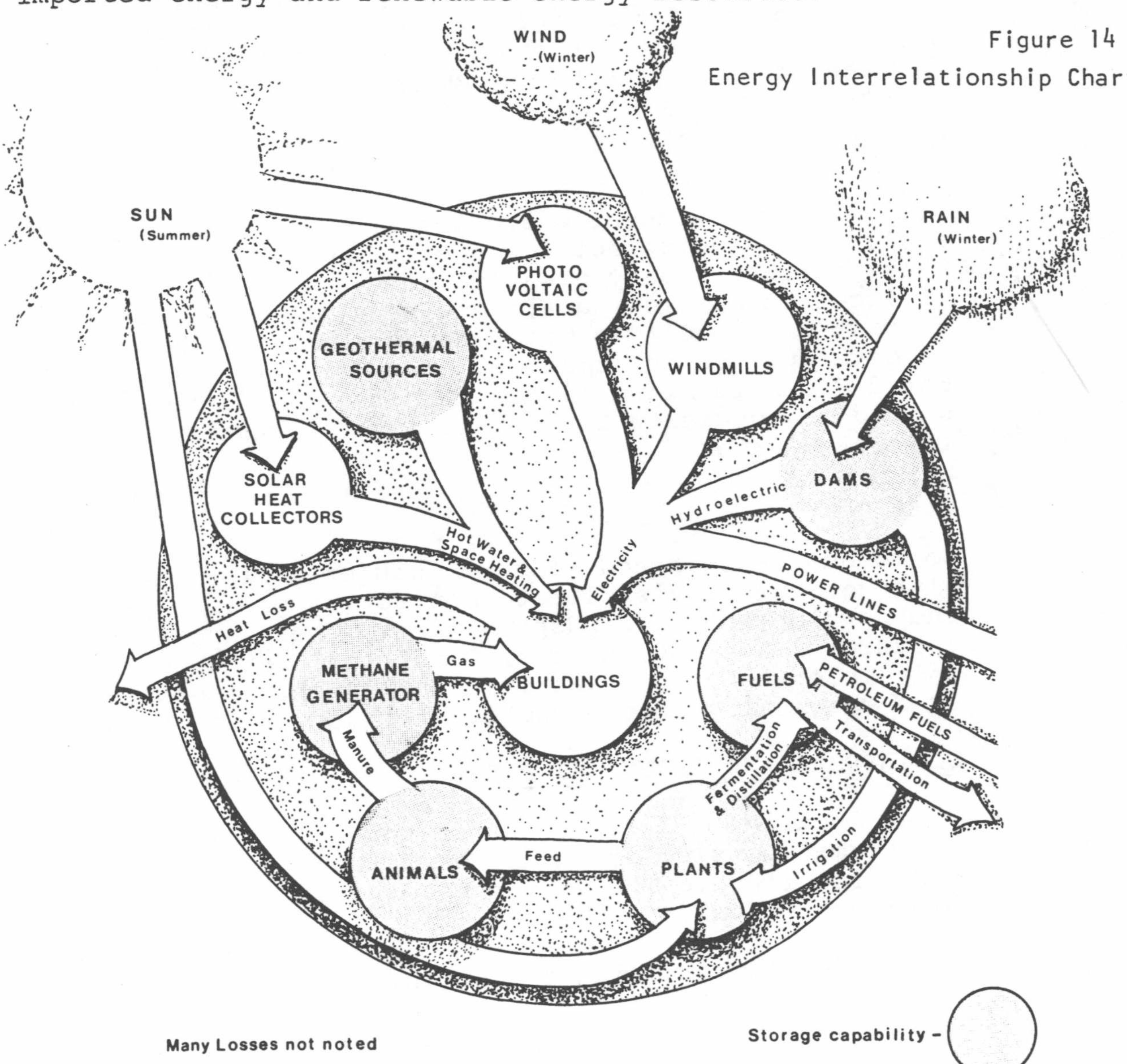
A few local wells drilled deeper than 500 feet have shown some geothermal possibility; they have tapped water in the 75 to 85 degree range. The City's water development program will continue to evaluate the potential for this energy resource.

Recent developments in heating and cooling systems have shown the viability of using underground temperatures to help stabilize the internal temperatures of above-ground buildings. The system consists of a trench four to six feet deep that taps relatively constant ground temperatures of around 50°. The trench serves as a sink for heat pumps that move air from buildings through a piping loop in contact with the earth in the trench (wells can also be used to accomplish the same end). Such systems can provide twice the efficiency of standard air-to-air exchange systems. Several homesites are being considered for the installation of this type of heat exchange on an experimental basis.

Figure 14 below shows the potential interrelationship between imported energy and renewable energy resources.

Figure 14

Energy Interrelationship Chart



3. CONSERVATION MEASURES

Although conservation measures obviously do not in themselves produce energy, if viewed in terms of energy units saved and matched back to their respective origins of production, the equivalent of energy units "produced" can be claimed. From this perspective, for example, it costs about six times more per unit to produce energy from a new power plant than it does to "produce" a unit of energy through conservation. Most forms of energy conservation reduce environmental pollution as well as costs and in addition conserve scarce resources.

To determine an appropriate point of entry into the energy conservation cycle it is helpful to know that in Oregon over one-third of all the direct energy used is for residential space heating and private automobile use (86% of individual family energy use). Conservation of energy used in maintaining building space temperatures can be approached directly in terms of site location and building orientation and design.

SITE AND BUILDING DESIGN

Local ordinances and state and local building codes affect building site location and design through enabling measures or building standards as these relate to energy conservation. Two effective means of land use zoning that help decrease energy use are those encouraging concentrated development including shared-wall and multi-family construction, and those allowing multiple uses in given areas. Both of these measures tend to save energy by reducing travel distance; multi-family construction reduces direct energy use (a 2:1 ratio of multi-family or common-wall residences to single family dwellings uses only 87% of the electricity used where the ratio is reversed). When such development is encouraged, however, problems must be addressed. In achieving higher densities, for example, more planning may be required to protect solar access.

Specific site and environmental factors must be considered to incorporate energy conservation measures in new developments. The region surrounding Rajneeshpuram is generally characterized as having moderate winds, hot, dry summers and cold winters, and low rainfall but high levels of insolation. Topography is gently rolling to steep with limited flat areas available for building. Translated into site design factors, these characteristics suggest layouts allowing for east/west orientation of the long axes of buildings, protection from winds and freedom from thermal pockets. Insofar as possible, site-sensitive considerations have been included in the new construction at Rajneeshpuram during the past year. Nearly all of the residences are oriented on lower sheltered southerly slopes of less than 15% - considered optimum siting for this region.

Many of the buildings already built or under construction at Rajneeshpuram exceed state building code standards in respect to energy conservation design. The mobile homes have been insulated beyond code requirements, as the new office building has,with R-28 insulation in the walls and R-38 in the ceiling together with a carefully installed vapor barrier. Windows are double glazed and most space temperature maintenance is accomplished by means of high-efficiency heat pumps for both summer cooling and winter heating. These heat pumps operating within a certain outdoor temperature range can be as much as three times more efficient than resistance heating. A highly energy-efficient system is utilized in the cafeteria to maintain temperature control. It consists of heat pumps and evaporation coolers with air curtains at the doorways to help retain the heat and cool. A commerical level solar hot water system is being installed, capable of producing 2500 gallons of 140-degree water on an average day.

Clustering of both housing and food service facilities has already presented opportunities for energy conservation at Rajneeshpuram. Clustered housing will be used where appropriate to maximize use of waste heat and increase the cost effectiveness of shared solar energy systems. Centralized food services have greatly reduced total travel distances for marketing purposes as well as the amount of energy expended to preserve and prepare food.

A problem that requires further addressing in building design, particularly that of residences and smaller commercial establishments, is the provision of adequate summer shade to south-facing elevations and glass surfaces exposed to the sun. Shading devices and overhangs can reduce this problem. An alternative is the use of reflective glass. Although reflective glass reduces somewhat the penetration of winter sun, it compensates for this by reducing heat loss at night, and it addresses the problem that the summer cooling load is nearly as great as the heating load in winter.

STREET AND PARKING AREAS

Streets conforming to width and surfacing material standards of the past do not contribute to energy conservation. They consume space and radiate summer heat, raising air temperatures to excessive levels in hot climates; they may contribute to storm water management problems and they consume both money and energy through maintenance requirements. Streets 20 feet wide are adequate to serve most residential areas; a 28-foot roadbed accommodates two lanes of traffic with a parking lane on one side. Crushed rock, cobble or brick surfacing of streets and parking areas reduces radiated summer head and decreases runoff of winter moisture. The need for curbed roadways to provide adequate storm drainage (used in about 95% of most urban storm drainage systems) should be open to question - especially where natural drainage systems are a part of the City topography and function adequately in handling storm runoff. The natural drainage systems of Rajneeshpuram, adequately maintained, will contribute not only to energy conservation but also to general environmental quality in the form of open space strands.

LANDSCAPING

Landscaping can aid or inhibit the conservation of energy. In warm climates during the summer heat, evaporation of moisture from plant surfaces cools the surrounding air, and shading prevents absorption and reradiation of solar heat from exposed surfaces. Shaded buildings may be 15° to 20° cooler than those that are unshaded, and air temperatures along narrow shaded streets can be 10° cooler than air temperatures along wider unprotected streets. In the winter, strands of vegetation serve as breaks, reducing the chill factor of the wind.

Landscaping may be a hindrance to energy conservation if it requires excessive expenditures of energy or other resources in its maintenance, or if it conflicts with direct energy production such as solar or wind systems. Proper landscaping sensitive to the above considerations can actually make alternate forms of energy, particularly solar energy, more competitive with conventional sources. Ideally, a community that could meet all its landscaping requirements applying the "natural setting" or "self-maintaining" approach in which the use of natural site factors and native vegetation is maximized would minimize energy and other resource consumption (particularly water) connected with the landscaping itself. Rajneeshpuram is characterized by minimal tree growth and sparse vegetation in general, making the potential for "natural setting" landscaping somewhat limited. Because of the harsh site, introduced species should be chosen with care; energy and other resources devoted to setting out and maintaining plant growth that does not survive are clearly wasted.

Three factors require consideration when viewing energy-conscious landscaping: the purpose of the planting, the species best adapted to the purpose and planting site, and the planting site location. As windbreaks, evergreen species having narrow vertical crown conformation serve best. Choice of site for windbreak plantings is crucial as solar access must be protected as well as openness of building to prevailing summer breezes. Rajneeshpuram is situated near the western margin of the Great Basin. For this region, recommended planting to protect solar access and yet provide acceptable shading levels calls for taller trees to the north of buildings (if evergreens, these will also offer protection from cold north winds) and to the south, short, broad deciduous trees that permit penetration of winter sunlight. In general, no trees should be planted within a 45° to 50° vertical angle of solar skyspace to the south of potential solar collectors.

WASTE HEAT

Waste heat is that which is produced through equipment operation and processes that utilize heat and reject unused quantities. In the construction of buildings, attention should be given to the central location of heat-producing equipment and processes so that the recovery of waste heat is feasible. An excellent example of heat recovery is that incorporated in the new Socrates office building in Jesus Grove. This building will require air conditioning all year due to internal loads. The air conditioning system will dump heat that has been picked up into a large tank to be reused at night when a heating balance will be required.

SOLID WASTE AND RECYCLING

It is estimated that about two-thirds of the materials wastage in the United States can be eliminated by recycling without reducing the quality of life, cutting energy consumption, or extending the usable life of landfills. Solid waste burners incorporating new technological concepts that involve a two-stage controlled air process can increase boiler efficiency with a 70% recovery rate of waste heat in the form of steam. In this process, raw waste that has been treated to remove non-combustibles is burned in a primary combustion chamber with insufficient oxygen to achieve complete combustion. The gas produced in this initial stage is then burned in a secondary chamber with an excess of oxygen. This process results in more complete combustion than that achieved by conventional burners while producing fewer atmospheric particulates. Such waste burner systems fit the needs of smaller communties, since they need not be operated on a continual basis to be effective but can burn waste and generate steam on a batch-load basis. Produced heat can also be stored underground and drawn off later when needed.

TRANSPORATION

Energy conservation can be effected in the transportation sector in four ways: (1) by using vehicles that are more fuel efficient, (2) by a reduction in vehicular trips, (3) through shifts from less energy-efficient means of transportation to systems that are more efficient, and (4) by maximizing load factors. These objectives can be incorporated directly into the purchase and use of vehicles for the administration of civic government and can be encouraged in the private sector.

The following factors should be considered when working toward the above goals:

1. The federally mandated 27.5-miles-per-gallon standard for new cars becomes effective by 1985 and continued advances in engine design will likely increase general passenger car fuel efficiencies to the 40-50 mpg range, which is expected to be the technological peak for such vehicles.

2. Fewer vehicular trips can be achieved by planning and combining trips to the same or nearby areas and by walking or bicycling whenever feasible. Land use planning should take into account that one mile is considered a comfortable walking distance and five miles a comfortable distance to bicycle.

3. Even with present relatively low passenger load levels, buses are more energy efficient than passenger cars in terms of passenger miles and are expected to continue to be so, even through passenger car fuel efficiency will increase at a more rapid rate than that of buses. Shifts from passenger car use to transit use should be encouraged by the City.

4. The maximization of passenger loads can be achieved by the continued encouragement of transit use and through

car pooling - two conditions already in effect at Rajneeshpuram.

CONCLUSION

Energy conservation measures are the most cost-effective means of "producing" energy and stemming the outflow of money from the community. Where technologically possible, the recovery of energy that in the past has been lost from systems utilizing high cost/risk primary energy resources is an extremely practical way of reducing the initial per-unit cost of such resources. A fully developed energy program for Rajneeshpuram should prioritize energy conservation measures based on their: (1) technological feasibility and adaptibility to local conditions, (2) cost-effectiveness and (3) potential for reducing the use of primary energy resources. The program should outline a clear course of action aimed at assessing and developing local renewable resources as well as defining roles of the public and private sectors in working toward this end.

GLOSSARY OF TERMS

AGGREGATE

Sand, gravel and crushed rock used in the construction industry.

ALLUVIAL FAN

A body of alluvium deposited by flowing water, with or without debris flow sediments. The alluvium forms a convex fan shape that radiates downslope from the point where the stream emerges from a narrow valley onto the flood plain of a river.

ANDESITE

A dark-colored, fine-grained lava rock similar to basalt, but containing olivine.

ANGLE OF REPOSE

The maximum slope at which a material, such as loose rock, remains stable; synonymous with critical slope.

ALLUVIUM

Unconsolidated material deposited by running water.

AQUIFER

Stratum or zone below the surface of the earth capable of producing water from a well.

BASALT

A grey-colored, fine-grained lava rock, composed predominantly of ferro-magnesium minerals; basalt lava forms columns having four to eight corners if the lava cools slowly.

BENTONITE

A sedimentary rock commonly formed from the alteration in place of volcanic ash; largely composed of the clay mineral montmorillonite characterized by high potential for swelling and shrinking by wetting and drying.

CATCHMENT BASIN

See Watershed.

CINDER

Glassy, vesicular volcanic slag (see Pumice).

CREEP

Slow mass movement of earth material down relatively steep slopes, primarily under influence of gravity but facilitated by saturation with water, frost action, and swelling and shrinking of clay.

COLLUVIUM

Unconsolidated earth material deposited on and at the base of steep slopes by direct gravitational processes such as creep and soil flow as well as by unconcentrated runoff.

CUESTA

A steep concave slope topped by a layer of a resistant, permeable rock (e.g. basalt, andesite) and underlain by a soft, impermeable rock (e.g. tuff, clay).

DESERTIFICATION

Man-made change that turns a steppe, a savanna, a grassland or a forest area into a semi-desert or desert by improper practices related to grazing, lopping, woodcutting, farming, burning and lowering of the groundwater table, and consequent quasinatural (accelerated) processes. These processes are soil erosion by water, wind and gravity, and a selective depletion of all natural plants useful for grazing.

DRAINAGE BASIN

See Watershed.

EVAPOTRANSPIRATION

Evaporation from surfaces like rocks, soil, roads, buildings, water and plants plus the transpiration of plants.

FAULT

A surface or zone or rock fracture along which there has been displacement.

FLOW BRECCIA

A type of lava flow in which angular fragments of solidified or partly solidified lava have been welded together or cemented by the still fluid parts of the same flow.

FOLD

A bend in strata or any planar structure.

FROST HEAVING

The lifting of soil surfaces by mechanical expansion through the formation of ice.

GEOMORPHIC

Relating to landforms: their classification, description, genesis, history, shaping processes and their relationship to underlying structures and rocks.

GEOTHERMAL

Of, or pertaining to, the heat of the earth's interior.

GROUNDWATER

That part of the subsurface water which is in the zone of saturation.

GULLY EROSION

Erosion in which the concentrated runoff is sufficiently large to cut deep trenches, or where continued cutting in the same groove deepends the incision; gullies cannot be smoothed out completely by normal cultivation.

HYDROGEOLOGICAL

That part of geology that refers to the hydrological properties of rocks.

HYDROTHERMAL ALTERATION

The changing of rocks by hot water solutions.

INTERMITTENT STREAM

A seasonal stream that does not flow all year round.

JOINT

A surface of actual or potential fracture or parting in a rock, without displacement.

KAOLINITE

A two-layer clay mineral with very low swelling after wetting it; commonly a product of wet tropical weathering.

LANDSLIDE

A process and a landform produced, involving downslope movement (e.g. sliding) by means of gravity, of a mass of earth and/or rock.

LOESS

Fine-grained material, dominantly of silt-sized particles, that has been deposited by wind.

MONTMORILLONITE

A three-layer clay mineral (see Bentonite).

NEEDLE ICE (Mush Frost)

Ice needles about 1 mm in diameter growing perpendicular, or in a slightly bent form, out of the ground, close together in such great numbers that they look like a comb. In growing they lift particles of soil and stones to heights of several centimeters.

PERCOLATION

The passage of water through fine interstices, pores, joints and fractures in weathering mantle and bedrock.

PERENNIAL

A plant having a life cycle of more than two years, a river running all the year round.

PERMEABILITY

Capacity of a rock (consolidated or unconsolidated) for transmitting a fluid.

POROSITY

The ratio of the aggregate volume of interstices in a rock or soil to its total volume.

PUMICE

An excessively cellular, glassy lava, generally of the composition of rhyolite.

RECHARGE

Of groundwater: the formation of new groundwater, the intake of surface water or groundwater to an aquifer; also the quantity of intake.

RHYOLITE

A group of silica-rich lava rocks having the mineral composition of granite, usually very fine grained or porphyritic.

RILL EROSION

Narrow trenches called rills are cut by small streamlets or rivulets in which runoff water is concentrated during heavy rains; rills can be smoothed out by ploughing.

RIPARIAN

Those areas associated with stream channels that reveal through their vegetative complex the influence of that water; a riparian system is a unique, functioning community of plants and animals, together with its environment of soils, water and other elements.

SAPROLITE

Soft, clay-rich, thoroughly decomposed soil material formed in place by intensive chemical weathering. In this report it refers to red-brown fossil soils.

SATURATED ZONE

A subsurface zone in which all rock pore space is filled with water.

SLATE

A compact, fine-grained metamorphic rock having thin, platy cleavage.

SLOPE WASH, UNCONCENTRATED

Soil and rock material that is being or has been moved down a slope predominantly by the action of gravity assisted by running water that is not concentrated into channels. The term also designates the process by which such material is moved.

STATIC LEVEL

The surface of the water table in a well at any given time.

SURFACE WATER

Water which flows or stands on the surface of the land.

TUFF

Volcanic ash; a soft rock formed of compacted airborne volcanic fragments, generally smaller than 4 mm in diameter.

VALLEY FILL

The unconsolidated sediment deposited by any agent (water, wind, ice, mass washing) so as to fill or partly fill a valley.

VALLEY FLAT

A general term for broad, nearly level flood-plain surfaces that are not subject to frequent inundation.

VALLEY FLOOR

A general term for the nearly level to gently sloping, bottom surface of a valley that is subject to flooding.

WATERSHED

The area contained within a drainage divide above a specific point on a stream. Synonymous with catchment basin or drainage basin; the term is also used in the meaning of drainage divide.

WATER TABLE

Concerning groundwater: the upper, free surface of a zone of saturation that is not confined by an impermeable body.

WELDED ASH (FLOW SHEET)

A tuff which has been indurated by the combined action of the heat retained by the particles and the enveloping hot gasses.

GLOSSARY OF NEW NAMES

New Name	Old Name
Bheeka Creek	Cherry Creek
Boehme Mt.	Horse Heaven Mt.
Cha'n Canyon	Arrastra Canyon
Cha'n Creek	Arrastra Creek
Christ Creek	Ross Creek
Daruma Canyon	Domogalla Canyon
Daruma Creek	Domogalla Creek
Daruma Ridge	Domogalla Ridge
Desiderata Canyon	Vanderhoof Canyon
Desiderata Creek	Vanderhoof Creek
Devateertha Rock	Post Pile Rock
Dharma Ridge	Axehandle Ridge
Farid Creek	Currant Creek
Francis Mt.	Maupin Butte
Gautam the Buddha Canyon	Dry Creek Canyon
Gautam the Buddha Creek	Dry Creek
Gautam the Buddha Grove	Dry Creek Area
Hassan Canyon	Gallagher Canyon
Hassan Creek	Gallagher Creek
Hotei Creek	Hawley Creek
Jesus Grove	Ranch Headquarters
Kabir Creek	Muddy Creek
Kabir Reservoir	Muddy Reservoir
Kamàal Creek	Little Muddy Creek
Kanahappa Ridge	Melendy Ridge
Krishnamurti Dam	Currant Creek Dam
Krishnamurti Lake	Currant Creek Reservoir (created by dam)
Milarepa Canyon	Sugarloaf Canyon
Milarepa Creek	Sugarloaf Creek

New Name	Old Name
Parshvanath Mt.	Wagner Mt.
Patanjali Lake	Mays Reservoir
Radha River	John Day River
Rishabh Mt.	Hunt Butte
Sambodhi Ridge	Lyons Ridge
Shiva Mt.	Currant Peak
Siddhappa Road	Cold Camp Road
Sufi Road	Mitchell Road/Wasco County Road #305 (Mitchell Road portion)
Suzuki Canyon	Fir Tree Canyon
Suzuki Creek	Fir Tree Creek
Tao Road	Muddy Road/Wasco County Road #305 (from Ranch crossroads to Antelope)
Henry Thoreau Forest	First Pines Hollow
Vimalkirti Springs	Wyman Springs
Yoga Road	Muddy Road/Wasco County Road #305 (from Ranch crossroads to Mitchell Road) & Mays Reservoir Road (from Muddy Road to Mays Reservoir)

APPENDICES

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* Indicates appendices which are not contained within the Comprehensive Plan. These appendices are available for review at the Rajneeshpuram Community Development Office.

APPENDIX 2

IntraWest Weather

P.O. BOX 5185
BEND, OREGON 97708
503-382-2167

JACK MERCER, CERTIFIED CONSULTING METEOROLOGIST
PRESIDENT

July 8, 1982

Rajneesh Neo-Sannyas International Commune
PO Box 12 A
Antelope, Oregon 97001

The following paragraphs summarize my evaluation of weather station sitings on the Ranch. The locations can best be depicted by using the enclosed topographic sheet on which I have placed reference numbers which correspond with the numbers contained in this narrative.

Location of hygrothermographs and rain gages (5 installations)

#1 - Orchard area near Little Muddy Creek. This site is a re-location of the site which is near the reservoir further up the Little Muddy. Locating the station here will provide data at the orchard site and, in the future, also give advance warning of cold air drainage toward orchards and vineyards along the Big Muddy downstream.

#2 - Existing site near the old ranch house. This site does not need to be moved from existing location.

#3 - Near John Day River about ¼ mile up river from the present location and just to the west of the road. This station must be re-located to remove some of the influence of irrigation which already surrounds it. The new site will be more representative of the area while the rain gage will not be subject to picking up irrigation water in addition to rainfall.

#4 - On the high ground about one mile from west entrance to Ranch. The site could be near where the small trailer was located at the time of my visit. This site should be a re-location of the Ince Camp site which is much less representative of conditions over the relative high elevation common to most of the area.

#5 - Near the county road, along the west edge of the Ranch not far from the radio tower. This would involve a short move from the current location.

Location of simple "max-min" or "min only-orchard type" thermometers. To be housed in simple louvered white shelters.

#6 - Low end of proposed vineyard (near road).

#7 - High end of proposed vineyard.

#8 - Orchard area west of vineyard.

Location of rain gage-only stations. These stations are to augment the rainfall coverage provided by locations one through five.

#9 - On the ridge south of Wagner Mountain; near the road but out of sight.

#10 - Near the radio repeater site at about the 4000 foot level.

#11 - On the ridge between the Little Muddy and Big Muddy near Kaser Butte.

#12 - At the 4000 foot level near Sugarloaf Butte or above First Pines Hollow. Access is currently not possible to these locations, however, it is important to locate a station in this vicinity when access is provided. Observations here should be representative of the large area of high elevation terrain found in the south portion of the Ranch.

The general plan for siting the weather stations described in this report is designed to provide maximum observational coverage at minimum cost for specific weather elements. These will serve the immediate and long-range agricultural goals for the Ranch. The rain gage network will provide information about potential for ground-water recharge and stream flow plus moisture falling directly on fields and orchards. Also important, eventually will be data derived from the accumulating records concerning significant rainfall return periods, potential for flooding and threat of drought.

The temperature sensing network will serve several important functions as well.

a) build climatology on which to base future agricultural decisions.
b) increase accuracy of weather forecasting for the Ranch in general.
c) allow advance warning of expected critical temperatures vineyard and orchard areas.

Humidity measurements will have less direct benefit, however, they can be important if used in research to help establish irrigation schedules and to study potential evapotranspiration.

One note concerning the hygrothermograph shelters already constructed; the entire shelter should be painted a flat white. Different colored surfaces will absorb and radiate at different rates so the temperature of the entire shelter can be affected if the color is not a uniform white.

Concern was also expressed as to the best way to log and enter for computer storage the observations from the weather station network.

Temperature - every 3 hours beginning with 00:00 GMT (5 PM PDT/4 PM PST) plus maximum and minimum
- for non-recording instruments just the max & min

Rainfall - daily total where possible and as frequently as possible otherwise. Include melted equivalent of snow.

Snowfall - Measure with standard "yardstick" for daily snowfall and total snow depth. Daily or as frequently as possible at hygrothermograph sites.

If you would like some actual physical help with the input format or other software procedures, we can have our software specialist contact you directly.

I hope this information along with the enclosed map will provide you with what you need. Should more information be required, please let me know.

Sincerely,

Jack M. Mercer, CCM
Meteorologist

JMM/gl

APPENDIX 3

CLIMATOLOGICAL DATA

Classification according to Keoppen with modifications for the USA by Trewartha (1968): Antelope has a Dsb climate; that is, a subhumid, continental highland climate with warm, dry summers and cool, moist winters.

Explanation: the mean annual temperature t = 9.1°C; the mean annual precipitation r = 32.4 cm. The six winter months have less than 70% of the annual precipitation. Therefore, for the delineation of the semi-arid climates, the formula r = 2(t + 7) has to be applied. The result is 32.4 > 32.3, that means, the climate is just outside the semi-arid type, in this case, BSk (S for steppe and k for wintercold). Thus, it is a C or D climate. The limit between C and D climates is at the mean January temperature of 0°C. The Antelope January temperature is below 0°C, so it is a D climate. The month of the cold season with a maximum of precipitation has well over three times the precipitation of the driest month of the warm season. So, it is a Ds climate (s for summer drought). As the temperature of the warmest month is well below 22°C and as there are more than four months above 10°C, it is a Dsb climate.

Conclusion: the wet parts of the ranch above approximately 2,600 feet (approximately three-quarters of the area) have a Dsb climate; the drier parts below approximately 2,600 feet have a BSk climate.

Classification according to Thornthwaite (1931): Antelope has a CC'd climate. This is a subhumid, microthermal grassland climate with drought all over the year. This is calculated by the means of the P-E index, as follows:

$$\text{P-E index} = \sum_{n=1}^{12} 115 \left(\frac{P}{T-10}\right)_n^{\frac{10}{9}}$$

where $\sum$ = summation of twelve monthly ratios,

P = monthly mean precipitation (inches),
T = monthly mean temperature (°F),
n = the particular month.

The P-E index leads to the definition of the humidity provinces as follows:

humidity province	vegetation	P-E index
A perhumid	rain forest	>127
B humid	forest	64 - 127
C subhumid	grassland	32 - 63
D semi-arid	steppe	16 - 31
E arid	desert	<16

The P-E index for Antelope is 33, that means, the climate is just outside the semi-arid steppe climate (D); thus it is a subhumid grassland climate C. The limit of the precipitation deficiency (between summer drought and drought at all seasons) is at a seasonal P-E index of 17 for the sum of the three summer months (for the annual P-E index of 33). The sum for Antelope is well below 17, so the letter d is added to the climate formula, which stands for deficiency at all seasons.

The temperature regime is characterized by the thermal efficiency index T-E.

$$\text{T-E index} = \sum_{n=1}^{12} \left(\frac{T-32}{4}\right)_n$$

where T = monthly mean temperature (^{o}F),
n = the particular month,

$\sum$ = summation of twelve monthly ratios.

The T-E index leads to the definition of the thermal provinces as follows:

temperature (thermal) province	T-E index
A' tropical	>127
B' mesothermal	64 - 127
C' microthermal	32 - 63
D' taiga	16 - 31
E' tundra	1 - 15
F' frost	0

The T-E index of Antelope is 50, thus the climate is well within the microthermal province.

Conclusion: the Thornthwaite (1931) classification, which attempts to define the climatic elements which are active in limiting plant growth and use them for classification comes to the same conclusion as the Koeppen classification: the wetter, higher and cooler parts of the ranch have a subhumid, grassland climate (CC'd), the lower and warmer parts have a semi-arid steppe climate (DC'd).

The Thornthwaite (1948) classification is based on the potential evapotranspiration and precipitation and is, by far, the most refined analytical tool so far devised for the classification of climates. As it is directly linked to plant growth it is of high value to agriculture. The Thornthwaite formula to calculate evapotranspiration can readily be used to evaluate the water consumption for irrigation. There is not enough data available yet for Antelope, but the climate formula for the ranch area can safely be taken from the maps for the USA given by Thornthwaite himself. According to these maps the ranch has a $C_1C'_2d$ climate.

The classification is based on the moisture deficiency/surplus index and leads to the following definition of the humidity provinces (climate types):

climate types		moisture index
A	perhumid (wet climate)	>100
B_4	humid (wet climate)	80 - 100
B_3	humid (wet climate)	60 - 80
B_2	humid (wet climate)	40 - 60
B_1	humid (wet climate)	20 - 40
C_2	moist subhumid (wet climate)	0 - 20
C_1	dry subhumid (dry climate)	-20 - 0
D	semi-arid (dry climate)	-40 - -20
E	arid (dry climate)	-60 - -40

According to the Thornthwaite (1948) classification the whole of Rancho Rajneesh has a dry subhumid (C_1) microthermal (C'_2) climate with a little moisture surplus (d) in winter. This is the best characterization of the ranch climate so far.

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APPENDIX 9

GEO-MAT, INC.
5433 S.W. Vacuna St.
Portland, OR 97219
(503) 244-9382

November 25, 1981

Mary Catherine
Rajneeshpuram
P.O. Box 12-A
Antelope, Oregon 97001

Dear Mary Catherine:

I have prepared the enclosed report in response to your request for a preliminary assessment of the ground water conditions on the Rajneeshpuram property. My findings are based on observations made during a three-day visit to the site in November of this year, and on information gathered from a review of pertinent literature and well construction records.

As we have discussed previously, my investigation should be considered preliminary in nature, and is intended primarily to give you guidance in planning additional hydrogeologic investigations or programs. In the report's recommendations section I have suggested some additional work that would be beneficial, and have included an approximate estimate of the time that would be required to complete these activities.

I hope that you will feel free to contact me if you have any questions concerning my recommendations or any other portion of the report.

Sincerely,

Kent Mathiot

Kent Mathiot

KM:kss
Enclosures

REGISTERED PROFESSIONAL
OREGON
R. KENT MATHIOT
E 324
GEOLOGIST

RAJNEESHPURAM - PRELIMINARY HYDROGEOLOGIC ASSESSMENT

CONCLUSIONS:

There is currently inadequate information available on the hydrogeologic conditions of the Rajneeshpuram property to allow accurate quantification of the available ground water resource. Preliminary review of the hydrogeologic setting and the construction records for existing wells, however, indicates that adequate supplies of ground water for domestic and other low volume uses may be available on lowland portions of the property.

The lack of recharge limits the possibility that adequate ground water for intensive irrigation or other high volume uses can be developed without negatively impacting the ground water system. The most likely exception would be with ground water developed from alluvial deposits or fractured bedrock along the John Day River. Additional drilling in selected sites will provide additional information on ground water resources, and careful monitoring of water use and aquifer response will allow refinement of preliminary ground water availability estimates.

Numerous springs of undetermined quantity and quality are located in the uplands areas of the property. Initial cursory investigation of some of the hydrogeologic characteristics of these sites indicates that the springs are discharge points for local perched ground water bodies. Their production capabilities will vary, but will most likely be best suited for low volume (1-10 GPM) uses.

Artificial recharge of alluvial aquifers along stream valleys and in fan deposits may be a possibility. An accurate assessment of the potential for this type of project will require collection of additional data on surface water availability and the recharge suitability of receiving aquifers.

A detailed assessment of the surface water resources of the property is not within the scope of this report. It should be noted, however, that the property boundaries closely follow drainage divides, and that all runoff from the basin should enter streams that flow through the property. If an area wide runoff of one inch per year can be anticipated, then approximately 6,700 acre feet per year of water may flow through surface drainages on the property.

RECOMMENDATIONS:

1. A hydrogeologic data collection and recording program should be established. This program should involve the collection of hydrogeologic, well construction, and water use data for existing and future wells, (see Appendix A). Proper collection, and interpretation of this information will be critical to the understanding of the hydrogeologic system in the Rajneeshpuram area. [On-going program - 5-6 days to establish]

2. Additional water supply wells should be constructed in selected areas in order to test preliminary conclusions and develop additional hydrogeologic information. Future sites should be located in areas where they will provide information on (a) the extent and thickness of valley fill alluvial deposits along Muddy and Currant Creeks, (b) the availability of ground water in bedrock aquifers in the lower portions of tributary canyons to middle Currant Creek, and (c) the availability of ground water in alluvial deposits and underlying bedrock units along the John Day River. Limited test drilling should also be carried out in the proposed Dry Creek incorporation area in order to develop additional information on local ground water conditions. If poor ground water conditions are encountered at the Dry Creek site, and if wells located in canyons along middle Currant Creek prove successful, then canyon sites along Lower Dry Creek could be explored as potential ground water supply areas for the Dry Creek development. [Ongoing project - 1-3 days per drill site selection]

3. Chemical quality tests should be run on representative existing wells. Water from wells 3, 5, 6, 14 and the shallow large diameter well located near well 5 should be tested initially. [2 days collection - 3 days data interpretation and write-up]

4. Following the completion of detailed topographic maps and aerial photograph production a survey of spring sites and structural lineations should be conducted. These features should be identified from the maps and photos, and, where possible, field checked. Water quality and quantity data should be collected from representative springs. The assistance of the Environmental Remote Sensing Applications Laboratory at Oregon State University may be useful in completing this study. [5-10 days, possibly more if extensive field checking is required]

5. Weather data collection stations should be located at representative sites around the property. Precipitation, temperature, and evaporation information will be useful in quantifying long term ground water resource potential.

6. Surface water gauging stations should be established and monitored on Currant and Muddy Creeks. Quantitative information on seasonal flow in some of the larger intermittent drainages may also be of value in planning future development of reservoirs or catchment basins.

7. Ground water rights applications should be filed as soon as needs requiring water right permits are identified (i.e., major irrigation, domestic use in amounts more than 15,000 GPD and commercial industrial uses of more than 5,000 GPD). In addition, a complete water rights records survey for the area should be conducted. A preliminary review of water rights conditions indicates that there should not be any problems with conflicting ground water rights. Surface water rights on the John Day River below Muddy Creek, however, reportedly require regulation due to low flow every four to five years. This issue and the question of surface water/ground water relationships require additional research. [3-6 days for water rights and ground water/surface water review]

8. A ground water quality management program should be developed to insure that agricultural, solid and septic waste disposal, industrial and commercial activities, and well construction practices do not have a negative impact on ground water quality. [On-going - 3-6 days to establish]

9. At this time aquifer tests (extended duration pump tests) should not be conducted. The complex hydrogeologic system, the poor suitability of the existing wells as test wells, and the lack of information on geologic conditions, climate, etc., would make interpretation of test data difficult; and would extremely limit the usefulness of any information that was generated. Specific capacity tests, as described in Appendix A, would provide useful short and long term information.

10. Detailed geologic mapping is essential to a complete understanding of any hydrogeologic system, and should eventually be conducted on the entire Rajneeshpuram property. Such mapping, however, requires extensive field and laboratory work and should be considered a long term project. In order to expedite mapping it may be useful to fund geologic graduate student thesis mapping projects on the property. Mr. Gene Pierson at Portland State University would be a good person to contact concerning this possibility.

Although not directly related to a preliminary hydrogeologic investigation I would suggest that the Rajneeshpuram property owners consider looking into the following problem areas:

a) Landslide Potential: both large and small scale slides may cause future problems with reservoir, road and other facilities construction.

b) Soils Engineering: expansive clay soils are common on the property, and their affect on proposed facilities should be evaluated.

c) Quarry Site Investigation: the rock material presently being used for road rock is of poor quality.

d) Flash Flood Potential: information on the potential for flash floods in the region should be developed, and caution should be used in siting facilities in canyon areas.

GEOGRAPHY:

The Rajneeshpuram property covers approximately 126 square miles of land located southeast of the Town of Antelope in North Central Oregon, and includes portions of Townships 8, 9 and 10 South and Ranges 17, 18 and 19 East, W.M. The Wasco County / Jefferson County line runs west to east through the central portion of the property, and the John Day River / Wheeler County line forms its eastern boundary.

The area receives approximately 12.5 inches of precipitation annually, and only 5 inches of that is reported to be surplus when considering potential evapotranspiration. The semiarid conditions limit local land use to grazing and dryland farming.

GEOMORPHOLOGY:

The Rajneeshpuram property is situated in an amphitheatre like setting. The land slopes downward from the 4,000 foot western margin to an elevation of approximately 1400 feet along the John Day River. The site includes a wide variety of landforms, but is dominated by the steep canyons, dry washes, alluvial fans, and alternating cliffs and slopes that are characteristic of a semiarid environment with a through flowing drainage system.

GEOLOGY:

The geologic history of the entire North Central Oregon area is quite complex, and the Rajneeshpuram property has not been studied or mapped in detail. The work that has been done shows a majority of the property to be made up of the volcanic rocks of the Eocene-Oligocene Clarno Formation. There are, however, localized outcrops of the Oligocene-Miocene John Day Formation, the Paleozoic-Mesozoic Muddy Ranch Phyllite, and Quaternary Alluvium in the form of valley fill deposits and alluvial fan debris.

The Muddy Ranch Phyllite is the oldest rock unit identified on the property. It outcrops at the confluence of Muddy Creek and Currant Creek and can be easily recognized by its well developed slaty cleavage and the smooth, relatively gentle slopes that develop in areas underlain by the unit.

The two major subgroups of the Clarno Formation are both found on the Rajneeshpuram property. A majority of the property is underlain by the subgroup that consists predominantly of maffic flows and domes. Locally these rocks have well developed jointing and, may also be extensively fractured. The second major subgroup consists predominantly of volcaniclastic sediments and pyroclastic rocks, including tuffs, lapilli tuffs, and breccias. These rocks range from moderately to well indurated and massive to extensively fractured. The maffic intrusive rocks found on the property are also grouped in the Clarno Formation.

Scattered outcrops of John Day Formation, tuffs, lapilli tuffs, and welded rhyolitic tuff occur in the northwest and southern portion of the property. These rocks make up only a small portion of the study area, but may play a critical role in local slope instability and spring development.

Poorly sorted, unconsolidated, alluvial fan debris is common at the mouth of nearly every canyon and draw. The size of the fans is normally proportional to the size and gradient of the drainage system providing the sediment, and the type of material in the fan deposits reflects the type of rock or rocks into which the canyon has been cut.

Relatively broad valleys have developed along portions of Muddy Creek and Currant Creek. These valley features are underlain by unconsolidated silts, sand, and gravels that are in places more than sixty feet thick. These valley fill deposits are best developed near the confluence of the two streams, but significant deposits may also occur along Muddy Creek between Mays Rock and Currant Creek.

Several large alluvial deposits are located along the channel of the John Day River. There is, however, no information available on the thickness of these sediments.

The entire area has been subjected to extensive structural deformation. The results of this deformation can be seen as folds, faults, and fractures in various bedrock outcrops on the property. A series of northeast trending anticlines and synclines has been mapped in the west central portion of the property (Swanson, 1969), and there are strong linear trends to many of the canyons and drainages. Such linear drainages often develop along fault traces, fold axis, joint sets, fracture systems, or other structural features.

An area encompassing approximately nine square miles in the northwest corner of the property has been mapped (Swanson, 1969), as part of a large Pleistocene landslide. A brief reconnaissance of a portion of this area did not turn up any obvious indications of significant recent movement, but Swanson indicates in his work that many such slide features are still active. Both large and small scale slides may be an ongoing problem at several sites on the property.

SURFACE WATER:

The Rajneeshpuram property includes almost the entire area drained by Muddy Creek and its tributaries, as well as the areas drained by Dry Creek and several smaller intermittent drainages. In general, these streams flow in a southwest to northeast direction, and drain into the John Day River.

No information is available on the amount of water flowing through these streams. If, however, there was one inch per year of runoff on the property, it is possible that 6,700 acre feet of water would enter the surface water system every year.

The John Day River, Currant Creek below Vanderhoof Canyon, and Muddy Creek are the only drainages mapped as perennial streams. All other drainages on the property are mapped as intermittent, and can be expected to carry water only during the wetter winter and spring months. Stream bank erosion and occasional flash flooding may be a problem in intermittent drainages that serve large drainage basins.

GROUND WATER:

GENERAL DISCUSSION - All ground water or underground water is derived originally from precipitation. Precipitation, in the form of rainfall or snow melt enters the ground water system by percolating down through the soil, or by flowing into a stream or pond and then leaking into the permeable materials beneath that surface water body. The ground water then moves downward through pores, cracks, and other openings in the rock and soil materials until it reaches the zone of saturation, (a depth below which all the openings are filled with ground water). The surface of this saturated zone is referred to as the ground water table or water table. The shape of the water table normally conforms, in a subdued manner, to surface topography. In general the distance to the water table is deep below upland areas and shallow in lowland or valley areas.

Water normally enters or recharges the ground water system in upland areas and leaves or is discharged from the system in lowland areas. The path that the ground water follows between its point of recharge and eventual discharge is called a ground water flow system, and such systems are normally referred to as being local, regional or intermediate. These flow system designations are based on the relative depths and distances of ground water movement. A local flow system can be characterized as one where precipitation falling on a valley floor or canyon wall percolates down to the water table and then follows a relatively short and shallow path to the nearest seep, stream, or spring, where it is discharged as surface water. In a regional flow system ground water may reach depths of thousands of feet and cover distances of many miles or tens of miles before being discharged.

In addition to the flow systems described above, ground water can also occur as "perched" ground water. This situation develops when downward percolating ground water encounters an impermeable layer of rock or soil before reaching the water table. In these instances a "perched" saturated zone will build up above the restrictive layer. These perched ground water zones are commonly the source of seeps or springs in upland areas, and in many instances are only seasonal features.

There are three general rules that apply to all ground water systems. They are that (1) ground water is derived from precipitation, (2) that it will move from upland areas to lowland areas, and (3) that in all but a very few instances ground water movement is very slow, and will average between five feet a day and five feet a year.

If ground water in a zone or layer of saturated subsurface material can be withdrawn through wells, that zone or layer is called an aquifer. Good aquifers yield water easily to wells, and usually consist of materials that are porous and permeable, such as unconsolidated sands and gravels or indurated rocks that have numerous joints, fractures or other forms of secondary porosity. Poor aquifers, on the other hand, may be saturated, but will yield water very slowly to wells. These aquifers typically consist of fine textured alluvial deposits, or massive, well indurated bedrock.

A good aquifer must also have an adequate source of recharge. This is necessary in order to insure that water withdrawn through wells will be replaced by the natural system. If this does not occur, the water table will be lowered by continued pumping and the resource may eventually be depleted.

GROUND WATER CONDITIONS AT RAJNEESHPURAM - very little information is available on the ground water conditions in the area of Rajneeshpuram. In general, the Clarno Formation, which is the dominant rock type in the area, is considered to be a poor aquifer. This is due in part to the relatively low primary porosity of most of the rocks included in the unit, and in part to the low precipitation levels common to the central and north central region of the State.

Based on the geomorphic setting and surface water drainage patterns, the Rajneeshpuram property may include an entire ground water sub-basin. That is, ground water entering the system in the upland recharge areas on the western and southern boundaries of the property will most likely enter local and intermediate flow systems and be discharged in the lowland areas in the central and eastern portions of the property.

Because of the wide range of rock types, the structural complexity, and the large amount of relief, it is anticipated that local flow systems will dominate the hydrogeologic setting in the area. Three categories of local flow systems have been recognized on the property to date. The first is the system that is developed in the valley fill alluvial deposits along Muddy and Currant Creeks. Ground water in these sands and gravels is recharged by leakage from the two streams, and moves down gradient to discharge points along lower stretches of Muddy Creek, or the John Day River.

Local flow systems have also developed in the canyon floor deposits, shallow fractured bedrock, and fan deposits in the lower portions of the major side canyons. These systems are recharged by incident precipitation, by runoff from the steep canyon walls, and by leakage from the intermittent streams. Ground water is discharged from these systems as seeps and springs at the toes of the fan deposits, or enters the valley fill deposits that underly and interfinger with the fan debris.

The third type of local flow system appears to be the source of most if not all of the springs in the upland portions of the property. Here precipitation enters into locally exposed, relatively permeable surface materials, and percoates downward to low permeability layers such as the saprolite layer common at the top of the Clarno Formation. These horizons perch ground water, and that ground water eventually migrates laterally to downslope discharge points where the perching horizon is exposed.

A portion of the ground water that is recharged in upland areas or that seeps into permeable materials underlying intermittent drainages may follow intermediate flow system paths, and migrate through permeable bedrock formations to discharge points along the channels of Currant and Muddy Creeks.

There is very little information on which to base predictions of regional ground water flow in the area. It is clear, however, that the John Day River is the lowest drainage in the area, and that any regional ground water discharge in the area would be as underflow to this river.

GROUND WATER DEVELOPMENT POTENTIAL - There is inadequate information available at this time to allow an accurate quantitative assessment of the ground water resource potential of the property. Certain general statements can be made, however, and guidelines on how to obtain additional information can be given.

At least seventeen wells have been drilled on the property to date. The amount of geologic and hydrogeologic information gained from the construction of these wells was minimal, but they have provided some basic information on ground water potential. All wells to date have been drilled in the local and intermediate ground water discharge areas along central Muddy Creek. These wells have demonstrated a potential for the development of low to moderate, (15-100+ GPM) quantities of ground water from two hydrogeologic environments. The wells have shown that a 30-40 foot thick saturated section of alluvium is present in portions of the valley fill along Muddy Creek. Wells constructed in these deposits have shown initial production capabilities of from 15-30 GPM, but no sustained pumping or aquifer assessment tests have been conducted.

Preliminary well construction also indicates that larger quantities of ground water, (50-100+ GPM) may potentially be developed from properly constructed and located wells in the bedrock formations. Although there is very little information available it appears that the best potential for these larger capacity wells may be in the intermediate ground water discharge areas along Muddy and Currant Creeks, and at or near the mouths of side canyons with significant drainage basins. Another key factor appears to be the presence of broken or fractured bedrock materials that allow adequate amounts of water to be withdrawn from the aquifer. If the linear nature of many of the canyons indicates zones of structural weakness, it is possible that materials underlying the canyons may be adequately fractured to enhance their aquifer characteristics. (Structural features can enhance or impede ground water flow)

Locations of potential well construction sites that could be used to provide further information on these preliminary conclusions are shown on the attached map.

No wells have been drilled on the upland areas in general, or on the area mapped as landslide deposits in the northwest corner of the property. These areas, however, do not appear to exhibit conditions favorable to the development of significant quantities of ground water. Their potential is limited by the fact that they are areas of ground water recharge, by the generally low permeability of the aquifer materials, and by the limited amount of available annual recharge. If a high production well were constructed in this area it is very likely that it would be developing water from a perched ground water zone, or that the aquifer would be recharged at a very slow rate. In either instance the production capabilities of the well, and the amount of water in the aquifer could decrease with continued pumping.

The problem of limited recharge is common to the entire Rajneeshpuram property. Because of this, and because there is virtually no historical ground water data, ground water resources on the property should be developed cautiously, and ground water application should initially be limited to low volume uses such as domestic and light commercial activities. As ground water monitoring and additional well drilling provides additional information on recharge rates and aquifer characteristics, improved ground water use guidelines can be developed. A program of phased ground water development should be adopted, and no activity reliant on ground water should be instigated until the long term availability of the necessary ground water has been established.

References Cited:

Swanson, Donald A., 1969, Reconnaissance map of the east half of the Bend Quadrangle, Crook, Wheeler, Jefferson, Wasco, and Deschutes counties, Oregon: U. S. Geol. Survey Misc. Geologic Investigations Map I-568.

APPENDIX - A

Ground Water Data Collection Program

A data file should be prepared for each well constructed on the property. The files should contain:

1. An Accurate Well Construction Record: Well logs for wells constructed to date are inadequate in their descriptions of well location, water level data, and geologic materials. If a geologist cannot oversee well construction, then the driller should be instructed to collect cutting samples for each major rock type encountered. These samples should be labled and stored for future interpretation by a hydrogeologist. In addition the driller should accurately measure and record the static water level when a significant amount of water is first encountered. The static level should be re-measured and recorded whenever a major production zone is encountered, and following the completion of the well.

2. The Results of a Specific Capacity Test: Specific capacity test procedures -

    a. Measure and record the static water level.

    b. Pump the well at a constant and known rate for a period of one to two hours (The pumping rate should be at or near the expected production rate of the well, and the dynamic water level rate should remain fairly constant).

    c. Measure and record the dynamic (pumping) water level in the well following the 1-2 hour pumping period. The specific capacity can now be expressed as the gallons per minute of water produced per foot of drawdown.

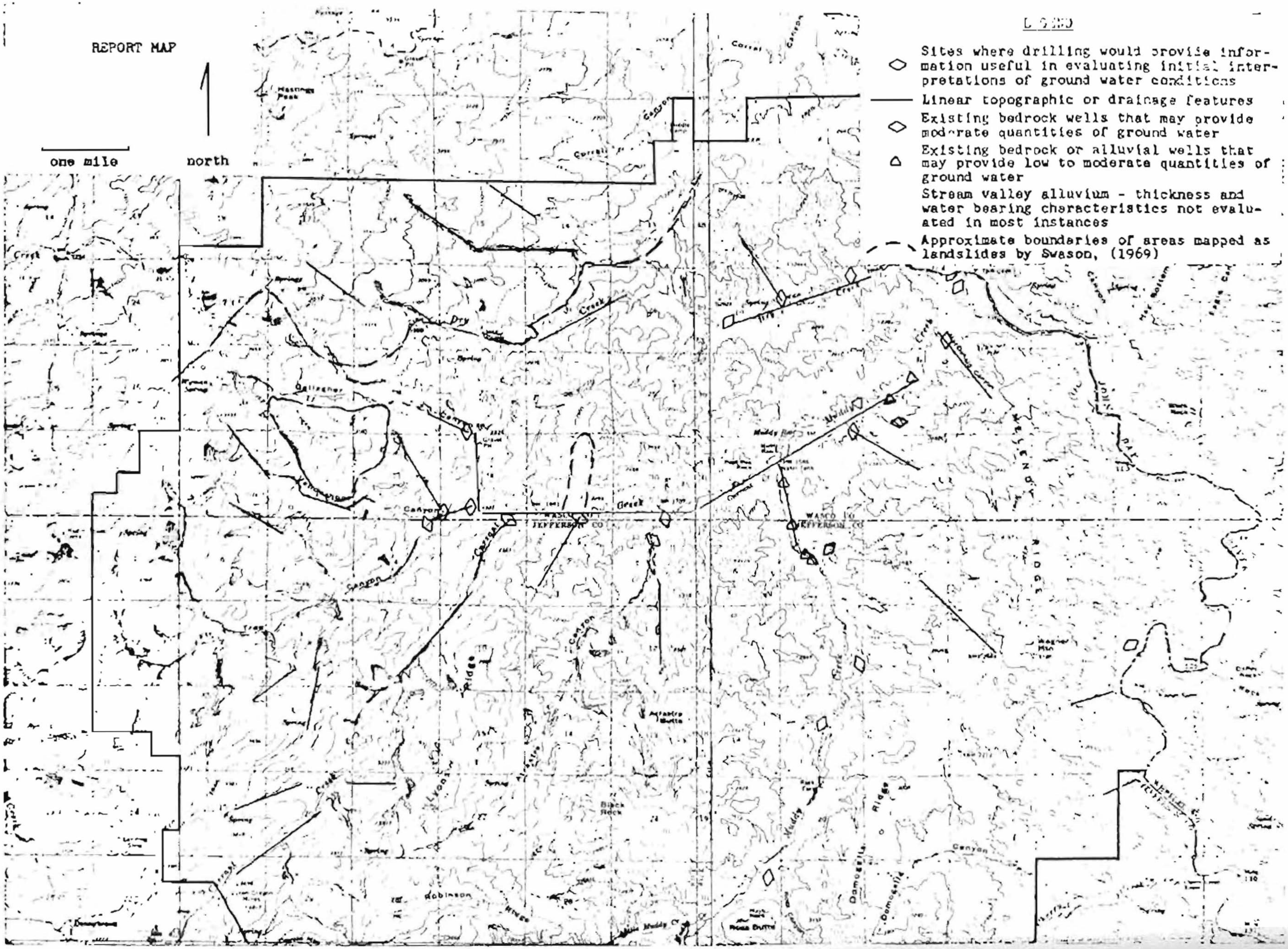
    d. Shut off pump and determine and record the time required for the static water level to return to its original level.

3. A Description of the Well Measuring Point: A written and diagramed description of the measuring point used for taking measurements of the well's water level should be provided. This description should include the true elevation of the M.P. or at least its elevation relative to other well M.P.s. The same M.P. must be used for every water level measurement.

4. A Hydrograph: A graphical record of seasonal static water level fluctuations in each well should be maintained. Water level measurements should be made at least once every three months, and should be taken following a period of well inactivity that is long enough to allow total water level recovery.

5. Water Quality Data: Records of any chemical or bacterialogical test done on the well water should be kept in the well file. The recommended frequency or detail of quality tests will vary depending on well characteristics and water use.

6. Water Use Records: A record of total water use should be kept for each major (high volume or critical supply) well. This will require the installation of totalizing flow meters.


REPORT MAP
one mile
north
LEGEND
Sites where drilling would provide information useful in evaluating initial interpretations of ground water conditions
Linear topographic or drainage features
Existing bedrock wells that may provide moderate quantities of ground water
Existing bedrock or alluvial wells that may provide low to moderate quantities of ground water
Stream valley alluvium - thickness and water bearing characteristics not evaluated in most instances
Approximate boundaries of areas mapped as landslides by Swason, (1969)
JOHN DAY
WASCO CO
JEFFERSON CO

<u>APPENDIX 10</u>

GEO-MAT, INC.
P.O. Box 1425
Lake Oswego, Oregon 97034
(503) 635-4711

July 23, 1982

Rajneesh Neo-Sannyas International Commune
Swami Anad Videh
Chuang-Psu Department
P.O. Box 12-A
Antelope, Oregon 97001

Dear Swami Anad Videh:

I have prepared the attached report in response to Mr. David Knapp's request for an update on the Rajneeshpuram ground water development program.

Please feel free to contact me if you have any questions or need additional information.

Sincerely,

Kent Mathiot

KM:kss

Attachment

REGISTERED PROFESSIONAL
OREGON
R. KENT MATHIOT
E 324
GEOLOGIST

UPDATE

Rajneeshpuram Ground Water Development & Management Program

A considerable amount of ground water related research and development work has been carried out since the preparation of the preliminary hydrogeologic assessment report in November of 1981. The following comments summarize the results of that work and provide a review of the direction and goals of the Rajneeshpuram ground water program. In addition, information pertinent to future ground water needs and the ability of the natural system to meet those needs is included.

POPULATION ESTIMATES

Population estimates prepared for the Rajneeshpuram Comprehensive Land Use Plan project a population of 3,800 by the year 2000. Population increase will, of course, occur in stages, but approximately fifty percent of the total number of residents will reportedly be living in the city by 1987. The following figures show the population breakdown by area, and the anticipated sustained yield water supply necessary to meet the needs of these residents (based on an 80 gallons/per person/per day average estimate developed by Rajneeshpuram Planners).

Incorporated Area	Approx. Population 1987	Necessary Sustained Yield - 1987 (80 g/p/d)	Approx. Population 2,000
Jesus Grove	450	25 gpm	900
Desiderata Canyon	350	20 gpm	700
Buddha Grove	1,100	60 gpm	2,200

The amount of water needed is shown for the 1987 population. This is primarily because the five-year period is a more realistic time span for which to develop ground water quality estimates given the amount of hydrogeologic information currently available. The five-year estimate is also preferable because numerous changes in the community's overall water development program are anticipated during this period. These changes include development of surface water reservoirs, a tremendous increase in hydrogeologic data, and other factors that will significantly affect water resource availability and usage patterns.

GROUND WATER PROGRAM TO DATE

Development: More than 25 wells have been drilled on Rancho Rajneesh since development began in July of 1981. Water from those wells has adequately satisfied the non irrigation needs of the community's 200-500 residents on an on-going basis, and recently, the system easily supplied water for at least 5,000 people during a week-long gathering on the property.

Following an initial period of relatively random selection of well sites, and indiscriminant use of wells, adequate information was obtained to allow development of a well drilling and ground water development program based on readily observable hydrogeologic characteristics. Continued well construction and data collection has demonstrated that the basic concepts and estimates outlined in the preliminary hydrogeologic assessment report are valid, with the following modifications: 1) The alluvial/shallow bedrock aquifer in the Jesus Grove area has been shown to be a viable ground water supply system with capabilities greater than those initially anticipated. 2) Initial drilling and geologic mapping in the Buddha Grove area has confirmed the complex nature of the area's hydrogeologic setting, but has provided positive information on the area's ability to receive ground water recharge and on the ground water yielding capabilities of underlying aquifer materials. 3) Initial work has indicated limited ground water production capability in the Lower Vanderhoof Canyon area. These topics will be discussed in greater detail in following sections.

Monitoring and Data Collection: Considerable improvement has occurred in the hydrogeologic data collection program. Preliminary geologic mapping has been completed for the three areas of the city and is updated as additional drilling or field work provides new information. An information file has been established for each well on the property. Many of these files presently contain, and they will all eventually contain, water level measurement and pumping test data, well head elevation, a well construction report, water quality information, and water use records.

A series of stream gauging stations and meterological stations are being installed, and, when completed, will contribute significantly to the hydrogeologic data base.

Accurate data collection and record keeping are the keys to a successful ground water management program at Rajneeshpuram, and this program must be kept active and be continually improved.

Ground Water Quality: Most wells on Rancho Rajneesh develop water from relatively shallow, local ground water flow systems. As a result, ground water quality has been quite good with a few minor exceptions involving sulphur odor and moderate hardness. A comprehensive ground water quality assessment program is planned, but has not yet been conducted. Tests done in order to comply with Health Division requirements have reportedly shown the quality of the major supply wells to be in compliance with State drinking water standards.

ANTICIPATED PRODUCTION CAPABILITIES

Analysis of any ground water basin in order to determine the maximum stable basin yield and optimal development level is a very involved process. Such an analysis requires a thorough knowledge of basin geology, aquifer characteristics, the local hydrologic budget, and several years of representative water level measurements. It is a very rare situation where this type of information is available prior to the initial development of a basin's ground water resources. Preferably the information needed for this level of study is collected over a several year period, and the assessment conducted prior to major expansion or other system modifications. In most instances, unfortunately, this type of study is conducted only if major quality or quantity problems have already occurred.

At Rajneeshpuram the ground water management program involves the selection of well construction sites in areas with favorable surficial hydrogeologic characteristics, the development of successful wells to production levels that do not cause significant static water level declines, and the careful monitoring of water level changes with time. As the number of wells and data base expands aquifer tests and basin assessments will be conducted.

Jesus Grove: The alluvial/shallow bedrock aquifer that underlies the valley floor in the Jesus Grove area has proved to be a productive and dependable system, and has supplied a majority of the ground water used at the Ranch to date. The system receives significant recharge in the form of stream channel leakage with some wells showing more than 15' of static water level rise between the fall of 1981 and spring of 1982.

As anticipated the production rates of wells in this aquifer vary in response to differences in permeability and thickness of the alluvium and the degree of fracturing in the underlying bedrock material. Short term specific capacity tests on two wells in this aquifer showed capacities of 3.7 gpm/ft. and 4.7 gpm/ft. for pumping rates of 35 gpm and 75 gpm respectively. Well number 25, which was drilled especially for the community's July festival, demonstrated a specific capacity of 45 gpm/ft. during a 10-hour pump test; and produced water at a rate of approximately 150,000 gallons per day (104 gpm) throughout the week-long event. No long term water level fluctuation data is available on well 25, but an indication of the long term production capability of wells in the alluvial/bedrock aquifer can be derived from a review of the history of well number 12. This well has been providing water at a rate of approximately 20 gpm for eight months. During that time the static level has experienced a seasonal rise of more than 10 feet.

Bedrock wells constructed in side canyons in the Jesus Grove area have continued to provide dependable supplies to residential sites. Tests of three of these wells indicated an average specific capacity of 3.5 gpm/ft. at production rates ranging from 30 to 120 gpm. Actual production rates on these wells, however, have been maintained at levels considerably below their apparent capabilities. This is being done primarily to avoid lowering static water levels until more information is available on recharge characteristics.

Future plans for the assessment of the ground water resource in the Jesus Grove area include the development of seasonal water table contour maps, a map showing the extent and thickness of the aquifer, one or two representative, extended period aquifer tests, and installation of stream gauging and weather monitoring stations.

It appears at this time that the ground water resource in the Jesus Grove area can easily supply the area's anticipated 1987 needs as well as provide a substantial amount of water to other districts of the city. Based on short term data it is possible that the Jesus Grove ground water resource could provide the total anticipated 1987 non agricultural water needs of the city. Additional work and long term monitoring will be necessary, however, in order to verify this possibility.

Buddha Grove: Additional geologic mapping and initial drilling in the Buddha Grove District has confirmed the hydrogeologic complexity of the area anticipated in the preliminary hydrogeologic assessment report. This work has also brought to light several positive factors concerning the ground water production potential of the area.

Mapping has shown the area to have a significant percentage of gently sloping surfaces and stream channels that are underlain by stoney ground. These areas appear to be well suited to stream channel and depression focused ground water recharge. The concept that ground water in this area is recharged in this manner is supported by the fact that stream flow is relatively short lived even following extended wet periods.

The two wells that have recently been constructed in this upland area have both encountered high production, fractured bedrock zones at relatively shallow (< 200') depths. Air tests on these wells following construction indicated production capabilities of more than 150 gpm in each well. One of the two wells was pumped at a rate of 25 to 30 gpm for 72 hours and during that time total drawdown was approximately 7 feet.

The positive recharge characteristics and productive aquifer materials are very favorable factors, but the key to developing dependable ground supplies in the Buddha Grove area will be to balance the per well withdrawal with the amount of natural recharge entering the local flow system developed by that well. There is inadequate information available at this time to determine optimal yield for the area, but an estimate of recharge potential does provide a basis for estimating production capabilities.

The Buddha Grove area receives approximately 6.8" of precipitation during the wet season of November through March, (based on 24 years of record at the Antelope station). Of this amount approximately 20% or 1.4" will run off as surface drainage, and approximately 1.6" will be lost to evapotranspiration. This leaves approximately 3.8" available for potential ground water recharge. At this rate each acre of land area would provide 104,000 gallons of recharge annually, and a recharge area of approximately 150 acres would be required to provide recharge equal to a sustained yield withdrawal of 30 gpm.

These figures must be considered a rough estimate, but they do indicate that a series of properly located and designed, low to moderate production wells could be located within the several thousand acre drainage basin that surrounds the Buddha Grove District. Such a system should initially be capable of supplying the anticipated 1987 needs of the district without overdrafting the ground water aquifer.

Desiderata: Preliminary drilling and geologic mapping has indicated that the lower canyon areas of the Desiderata District have low ground water development potential. The low permeability bedrock materials that underly these areas limit well production to a few gallons per minute.

Spring activity, and more favorable hydrogeologic conditions in the upper canyons, however, may indicate greater potential for low to moderate well yields from these areas. Additional mapping and exploratory drilling are planned for the near future in the Desiderata District. Estimates of the area's overall ground water production capability cannot be made until this work has been completed.

WELL INTERFERENCE

The Rajneeshpuram ground water development plan calls for careful observation and mananement of the resource. Under these conditions the potential for overdrafting of aquifers, and significant interference with neighboring wells is minimal.

At this point there does not appear to be any potential for impacting neighboring wells or springs through the development of ground water resources in the Jesus Grove District. The amount of available hydrogeologic information on the Desiderata and Buddha Grove Districts is still quite limited, but the potential for affecting neighboring ground water supplies by well development in these areas is limited by factors described in earlier reports.

The Rajneeshpuram residents should work closely with neighboring ground water users to establish accurate monitoring programs.

APPENDIX 11

RAJNEESHPURAM GROUND WATER MANAGEMENT PROGRAM

Protection Of Wells And Springs On Neighboring Properties

8-20-82

Rajneeshpuram Ground Water Management Program
Protection of Wells and Springs on Neighboring Properties

Any ground water management program should address the issue of potential impact of ground water development on existing ground and surface water users. Like all other aspects of a ground water management program the plan to protect neighboring water users should be initiated early, and expanded as new information becomes available.

At Rajneeshpuram preliminary information on the hydrogeologic setting has indicated that there should be very little threat to neighboring water supplies from a conscientious water development program on the Ranch property. The following pages contain information on the nature and extent of water development on properties in the general area of the Ranch. This information was compiled to further test the theory of minimal potential impact, and is part of an on-going program designed to promote sound water resource management.

Oregon Ground Water Law

Oregon ground water law is based on the general concept that ground water is a public resource that belongs to all residents of the State. It can be developed for private use however, as long as the developer complies with State regulations designed to insure the continued availability of the resources for beneficial use.

In areas where adequate ground water is available to meet all existing and anticipated needs, State law only requires that the developer use a properly constructed well, and obtain a water right certificate from the State Water Resources Dept. For certain small uses such as stock watering, limited domestic, irrigation, or commercial uses the developer's right to appropriate water is considered to be automatic upon submittal of a well construction record to the W.R.D., and actual use of the resource.

In areas where the resource has been shown to be overdeveloped, ground water withdrawals can be limited by the State through a Critical Ground Water Area designation. Under this designation, earliest established water rights are given priority of protection over those that have been established more recently. Establishment of a critical ground water area is a very involved process, and normally requires a comprehensive hydrogeologic assessment of the affected area.

Springs: Under State law springs are considered to be surface water, and anyone using a spring for any purpose must apply for and eventually obtain a water right certificate.

Existing Ground Water and Spring Development in the Area of Rajneeshpuram

Using the water rights records and well log files of the Water Resources Dept. in Salem, a map showing well and spring development around Rajneeshpuram was prepared (see attached map). Other wells and developed springs may exist in the study area, but they are not on record with the State, and their protection under the law may therefore be limited.

Potential Impacts

General: As can be seen on the map, there is only one existing well and two springs within 5 miles of the centers of the three primary areas of ground water withdrawal at Rajneeshpuram (does not include wells or springs located east of the John Day River). This fact, along with the hydrogeologic conditions described in earlier reports, significantly limits the potential for impacts on wells or springs outside the Ranch boundaries. It is highly unlikely that any impact on off-site wells or springs could occur without problems of well interference or excessive water level declines first developing within the Ranch ground water development areas. In other words, the Rajneeshpuram ground water supplies would most likely be the first to be impacted by poor management practices.

Specific Existing Users:

The McGreer well: The McGreer well is reportedly located in the NE 1/4 of the SW 1/4 of Section 4, T8S, R19E. The well is shallow (74') produced only 8 gpm with total drawdown during a 1971 bailer test, and has a history of sanding problems. Based on the well log information the well appears to be developing water from alluvial/colluvial material, and from a zone at the interface of surficial material with underlying basalt bedrock. It is likely that the well is developing ground water supplied by a local ground water flow system, and is therefore unlikely to be impacted by development of ground water outside of the recharge boundaries of that system. The nearest Rajneeshpuram withdrawal area is approximately 4 miles from the McGeer well and is in a different surface water drainage basin.

The Catherine Maurer Springs: The two Maurer Springs are located in the NE/SE/SE of Section 4 and the NW/SW/NE of Section 12, T8S, R18W. These springs reportedly have a combined flow of approximately 5 gpm and are used for stock watering purposes. It is likely that these springs are fed by shallow ground water flow systems that are recharged in upslope areas of the surface water drainage basins that contain the springs. Both of the Maurer Springs are in surface water drainage basins separate from those on the Rajneeshpuram property, and the western spring is situated approximately 600' higher than the center of the anticipated Buddha Grove ground water withdrawal area.

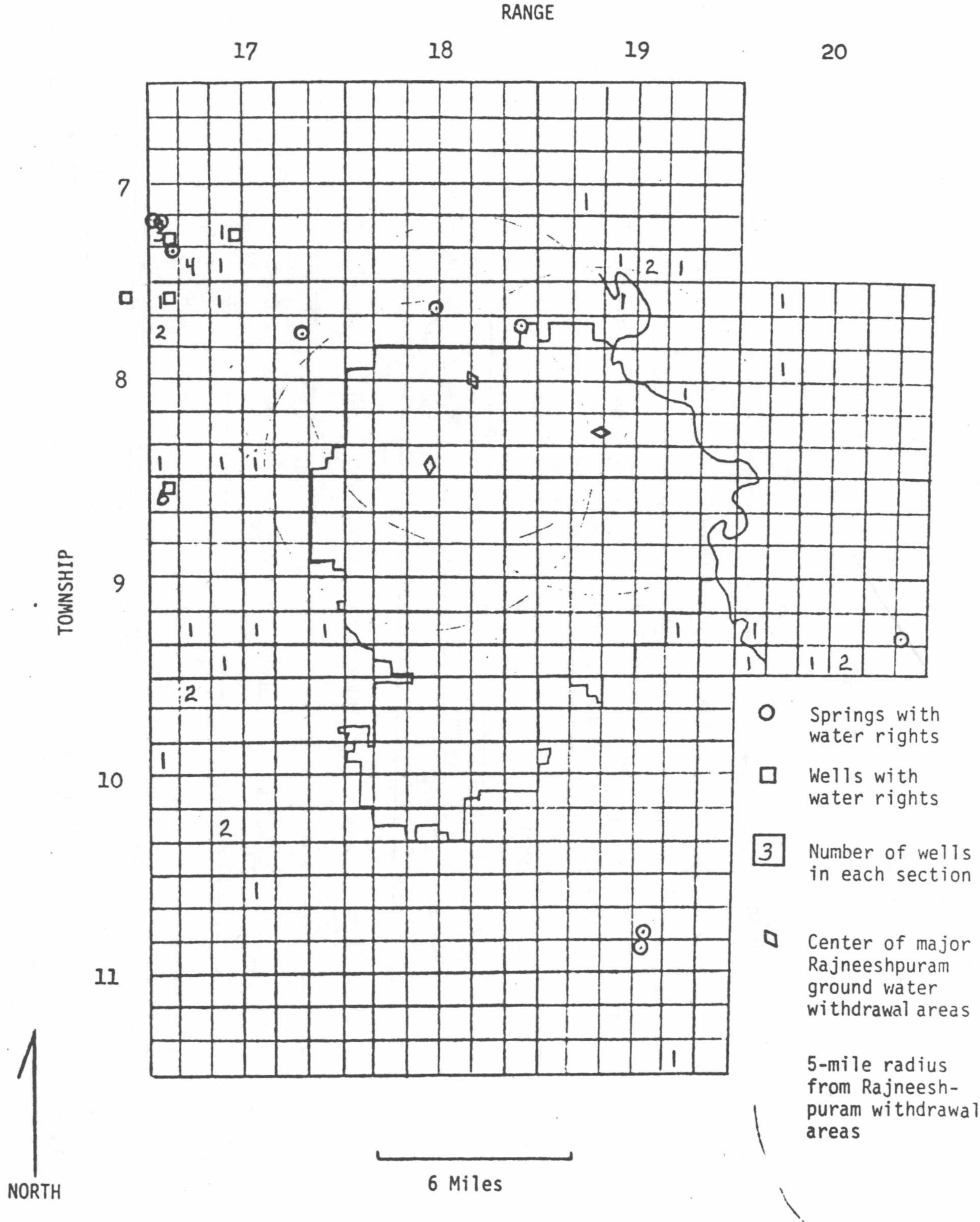
Cold Camp Spring: Cold Camp Spring is located approximately 5 miles from the nearest anticipated ground water withdrawal area. Like the Maurer Springs, the potential impact on Cold Camp Spring is limited by the fact that it is situated in a separate surface water drainage basin and at an elevation several hundred feet higher than any anticipated Rajneeshpuram ground water withdrawal area.

Recommendations

Although the potential of impacting existing wells and springs appears to be minimal, monitoring of ground water levels, well production rates, and spring flows on Rajneeshpuram property should be continued. In addition, records of ground water and spring development on adjoining properties should be kept up to date, and lines of communication with adjacent property owners should be kept open. Users of the Maurer and Cold Camp Springs should be contacted to see if they would be interested in establishing a cooperative monitoring program.

Water Well and Developed Spring Locations in the Rajneeshpuram Area Excluding Those on the Rajneesh Property

(Based on Oregon Water Resources Dept. Records, Aug. 1982)



WATER RIGHTS - BASIN 5 STUDY AREA

Town Rng.	Sec	¼	¼	App'l. No.	App'l. Date	Facility	Owner	Status	Quan.	Stream	Use or Gen. Comments
7-17	28	NE/SE		U-613	6-53	1 Well	Frank & Edna Thompson	Cert.	1.0 cfs	Antelope Ck.	Major G.W. User
7-17	30	NW/SE SE/SE		G-10671	3-82	2 Wells	Steinmetz, Dickson Opray, Mobley	App.	37 gpm		Quasi Municipal
7-17	30 31	NE/NW NW/NW NE/NE		6172	6-18	Springs	City of Antelope	Cert.	.225 cfs		Domestic
8-17	6			G-7320	4-76	1 Well	Clarence Brown	Perm.	1.56 cfs	Antelope Ck.	Irrigation - 100 ac. Major G.W. User
8-17	11	NE/SE		63599	6-82	Cold Camp Spring	James & Shirlee Perkins	Appl.	16 gpm	Trout Ck.	Stock Watering
9-17	6	SW/NE		G-6878	4-75	2 Wells	Robert D. Morss	Cert.	2.0 cfs	Unnamed Stream	Irrigation - 164 ac. Major G.W. User
9-17	6	SW/NE		G-6970	6-75	1 Well	Robert D. Morss	Cert.	2.8 cfs	Unnamed Stream	Irrigation - 333 ac. Major G.W. User
8-17	10 22	NE/NE SW/SW		R-52454	9-74	2 Reservoirs	W.L. Dickson	Cert.	1.5 ac.ft.	Unnamed Int. Stream	Stock Watering

WATER RIGHTS - BASIN 6 STUDY AREA

Excludes main stream John Day water rights and surface water rights east of John Day River

Town Rng.	Sec	¼ ¼	App'l. No.	App'l. Date	Facility	Owner	Status	Quan.	Stream	Use or Gen. Comments
8-18	4 12	NE/SE/SE NW/SW/NE	63331	3-82	Springs	Catherine Mauer	Perm.	.01 cfs		Stock Watering
9-20	25	SW/SW	52901	3-75	Spring	Kenneth Bond	Cert.	.01 cfs		Stock Watering
11-19	10 15	SE/SW NW	4958	4-17	Springs	Walter N. Ludwick	Cert.	.3 cfs		Stock & Irrigation
7-19	19	NW/NW	2625	10-12	Surface Water	R.J. Campbell	Cert.	.125 cfs	Sorefoot Ck.	Irrigation - 10 ac.
9-18	25	NE/NE	11559	6-27	Surface Water	A.O. Lowry	Cert.	.38 cfs	Little Moody Ck.	
9-18	36	NE/NE	R-33562 33563	6-60	Reservoir	Prineville Land & Livestock	Cert.	456.5 ac.ft.	Moody Ck.	
9-19	25	SW/NE	3193	9-13	Surface	A.E. LaFollette	Cert.	.25 cfs	Cherry Ck.	Irrigation
10-19	9	SW/SW	3608	4-14	Surface	Roy Shrum	Cert.	.35 cfs	Cherry Ck.	Domestic and Irrigation
10-19	23	NE/SW	R-57519 57520	6-78	Reservoir	Forrest Solomon	Perm.	86.1 ac.ft.	Cherry Ck.	Irrigation

APPENDIX 14

ESTIMATE OF AN EXPORT BASE MULTIPLIER FOR THE CITY OF RAJNEESHPURAM

by

Anthony M. Rufolo, Ph.D.

This report presents an estimate of the export base multiplier for Rajneeshpuram and an explanation of how the estimate was derived.

Based on a review of existing studies of export base multipliers for communities similar in size and isolation to Rajneeshpuram, I believe that the appropriate multiplier would be in the range of 1.4 to 2.0. This means that for every ten workers in export jobs there will be between four and ten additional workers in local service jobs. Further, the particular characteristics of the community make it likely that a higher multiplier would be appropriate. Since there is no practical way to incorporate these adjustments into the numerical estimates, I would recommend the use of numbers in the upper part of the range.

What is a Multiplier?

Whenever a business in a region sells something outside of the region, the sale creates both jobs and income within the region; but this initial impact does not represent the total effect of the transaction on the region. The business making the sale will require certain inputs, some of which will be produced within the region; and the employees of the export firm will require a variety of goods and services. Further, local providers of these inputs and services will also require some local inputs and services. Thus, each job in an exporting industry will require some additional workers in the service sector of the regional economy. In general, a larger export sector will require a larger service sector. The relation between total income or employment in the region and export-related income or employment is frequently referred to as the regional multiplier or the export base multiplier.

Two types of export base multipliers can be calculated. One is the ratio of total income generated in the region to the income generated in the export industry. The other is the ratio of total employment generated in the region to employment in the export industry. Once these numbers have been calculated they allow for a simple way of estimating the total regional impact of a particular change in export activity. One need only estimate the change in export employment and multiply it by the regional employment multiplier to generate an estimate of the change in total regional employment.

In a standard market arrangement these links between the export activity and the service activity will be generated by firms in the region purchasing some of their inputs from other firms and by employees purchasing some goods and services within the region. However, the economic relationships do not depend on a market economy. If a person consumes food in a restaurant, for example, someone must prepare the food and serve it, whether or not there is a monetary transaction associated with the meal. In the absence of monetary transactions within the community, the income multiplier cannot be used, but the employment multiplier is still valid.

Why Use a Multiplier?

An export base multiplier is a very useful tool which is frequently applied in forecasting employment. However, a number of arguments have been raised as objections to its usage; and these objections make it clear that the analysis must be applied carefully. The major objections are that the ratio of total employment to export employment may not be stable over time and that it is really the total amount of resources in the community that determines total activity rather than the amount of export activity. Both of these objections have some merit. Unfortunately, every forecasting technique can have arguments raised against it. The real issue is whether there are any other reasonably inexpensive techniques that can do as good a job; and there do not appear to be any. Further, the specific problems can be addressed by a careful use of the analysis.

The argument about resources constraining the multiplier impact is primarily an issue when the local economy is near full employment. It is much less likely to be important when, for example, the employees projected by the multiplier analysis will in fact be available to work. In addition, much of the concern with variability of the multiplier relates to its changing as a region grows. This concern can be addressed by taking careful account of the region's size.

The benefit of using the multiplier analysis for projections is that it is usually possible to estimate employment for export purposes much more accurately than it is to estimate other components of employment. For multiplier purposes, employment is divided into the export and service sectors. Employment in the service sector is harder to forecast directly because it is difficult to identify the specific linkages that will arise in the community, especially in a small community. The multiplier ratio, however, has proven to be more reliable than the specific service sector employment estimates. In addition, the export market is likely to remain fairly stable as the community grows, making it easier to estimate export employment. The difference is even more pronounced in a rapidly growing community because there are fewer established service linkages to use in making projections.

Estimating a Multiplier For Rajneeshpuram

Economic base multipliers are used frequently. Unfortunately, it is easy to misuse them. There are a variety of methods to calculate the multipliers, and different methods can lead to large differences in the multiplier.[1] Some of these differences are due to variations in what the multiplier takes into account and others are due to the methods of calculating the multiplier. It is important to rely on multipliers derived using the best techniques and to use a multiplier that is based as much as possible on the situation under study.

The ideal economic base multiplier would be found by starting with a careful survey of the existing jobs in a region. Employment in each firm would then be allocated between export and local production. Refinements would be made by adjusting for part-time versus full-time workers, commuting into and out of the region, and the pattern of transfer payments.[2] Further refinements could be made by looking in detail at the particular industries and the changes in certain relationships over time.

The more refined the estimates of the multiplier, the more costly they are to generate; and, more important, the data simply do not exist in Rajneeshpuram to estimate a multipler based on past experience. Thus, the choice of a multiplier should be based on the experience of similar communities; and the major issue is then in defining and identifying similar communities.

There are several characteristics of Rajneeshpuram that are important in considering an economic base multiplier. First, it is small and isolated. Both of these characteristics can have an important impact on the economic base multiplier. It is widely recognized that smaller regions have smaller multipliers and that the more isolated a region is, the higher its multiplier is likely to be. Second, most of the population will belong to a religious commune and have consumption patterns which differ from those in most communities.

It would be very nice if careful multiplier estimates existed for communities in the U.S. similar to Rajneeshpuram in all of the above characteristics. In the absence of such studies, one can start by looking at the estimates of economic base multipliers for small, isolated communities. A thorough recent study looked at 20 such communities in Arizona.[3] Based on the size and nonmetropolitan status of the communities, they represent a large sample of comparable communities. The multiplier estimates are based on employment surveys, and estimates of the multipliers are provided for many of the refinements discussed above.

The relevant region for these communities was defined as being an isolated community and all related activity within a ten-mile radius. The population of these regions ranged from 1,838 to 15,000 people. The best estimate of the economic base multiplier for these communities ranged from 1.13 to 1.66; however, there are a number of reasons why these numbers should be considered too low for Rajneeshpuram.

The first is that the "best" multiplier treats transfer payments as a source of export. The Arizona study adjusted for unemployment compensation, Social Security, and various forms of welfare payments. Given the age structure of the current residents of Rajneeshpuram, it is unlikely that many residents will be receiving Social Security payments. Further, since most residents will be members of the commune, there will be little in the way of unemployment or welfare payments. However, donations to the community will have essentially the same effect as these other transfer payments. Since the structure of the community does not allow for separate estimation of the impact of such transfer arrangements, the multiplier without such adjustments is the most appropriate. The multiplier estimates under these circumstances are 1.14 to 2.44, with most falling into the range of 1.42 to 2.05.

If Rajneeshpuram were to be a conventional, market-oriented community, a multiplier of 1.4 to 2.0 would be recommended; however, several features of Rajneeshpuram make it likely that the community will experience a higher multiplier. The most important feature is the relative lack of consumer durable goods for the individual residents. The major reason for small multipliers in smaller communities is the so-called "leakage" from the system. Money which goes to purchase goods and services outside the community is not available to support employment within the community. For example, when a person buys a television, it represents an import for the community and supports employment somewhere else. However, when a person consumes a service, it is more likely to provide employment within the community. Thus, the relative reliance on services rather than material goods in individual consumption will raise the multiplier for Rajneeshpuram. The second factor is the provision of services through the commune rather than the family. In most communities, some large fraction of the women provide services outside the economic system. In Rajneeshpuram, services such as housecleaning are provided by community workers. In the standard analysis, these providers of domestic services would not be included in the multiplier and their inclusion would significantly raise the multiplier for most communities. Since domestic service workers are being included in the service category at Rajneeshpuram, the multiplier would be expected to be higher. Working to offset these factors somewhat is the ascetic lifestyle in the commune since this requires fewer services per person to maintain the lower material living standard.

On balance, the range of 1.4 to 2.0 for the multiplier is probably a little low for Rajneeshpuram; but I would recommend this range given our inability to quantify the adjustments for the factors mentioned above. However, in light of the need for upward adjustment, I would recommend using multipliers in the upper part of the range.

The other consideration in adopting a multiplier to this situation is the experience in Oregon and the relationship between this multiplier and those that are derived in other circumstances. In general, the larger the area under study, the larger the multiplier will be. This is because some of the "leakage" from the local economy will generate employment in the larger area. When this additional employment is added to the total, the ratio of total employment to export employment rises. Thus, the multipliers for a county will be higher than the ones for a city and those for a state are higher than those for a county. A recent study summarizes the economic base multipliers found for agricultural exports in nine Oregon counties.[4] These ranged from 1.51 to 2.87 for direct agricultural exports and from 1.71 to 3.08 for export sales of processed food. It is concluded in the study that it is safe to assume a statewide multiplier of 3.0. This indicates that the multiplier estimate for Rajneeshpuram is consistent with those for counties in Oregon. Further, the multiplier of 3.0 for the state would imply that for every ten export jobs in Rajneeshpuram, ten to 16 additional jobs would be generated in the state outside of the city as well as the four to ten additional jobs in the city.

A further example within Oregon is the Bend Area General Plan for 1974. In this plan an export base multiplier of 2.9 was used in making employment and population projections. Hence, the multiplier range suggested for Rajneeshpuram does not seem unreasonable in light of other studies done for Oregon.

Evidence from many other types of studies could also be used to support these estimates.[5] However, each of these other studies is in some ways less directly applicable than those already cited.

Calculating the Multiplier Impact

In using a multiplier to estimate employment impact, it is important to maintain the definitions used in the data from which the multiplier was calculated. In this case it is necessary to carefully distinguish between workers within an establishment providing output for nonresidents and those providing output for residents. Only the former should be counted in the base employment. Thus, workers in a restaurant should be counted as service or base workers according to the percentages of patrons who are residents and nonresidents, respectively.

The only area where this rule should not be applied is in construction. Within a moderately growing or stable community, it is reasonable to treat the ongoing construction in the area as part of the service employment. But in a rapidly growing area, the level of construction is beyond what will be sustainable as service to a community. In this case, the construction work acts essentially as additional basic employment. The product is not sold directly outside the region, but most of the financing comes from external sources. Further, the product is not used for direct consumption by the region's residents. Rather, it is an investment that produces services over a long period of time. The fact that construction in these circumstances acts very much like an export partially explains the "boom town" phenomenon. In a growing area there is demand for employees to serve the basic industries which are growing. In turn, their activities create part of the demand for service sector workers. However, a large amount of construction must also take place. There is thus a demand for workers in the construction area and the resulting additional demand for service workers. But the effect due to construction is only temporary. Even if the true export industries continue to grow, the reduced demand for construction will create a large relative slowdown. By treating these workers as base workers, the longer-term multiplier performs more accurately in predicting the level and pattern of employment over time.

FOOTNOTES

1. For example, see Gibson and Worden (1981).

2. Transfer payments are flows of funds into and out of a region that are not for the compensation of labor or purchase of a good or service. These transfers into a community can act just like export employment in terms of generating a multiplier impact. Money received for Social Security, for example, is spent just as wages received in an export job. This will increase the number of service jobs relative to the number of export jobs; and a direct estimate of the ratio of total employment to base employment would overstate the multiplier.

3. Gibson and Worden (1981).

4. Obermiller, et al (1981).

5. For example, see Henry and Nyankori (1981), Weiss (1968), and Palumbo (1982).

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APPENDIX 15

POPULATION PROJECTIONS

FOR THE CITY OF RAJNEESHPURAM, OREGON

1982 - 2002

Prepared by the Center for Population Research and Census

Portland State University

August, 1982

Introduction

The projections found within this report are an attempt to model population growth in a manner consistent with the expected economic development of the City of Rajneeshpuram. Because of the rather unique features of this community, a rather detailed explanation of the particular techniques used in this study follows. In addition, the report contains the rationale for the various assumptions that went into these projections.

THE MODEL

Although assumptions, more than the model, ultimately determine the accuracy of a population forecast, demographers generally prefer various models over others. Perhaps the most preferred model is the cohort-component model. Though many variants of this technique have been developed, all contain the basic generic structure. This structure is based upon the mathematical formula demographers refer to as the "balancing equation." This is

$$P_2 = P_1 + B_{1-2} - D_{1-2} + IM_{1-2} - OM_{1-2}$$

where P_1 = population of an area at time 1,

P_2 = population of an area at time 2,

B_{1-2} = number of births in the area during the interval time 1 to time 2,

D_{1-2} = number of deaths in the area during the interval time 1 to time 2,

IM_{1-2} = number of people moving into an area during the interval time 1 to time 2, and

OM_{1-2} = number of people moving out of an area during the interval time 1 to time 2.

Since this equation is an equality, if one could forecast without error the components of change (births, deaths, inmigrants and outmigrants), one could forecast without error the future population, P_2.

The reason this generic technique is preferred by most population analysts is that it most directly models the manner in which a population evolves. That is, the cohort-component model allows for the interaction of the rates of various vital events (births, deaths, inmigration and outmigration) and the size and structure of the population. This feature is very important since the pattern of vital events is highly correlated to the age and sex structure of a population. For instance, two populations of identical size, one with twenty percent of its population over the age of 70 years and the other with forty percent, will experience very different numbers of deaths during a period, even though the age-specific rates of dying are identical for both populations. This happens since the probability of dying is much greater for those over age 70 than for those younger.

Another feature of the cohort-component model which recommends its use is its ability to forecast the population by age and sex. Since many social services are targeted to particular age and sex groups (i.e., schools, maternity care) planners and policy makers find the results more useable than a simple total population.

A final characteristic of the cohort-component model which is very important in this particular exercise is the potential historical nature of the model (Pittenger, 1976:135). A number of projection techniques rely exclusively on curve-fitting techniques to trend future population growth. Though one can trend by curve-fitting the various rates of vital events used in the cohort-component model, this is not a requirement. Current data can be used, with trending based upon judgements derived from data sources from other populations, rather than from historical data of the population to be forecast. This particular feature is very important in this situation since the Rajneeshpuram population has just recently moved into the area of the new city.

ASSUMPTIONS

In this forecast we make assumptions about the following phenomena: age-specific birth rates, sex ratio of infants at birth, age-specific labor force participation rates, the ratio of labor force migrants to total migrants and the age and sex pattern of net migration. Each of these assumptions is related directly to either births, deaths or migration. An explanation of each follows.

Mortality

Mortality is by far the least difficult component of population change to forecast. Within a specific population it will be most sensitive to the age and sex distribution of a population. In addition, within economically and socially advanced societies, the amount of change that occurs over a relatively extended period of time to a set of age and sex specific mortality rates is slight.

What we have used as a mortality assumption for the purposes of these forecasts are survival rates calculated from the 1977 life table for the white population of the U.S. (NCHS, 1980). These rates are age and sex specific. They represent the probability of an individual in a specific age and sex category surviving to the next age. In these forecasts we have held these rates constant over time. This was done for two reasons: first to trend age and sex specific death rates, one needs a target set of rates. None were readily available at this time. Second, since age and sex specific mortality rates in economically and socially advanced populations change so gradually, and since the base population to which these rates were to be applied is so small, the effect of trending these rates would have been very negligible.

Fertility

Unlike mortality, the lack of historical data greatly exacerbates our efforts in arriving at assumptions about the future fertility behavior of the Rajneeshpuram population. However, an analysis of the current age structure of the population suggests that recent past fertility in this population has been much lower than that which has occurred in the total population of Oregon. For instance, by comparing the child/woman ratios for the two populations (number of children under 5 years of age to the number of females 15-44) we see that while the State's ratio for 1980 was .316, it was only .007 for the Rajneeshpuram women. Thus it is clear that in the last five years, the fertility of the women of Rajneeshpuram has been markedly lower than that of women in Oregon.

A contributing factor which certainly is responsible for some of the disparity between the recent fertility of these two groups of women is the difference in the age structures of the two populations. The Rajneesh women tend to be much older, with nearly 50 percent of the female population in their 30's. The corresponding percentage for the State's population is only 15 percent.

Knowing that Rajneesh women in the recent past have been less fertile than Oregon women as a whole, we opted for a conservative fertility assumption. Our assumption began with a rate .75 of the 1980 State rate (State of Oregon, 1980), with a rise to an eventual rate of replacement fertility (from a total fertility rate of 1.3 to an eventual rate of 2.1). (See Table 1.) Though these specific numbers were arbitrarily chosen, they represent some attempt on our part to balance two concerns: 1) the obvious fact that Rajneesh fertility is low, and 2) reproduction is a basic function that all successful groups must eventually deal with. Thus it would seem unlikely that the Rajneesh women would continue with levels of fertility much lower than we have assumed. Age-specific fertility rates were used in the forecasts. Besides the slight trend upward, we also shifted the timing of births to older women. This is consistent with expected trends in U. S. fertility. A sex ratio of 104 males to 100 females was applied to each set of birth projections. This is an often observed and stable pattern.

Migration

In this population forecast we use employment projections to "drive" our migration assumptions. Migration is generally viewed as a response to changing economic conditions; that is, people tend to move to areas where they can obtain more desirable jobs and living conditions. Thus as more employment opportunities become available in the Rajneeshpuram area, more people will be attracted to the area.

Rather than treating inmigrants and outmigrants separately, we have combined the two into net migration (in-minus out-migration). This particular technique is generally used when one is projecting a population of a sub-area of a much larger area. In this case we are projecting the population of a city, and that city is part of the U.S.

To incorporate this notion into our model, we first "survive" the resident population to the projection date. At this point, we determine what size labor force the survived resident population can provide and then compare it to the labor force needed to be compatible with the employment projections. If the survived labor force is less than needed, then we assume the deficit will result in positive net migration. If, on the other hand, the survived labor force is more than needed for the projected employment, we assume negative net migration. In this manner, the employment projections "drive" the migration assumption.

Employment is often viewed as being either export-base related or non-base related. Export-base related employment includes those jobs which result in products which are sold outside the region, thus resulting in the flow of capital into the area. Non-export base employment produces products which are consumed within the region.

In forecasting employment, export-based employment is generally regarded as the foundation for non-base employment. Thus, one first calculates the export-base employment and then uses a multiplier to arrive at the non-base employment. In these projections we have taken the export-based employment projection produced for the city of Rajneeshpuram by an outside consultant. To these we have applied the multipliers of 1.7 for the year 1987 and 2.0 for later projection dates. These particular multipliers were consistent with analyses and recommendations contained within the report of Dr. Rufolo (1982).

The employment projections used in this population forecast are contained in Table 2.

Since this forecast is age and sex specific, some assumptions must be made concerning the age and sex structure of the labor force population. What we have done is to anticipate that the age and sex selectivity of future migrants will parallel a suburban area. The pattern chosen was that which occurred recently in Washington County, Oregon, with some modification. According to leaders of the Rajneesh sect, most U. S. based members tend to be young adults. This is smiliar to the major stream of migrants which have been moving into Washington County.

The major modification made to the Washington County pattern included a lowering of the proportion of migrants in the ages 0-17. This was done to compensate for the lower than average fertility of the Rajneesh. In addition the migration was ended at age 64. At this time no provisions have been made to accept non-resident retirees.

When using an employment driven cohort-component model, some provision must be made to determine what size labor force a "survived" population can supply. This is usually done by multiplying the survived population times labor force participation rates.

In these projections, labor force participation rates were assumed to be 1.0 for all ages between 18 and 64 years. For those over 65 years, labor force participation rates were reduced to .5.

The rationale for the above assumptions is that as a working commune, all adult members are expected to contribute fully. The lowering of the participation rate after age 64 reflects both anticipated increased nonwork activities by the elderly and a lowering of productivity due to biological degeneration which often accompanies advanced age.

Since all migrants are not eligible for labor force participation (i.e. the very young and the very old), total migration generally exceeds labor force migration in magnitude. To project this, we have taken the percent that labor force aged migrants represent of total migrants (as appears in our assumed age and sex pattern of migration) and have used this to inflate labor force aged migration to arrive at total migration. That multiplier is 1.32.

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Table 1. Age-Specific Fertility Rates Used in the Population Projection of Rajneeshpuram, Oregon: 1982 to 2002

Age	1982-1987	1987-1992	1992-1997	1997-2002
		Rate		
15-19	.038	.051	.051	.051
20-24	.093	.124	.137	.137
25-29	.086	.114	.140	.140
30-34	.043	.057	.070	.070
35-44	.008	.011	.011	.011

Table 2. Projected Employment by Base/Nonbase Sector for Rajneeshpuram, Oregon: 1987 to 2002

Sector	1987	1992	1997	2002
Export base	1088	1176	1386	1596
Nonbase	762	1176	1386	1596
Total	1850	2352	2772	3192

Table 3. Population of Rajneeshpuram, Oregon: 1982

	Population		
Age	Males	Females	Total
0-4	1	0	1
5-9	2	5	7
10-14	3	4	7
15-19	4	0	4
20-24	7	15	22
25-29	28	26	54
30-34	43	44	87
35-39	36	35	71
40-44	15	18	33
45-49	5	7	12
50-54	5	7	12
55-59	5	3	8
60-64	0	3	3
65&Over	0	0	0
Total	154	167	321

Table 4. Projected Population of Rajneeshpuram, Oregon: 1987

Age	Males	Females	Total
		Population	
0-4	56	52	108
5-9	89	87	176
10-14	93	90	183
15-19	49	59	108
20-24	4	21	25
25-29	160	165	325
30-34	207	178	385
35-39	164	150	314
40-44	133	122	255
45-49	97	94	191
50-54	62	59	121
55-59	52	53	105
60-64	31	37	68
65-69	0	3	3
70-74	0	0	0
75&Over	0	0	0
Total	1197	1169	2367

Population Change: 1982-1987

Total	2046
Births	16
Deaths	0
Migrants	2030

Table 5. Projected Population of Rajneeshpuram, Oregon: 1992

Age	Males	Population Females	Total
0-4	28	26	54
5-9	79	74	153
10-14	112	109	221
15-19	105	104	209
20-24	49	61	110
25-29	43	65	108
30-34	205	204	409
35-39	236	204	440
40-44	188	171	359
45-49	153	140	293
50-54	110	106	216
55	72	70	142
6 64	57	60	117
65-69	29	35	64
70-74	0	3	3
75&Over	0	0	0
Total	1466	1432	2898

Population Change: 1987-1992

Total	531
Births	31
Deaths	22
Migrants	522

Table 7. Projected Population of Rajneeshpuram, Oregon: 2002

		Population	
Age	Males	Females	Total
0-4	36	35	71
5-9	50	49	99
10-14	66	62	128
15-19	107	103	210
20-24	120	120	240
25-29	139	142	281
30-34	118	129	247
35-39	105	119	224
40-44	247	242	489
45-49	266	235	501
50-54	208	193	401
55-59	163	154	317
60-64	112	116	228
65-69	64	70	134
70-74	43	52	95
75&Over	18	30	48
Total	1862	1851	3713

Population Change: 1997-2002

Total	422
Births	50
Deaths	81
Migrants	453

Table 6. Projected Population of Rajneeshpuram, Oregon: 1997

	Population		
Age	Males	Females	Total
0-4	30	30	60
5-9	46	43	89
10-14	97	91	188
15-19	121	120	241
20-24	106	104	210
25-29	79	95	174
30-34	79	95	174
35-39	227	224	451
40-44	252	220	472
45-49	201	184	385
50-54	160	148	308
55-59	114	112	226
60-64	72	74	146
65-69	51	57	108
70-74	24	32	56
75&Over	0	3	3
Total	1659	1632	3291

Population Change: 1992-1997

Total	393
Births	42
Deaths	52
Migrants	403

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MAP REFERENCES

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Desiderata Canyon

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- Ashwood Quadrangle
- Macken Canyon Quadrangle
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