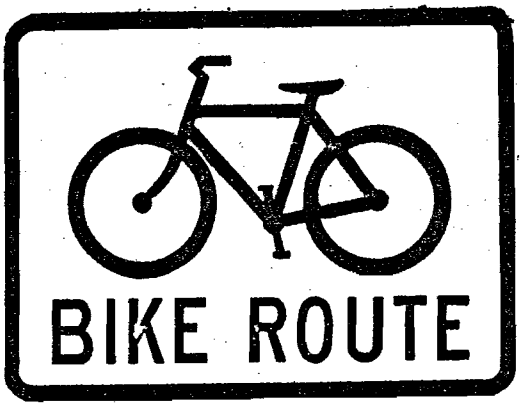
OREGON DEPARTMENT OF TRANSPORTATION

HIGHWAY DIVISION

BIKEWAYS FOR OREGON
INTERIM REPORT



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BIKEWAYS FOR OREGON -- INTERIM REPORT

GOALS

The Highway Division's goal is to provide a system of bikeways that will serve the needs of those wishing to ride bicycles as an alternative to traveling by car or public transportation to work, school, shopping or recreation. Bike routes must provide commuter facilities as well as access to recreational facilities and scenic points of interest. These facilities should allow an individual the opportunity of taking extended trips and, finally, to give the bicycle enthusiast an opportunity to ride with safety for the pleasure of riding.

OBJECTIVES

Through consultation and coordination with other governmental entities, citizen advisory groups devoted to developing bikeways and organized bicycle groups such as the League of American Wheelmen, meaningful routes can be established. These goals can be accomplished without creating a system of segmented bike routes that would be meaningless.

To create this system of routes, programs for development must begin in our urban areas in order to serve our first priority user groups--school children and commuters. Building from our urban areas, a system of trails can be developed that will be meaningful and obtain maximum usage. Providing trails within recreational areas will also serve as a nucleus for a systematic growth of bike routes.

BIKE ROUTES -- INTERIM REPORT

HISTORY, TRENDS AND ACCIDENT STATISTICS

Oregon Law

The 1971 regular session of the Oregon State Legislature enacted the first statewide bicycle path and pedestrian footpath legislation in the nation. This law, Chapter 376 of Oregon Laws, 1971 (commonly known as House Bill 1700--the "Bicycle Bill"), provides that no less than one percent of the funds received from the State Highway fund by any city or county, or by the State Highway Commission, shall be expended for the establishment and maintenance of footpaths and bicycle trails. Funds can accumulate for a period not to exceed ten years for cities with a small amount of funds available.

The Oregon law requires that footpaths and bicycle trails shall be established by the Highway Commission or by any county or city receiving State Highway funds wherever a highway, road or street is being constructed, reconstructed or relocated. Footpaths and bicycle trails may also be established along other highways, roads or streets and in parks and recreation areas. In other words, the expenditure of funds is not limited to those rights of way under the jurisdiction of the particular agency involved, but instead may follow any right of way or, for that matter, meander through the countryside.

The law goes on to insure that footpaths and bicycle trails will not be established on construction projects unless:

1. Where the establishment of such paths and trails would be contrary to public safety;

2. If the cost of establishing such paths and trails would be excessively disproportionate to the need or probable use; or

3. Where sparsity of population or other available ways or factors indicate an absence of any need for such paths and trails.

These qualifications effectively leave one without guidelines in choosing where bicycle routes should be placed and what qualities of routes should be constructed. An attempt will be made in this paper to outline some guidelines to determine route locations that will be of benefit to the public, that will be economically feasible, and will be a credit to the Highway Division.

Bike Production and Popularity

In 1971 8.5 million bicycles were sold, of which 2.2 million were imported. For 1972 the industry has geared itself to produce 10 million bicycles to meet the demands of the public. This year bicycle production is expected to equal automobile production with 25 percent of sales going to the adult cyclist. The adult market has increased 50 percent in the last two years and approximately 5 to 8 percent of the adult population are now riders. Estimates indicate that there are 78 million bicycles in the United States, or that one person in six now owns a bicycle.

Let's look at some of the statistics and reasons for bicycle popularity. Physical fitness, recreation, and "protect the environment" programs

are in the ascendancy and directly tie in with the bicycle boom and give it a vitality that is causing public pressure for bikeways and routes. Bicycles can be riden with relative safety. There is no doubt that bicycle riding is an excellent form of exercise. Mainly due to the advent of the new 10-speed bicycles that are now not considered children's play things, the feasibility of the bicycle becoming a significant mode of transportation has increased markedly. The cyclist can now cope with hills and easily manage an average speed of 10 to 15 miles per hour or better on level ground for long periods of time, while not polluting the air. This new group of adult cyclists is no longer satisfied with curb hopping, car or pedestrian dodging, being squeezed between moving and parked automobiles, et cetera, therefore creating a need for bikeways physically separated wherever possible.

The potential of bicycle transportation cannot be realized without the necessary environmental support system. Just as one cannot have a railroad without tracks or a bus system without highways, so one needs special bike route facilities and regulations for bicycle traffic.

Oregon's Estimated Bicycle Population

Bicycle registration would be required to establish an accurate bicycle population for the state of Oregon. The Motor Vehicles Division could probably handle this additional task within their existing framwork. For the purpose of this report the bicycle population will be based on the aforementioned percentage estimates.

In assuming that one person in six now owns a bicycle, based on Oregon's population at 2,143,000, it would mean that 350,000 bicycles are owned in our state. The adult ownership would be comprised of approximately 90,000 riders based on 6 percent of the state's adult population (1,480,000 persons over the age of 16).

The largest concentrations of users of bicycles will be in our metropolitan areas throughout the Willamette Valley. Universities will generate large student user groups as is apparent in Eugene and Corvallis. Bicycle routes developed in concentrated areas of population will receive a maximum usage and benefit.

Accident Statistics

Following passage of the law, the Oregon State Highway Division initiated a program of constructing bicycle routes planned to be of special benefit and provide safety to school children riding bicycles to and from school along sections of state highways. These involve not only routes to school but also routes to attractions such as parks, swimming facilities, baseball diamonds and other recreational areas. These routes were constructed by the Highway maintenance forces on an experimental basis and in most cases involved the widening of the highway shoulders. These routes were appropriately signed and delineated as one-way bike routes as outlined in our manual.

An analysis of the 1971 bicycle/motor vehicle accidents indicates our initial assumption in locating bicycle routes to serve schools was correct.

There were a total of 705 accidents with 12 fatalities reported in 1971. Of these 12 fatalities 7 were between the ages of 10 and 14. There were 601 accidents involving personal injuries and a summary of these accidents by age groups indicates the area of major concern; 136 accidents in the 5 to 9 age group, 184 in the 10 to 14 age group, 117 in the 15 to 19 age group and 64 in the over 20 group. In addition, the accident reports indicate that 602 of the 705 accidents occurred in the suburban and urban built up areas. It is apparent, based on these statistics, that routes serving our urban areas would jointly serve school children and commuters and should be undertaken prior to an extensive system of recreational trails.

Although there is not sufficient information available to conclude that bicycle routes increase or decrease bicycle and automobile accidents, it can be readily seen that accidents will increase as more cyclists are added to our existing, overcrowded streets and highways. However, after motorists become aware of bicycles, safety practices of the cyclist are improved and better bicycle facilities are established, accidents per capita could be expected to decrease. Bicycle operator error was prevalent in most of the accident reports indicating that there is a definite need for an intensive educational program in our schools.

According to Mr. Quimby, national president for the League of American Wheelmen, a program of this type will be undertaken by the League's Salem Unit as this year's project. The purpose of their program is for the education and training of amateur bicyclists, especially of the school age group, by working with schools, police departments and other interested bodies.

Bicycle Path Effectiveness

To create bikeways that will effectively be used by cyclists and be considered safe, it will require an educational awareness by the bicyclist, motorist and the engineer developing these facilities. New concepts in design and signing of facilities will be required coupled with education as to the proper usage of bikeways. Many motorists today assume that highways and streets are only for automobiles and that bicyclists have no right to be there. This is contrary to Oregon law which treats the bicycle as a transportation vehicle, requiring the bicyclist to obey the same laws as those which govern the motor vehicle operator. Presently, the bicyclist is probably the most prevalent violator of these laws.

Through design of bikeways, the engineer can partially provide and suggest proper usage through signing and painted legends on the pavement. Warning signs cautioning the motorist of bike lanes will be used and regular parking along some highway shoulders will require changing to "emergency parking only" where shoulders are designated "bike lanes". Conversely, in areas where separated bike lanes are established, bicycle travel will be banned from the highway facility. These bans will be extended to main arterials in areas where bike routes are established on parallel streets located within a reasonable distance.

Through education and signing, compatibility must be created between the cyclist and the motorist in order to establish a workable system of bike routes.

PLANNING AND ECONOMIC EVALUATION

Route Planning and Users

Opinions on how to provide bicycle transportation differ among citizens, politicians, bicycle interest groups and transportation professionals. The factual basis for planning bicycle facilities is not well understood. Planning is surrounded with confusion and controversy and often are developed from feelings, emotions or incorrect facts, often arranged to fit preconceived conclusions.

It is necessary to follow all steps in the transportation planning process in order to determine the proper scale of development and investment for bicycle facilities. Without adequate planning, actions taken to provide facilities for bicycles are more likely to be failures. It is likely that there will be poorly coordinated facilities that do not give the public an adequate return on investment. Plans should be chosen through an examination of alternative strategy. At the end of the planning process, the solution can be chosen by the community and decisions made in full view of the probable consequences of alternative strategy. The planning process will take considerable time and staff.

Goals and objectives that should be kept in mind in planning are identified as safety, mobility, efficiency and pleasure. Safety must be provided for the cyclist as well as the pedestrian and the motorist. Mobility for

the cyclist as well as mobility for the overall transportation must be kept in mind since the cyclist and the motorist often hinder each other today. Well established routes will result in additional safety to the cyclist as well as the motorist.

In establishing a bicycle route a determination for the purpose of the route and types of cyclists to be served must be considered. There are four groups of cyclists. All have different needs and purposes for using specific routes.

1. School children require routes that connect their homes with schools, parks and community services. These routes should be contained within a 2-mile radius of the school. Bussing usually occurs outside of this area.
2. Commuters require routes to places of employment, shopping, colleges and universities as well as provide routes for school children to use. This group will provide the alternate to traveling by car or public transportation within our cities, establishing a viable alternate mode of transportation.
3. Recreational users will require various types of facilities. Some require location within parks, access to parks, along beaches or in scenic areas.

4. Long-distance riders will ride 100 to 150 miles per day and will be traversing the entire state or country. Routes that will serve this group will take many years to complete as their needs require a complete system of highways throughout the state, similar to the highway system. These riders will benefit from the other types of bike routes, such as the commuter routes and recreational facilities.

Economic Justification for Bikeways

The cost of providing bikeway facilities will vary with the type selected and the design standards used. Cost of providing bikeways is generally more than people presume.

To aid in evaluating and justifying bike routes, an economic study was made to determine per mile expenditures which are justified for the construction of bicycle routes.

Using a standard benefit-cost technique, it was estimated that:

1. With approximately 500 to 700 business commuters diverted from automobiles to bicycles, an expenditure of approximately $40,000 per mile would be justified for a bicycle route of four miles or less. It is unlikely that a route designed for commuters of over five miles would be feasible. Also, with only about 100 commuters,

it would be unwise to spend more than $6,000 to $8,000 per mile for a three or four mile route.

2. The construction of a recreational bicycle route of five to ten miles would be worthwhile at a cost of $30,000 to $60,000 per mile if it could draw approximately 25,000 riders annually, e.g., if 500 riders were to use the facility for 50 days a year.

3. Bicycle routes designed to serve school children are the most difficult to justify with a benefit-cost framework, calling for per mile expenditures of only $10,000 to $15,000 for a two mile path. If, however, the route clearly were to reduce accidents or were used for recreation, expenditures of two to three times these amounts would be reasonable.

Appendix "A" of this report contains the complete economic evaluation.

Questionnaires

In order to insure the effectiveness of a proposed bikeway system, it is necessary to understand the needs and locations of bicycles in the community as well as the number and types of riders to be served. There must be sufficient short- and long-run demands to warrant route construction. Bikeway systems must be located with respect to existing traffic generators

as well as providing advantages over present transportation systems so as to attract additional users.

To determine the needs of the public, various types of questionnaires will be sent out with special emphasis placed on bicycle clubs, bicycle planning groups and schools. Questionnaires will be designed to provide three types of information. The first, the socio-economic characteristics, preferences and attitudes of bicycle users; second, determine ownership population and estimated proportion that will constitute actual users; and third, the kinds of trips made and location preferences of bike routes.

Several citizens' bicycle route planning groups have distributed questionnaires, some with good results. The West Linn group's questionnaire resulted in a majority response for the use of the Oswego-West Linn Highway for a bike route which supports our route constructed on this highway. This response was not anticipated by the group.

Individual questionnaires will be designed and circulated in September to establish the specific needs of the following groups in order to determine opinions and types of route facilities desired:

1. Cyclist organizations such as the League of American Wheelmen.
2. Citizen task force groups charged with bike route planning.
3. To all county and city officials to determine their plans and priorities for the bikeway program in respect to their communities.

4. To all grade and high schools throughout the state.

5. Questionnaires designed to determine the opinions of the general public. These will be spot surveys to obtain a representative sampling of ideas in our urban and rural areas through the state.

A sample questionnaire that will be used as a guideline in developing the various questions is included as Appendix "B".

PRIORITIES AND FINANCIAL AID

Objectives and Areas of Priority

It has become obvious through various meetings and contacts with city officials, bicycle groups and task forces charged with bike route planning that the desire for commuter routes in our urban areas and safety for children riding bicycles is of primary concern. This logic is further supported by the 1971 accident statistics.

The first priority for routes must be to establish commuter routes in urban areas that will jointly serve school children and the cyclist commuting to work. With proper planning and liaison with local entities these joint facilities can be established.

Routes to serve school children are not to be confused with children riding within their own neighborhoods. Neighborhood riding is short, close to home, typically purposeless and considered play. Riding of this type is one of the areas where a great deal of education and supervision is important in influencing safety. Some trips do have a purpose such as trips to school, to a local park, to the local swimming pool and to the library or store. Bike routes should be provided for this type of activity as they would be used jointly by commuters and children.

Commuter riding is generally done by adults. Trips are typically purposeful, follow a particular route and occur with regularity, such as to work. They are generally longer and take the bicyclist out of the neighborhood. The commute trip made to major generators may cause a concentration of

bicycles along certain routes which could be serviced by bikeways. The joint use of commuter routes, located to serve parks and recreational facilities, would serve the needs of children as well as the commuter.

The second priority is to establish short, family-type recreational bikeways near population centers. Recreation riding is done by people of all ages pursuing leasure time activity. These routes will be used mostly on weekends by mom, dad and the family and should have an average length of about 15 miles, a typical distance for a family ride. Recreation riders seek opportunities to be in pleasant surroundings, see new things, to get away in leasurely rides. Concentrations of recreation riders generated by recreational facilities could benefit from bikeways. Typically, routes should be planned and developed with pleasure in mind, connecting points of interest, scenic vistas and recreational areas. Recreational use of bikeways will occur primarily on weekends but we must bear in mind that recreational opportunities offered today will create use tomorrow.

The third priority will be to establish long-distance bicycle routes, such as a route along the entire Oregon coast, a route along the entire Columbia Gorge, as well as a route extending through the Willamette Valley. These routes will serve the needs of the bicycle buff or the sport rider. These routes are highly desirable and will be the most costly to construct. Sport riding is done by people of all ages as a form of self-improvement or exercise. Trips are typically longer with higher speeds and are made generally by the more experienced rider with high-type equipment in our rural areas.

These trips generally do not mix well with other types of bicycle trips because of the speed and purpose and of the desire to get as far as one can travel in one day.

With these priorities in mind the Highway Division's ulitmate goal is to provide a bicycle route system that will serve the needs of those wishing to ride bicycles as an alternative to traveling by car or public transportation to work, school, shopping or recreation. It should provide access to recreational facilities and scenic points of interest. It should allow an individual the opportunity of taking extended trips and finally to give the bicycle enthusiast an opportunity to ride with safety for the pure pleasure of riding.

Financial Aid to Cities and Counties

In studying the programs for the different urban areas, especially those with price tags attached, it becomes evident that the completion of commuter bicycle programs in various metropolitan areas will take 20 to 30 years if these programs are geared to maximum expenditures of the local one percent. As an example, the bicycle program for the city of Eugene is estimated at $200,000, and Eugene's responsibility under the Bicycle Bill is $9,000 per year. This figures out to approximately 22 years.

By the statute, the Highway Commission actually fulfills its responsibility legally when it includes bicycle trails or footpaths on projects where a highway is constructed, reconstructed or relocated. However, the expendi-

ture of funds is not limited to these projects in the statute. Facilities can be established along other highways, roads and streets. It is suggested that the intent of the Bicycle Bill would be better served if the Highway Commission were to use a portion of its one percent of the revenues to assist the cities in completing their commuter bike routes in the reasonably near future and then concentrate on our rural bicycle routes after this is accomplished.

The Highway Division is considering the possibility of developing a program to assist cities and counties with construction of urban area bikeways. As a policy, only route proposals with a well established and justified purpose will be considered. Requested routes will require that cities and counties determine anticipated usage, purpose, design and estimated costs. Agreements will be required to determine maintenance responsibilities for these routes. The bicycle fund share, per year, for cities and counties is estimated in Figure "A" and Figure "B" of this report.

Status of Local Bike Route Requests

Many requests for bike routes have been received, ranging from mere suggestions to formal resolutions by city councils. The current progress and status of these requests follows:

1. Johnson Creek (Milwaukie)-Abernethy Creek (Oregon City) Bikeway. The Portland Traction Company is reviewing the deeds and title reports as to their adequacy at the present time. Negotiations with the railroad to acquire their right of way will commence upon completion of their review.

ESTIMATED DISTRIBUTION TO CITIES (SUBJECT TO BICYCLE LAW) OF FUNDS FROM OREGON STATE GAS TAX BASED ON CITY SHARE = $13,822,386

	1% Bicycle Fund		1% Bicycle Fund
Albany	2,129	Milton-Freewater	480
Ashland	1,443	Milwaukie	1,925
Astoria	1,215	Monmouth	612
Baker	1,093	Myrtle Creek	313
Beaverton	2,171	Myrtle Point	293
Bend	1,602	Newberg	761
Brookings	318	Newport	607
Burns	385	North Bend	1,006
Canby	446	Nyssa	306
Central Point	468	Oakridge	400
Coos Bay	1,574	Ontario	764
Coquille	498	Oregon City	1,072
Corvallis	4,109	Pendleton	1,542
Cottage Grove	702	Portland	44,723
Dallas	748	Prineville	479
Eugene	9,005	Redmond	435
Florence	263	Reedsport	472
Forest Grove	968	Roseburg	1,690
Gladstone	729	Salem	8,117
Grants Pass	1,434	Seaside	515
Gresham	1,156	Silverton	503
Hermiston	572	Springfield	3,161
Hillsboro	1,797	St. Helens	726
Hood River	469	Stayton	371
Independence	357	Sutherlin	360
Junction City	277	Sweet Home	452
Klamath Falls	1,844	The Dalles	1,277
LaGrande	1,134	Tigard	790
Lake Oswego	1,717	Tillamook	464
Lakeview	316	Toledo	329
Lebanon	861	West Linn	829
Lincoln City	491	Winston	301
McMinnville	1,183	Woodburn	876
Medford	3,494		
			$ 123,929

Figure "A"

ESTIMATED DISTRIBUTION TO COUNTIES (SUBJECT TO BICYCLE LAW) OF FUNDS FROM OREGON STATE GAS TAX BASED ON COUNTY SHARE = $23,464,003

	1% Bicycle Fund
Baker	1,860
Benton	4,695
Clackamas	17,008
Clatsop	2,965
Columbia	3,300
Coos	6,433
Curry	1,677
Deschutes	4,010
Douglas	8,645
Hood River	1,696
Jackson	11,452
Josephine	4,772
Klamath	6,223
Lane	24,203
Lincoln	2,908
Linn	8,262
Malheur	3,064
Marion	16,441
Multnomah	60,841
Polk	3,389
Tillamook	2,017
Umatilla	5,794
Union	2,328
Wasco	2,480
Washington	15,833
Yamhill	4,588
	$ 226,884

Figure "B"

2. City of Portland request through City Resolution No. 31047.

   To construct a bicycle path from the Portland State area along the Stadium-Sunset Freeway Interchange to SW 17th and Market Streets to serve the Portland Student Services Building. Bids were taken for construction of this project on July 27, 1972.

   The second request is to construct a separate bicycle path along SW Terwilliger Boulevard or a suitable alternate between Interstate 5 and SW Barbur Boulevard, from Duniway Park to Lewis and Clark College and Tryon Creek Park. A field reconnaissance of the Terwilliger Alternate route has been made; maps and estimates are being developed to determine feasibility and costs.

3. CRAG has made maps of possible bike routes and are currently studying routes throughout the Portland area. CRAG has assumed the role of general planning and coordination.

4. City of Beaverton has submitted a plan indicating their proposed routes in the Beaverton area. They have made a general request that we construct bike routes along state highways in conformance with their general plan, specifically on SW Scholls Ferry Road.

5. Lake Oswego has a citizens task force developing trails. No requests have been made at this time.

6. West Linn Bicycle Committee has requested that our existing bike route along Highway 43 be extended southerly from Mary S. Young Park to Bolton School. This is currently being studied by our Region office. Previously they had requested a sidewalk on the I-205 - Willamette River-West Linn Bridge to provide a facility to the Oregon City Shipping Center. This request, estimated at $445,000, was not approved by the Federal Highway Administration and further study is being given to the use of the old Oregon City-West Linn Bridge.

7. Multnomah County currently has two citizen bicycle route planning groups; one for the east county and the other on the west side. A general preliminary outline plan has been received for eastern Multnomah County, not adopted by the citizens group and without any specific requests--information only.

8. City of Tualatin requested that a bike facility be provided along SW Boones Ferry Road from the SW Nyberg Road to SW Killarney Lane to provide a safe route to the high school. This route will be constructed by Maintenance.

9. Salem has approved a general bikeway plan, dated May 10, 1971, which was developed through the Council of Governments, Salem Bicycle Club and the Regional

Parks and Recreation Agency. A request for a bike route along State Street from 25th Street to 37th Avenue (East Salem). This route is designed and will be advertised to receive bids in August 1972.

A high school student group requested consideration for a bike route from the Salem area to Silver Creek Falls, through Silverton. Routes to this park are being studied.

10. Corvallis has prepared a master plan for bike routes developed by a citizens committee. One phase of the system was requested beginning at SW 35th Street; then easterly along the Corvallis-Newport Highway and Marys River to the Willamette River; then extending northerly to Tyler Street. This will be advertised in August 1972.

11. Albany, through the Parks Department, has developed a comprehensive bicycle plan for the city. No formal request for implementation of any part of this plan has been made.

12. Eugene. A citizen's planning committee has been formed to develop bikeway plans. They have made a request to the Highway Division for construction of a bike route along the south shore of the Willamette River. This group has also prepared a bike route plan for the downtown area of

Eugene but has made no requests to the Highway Division for implementation. The Delta Highway-Coburg Road bike route will be let as soon as final right of way problems have been cleared. This was a previous request from the city of Eugene.

13. Medford, through the City Parks Department, made a request to construct a bicycle trail along Bear Creek, which lies adjacent to I-5, through the city of Medford. This project will be advertised in August 1972.

14. Ashland has recently completed and adopted a bicycle path plan developed through a citizen advisory committee. As a first priority they have requested that we construct a bicycle path along Siskiyou Boulevard utilizing the existing sidewalk. The City furnished the plans from which we have now developed construction plans. The project will be advertised and bids received on July 27, 1972.

15. Jackson County, through the Parks and Recreation Department, has recently formed a citizens advisory committee for the development of bicycle trails.

16. Bend. A request has been received from the Bend Bicycle Trails Study Committee for consideration of a bike trail along the Bend-Ward Road Section of the Central Oregon Highway. This trail will be considered during the location process of this highway.

17. Klamath Falls. A request was made through the city of Klamath Falls to construct a bicycle trail beginning at the northerly side of Portland Street and extending to Campus Drive on the O.T.I. campus. This route is now in the design stage and will be advertised in August 1972.

18. Yachats has requested that we consider a bike route for several miles on each side of the city. A reconnaissance will be made.

19. Reedsport has requested that the State consider the construction of a bicycle trail along Highway 101 between Reedsport and Winchester Bay. The feasibility of this route will be studied.

20. Roseburg-Winchester Area. A request was made by the Sixth Grade Health Class of Wilbur School. They suggested a bike route be constructed along the Shady Highway between Winchester and the Newton Creek area. This proposal was studied and the cost would be disproportionate to probable use.

BIKEWAY TYPES-COSTS

Current trends and literature on the subject of bicycle facilities indicates that a universal adoption of three general classes of bikeways will be used. Our manual does not use specific classifications. This trend indicates the term "bikeway" to define all types of facilities that explicitly provide for bicycle travel. Bikeways, then, can be anything from fully grade-separated facilities to simple signed streets. Three basic classifications of bikeways are chosen for this report. Class I - Exclusive Bikeway, Class II - Restricted Bikeway, and Class III - Shared Bikeway.

Bikeway Types Defined

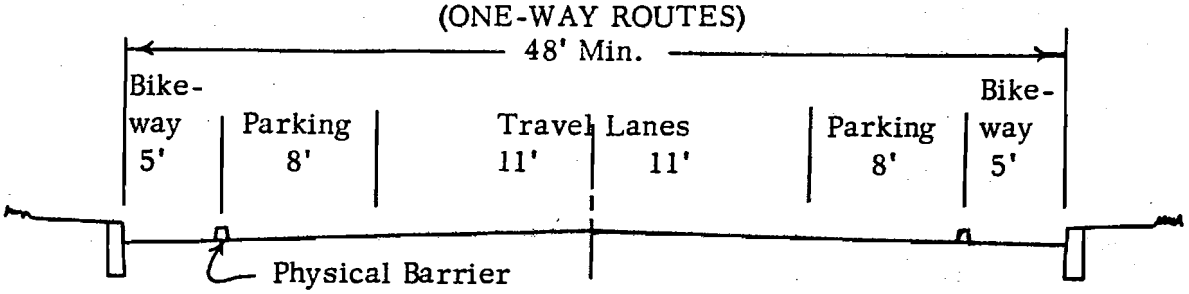
Class I - Exclusive Bikeway is the ideal type and would be defined as a completely separate route with a separate or shared right of way and designated for the exclusive use of bicycles and pedestrians. (Shown in Figure 1.) Conflicts at grade are kept to a minimum. Potential locations for exclusive bikeways are public parks, open spaces, abandoned railroad rights of way, channels or river banks, in conjunction with new highways and planned communities.

Class II - Restricted Bikeway is defined as a route with a restricted right of way designated for the exclusive or semi-exclusive use of bicycles. (Shown in Figure 2.) Through travel by motor vehicles or pedestrians is not allowed. Parallel conflicts between the bicycle and motor vehicle are reduced by creation of a physical separator or buffered by parked cars,

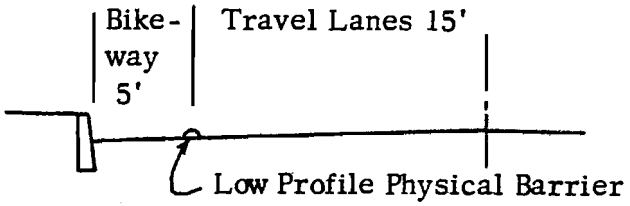
providing a right of way for each mode. Crossflows by motorists would be allowed to gain access to driveways or parking facilities.

Class III - Shared Bikeway is defined as a route that shares the right of way and is designated as a route by signs, painted stripes and stencils on the pavement. (Shown in Figure 3.) Any bikeway which shares the paved travel way with motor vehicles and/or pedestrians is considered a Class III bikeway. An alternate Class III bikeway (shown in Figure 4) utilizes an existing sidewalk facility and can be considered two-way as there is a physical separation from the traffic flow. Sidewalk alternates can only be considered if pedestrian movement is light.

CLASS II RESTRICTED BIKEWAY
(ONE-WAY ROUTES)



ALTERNATE #1 (With Parking)



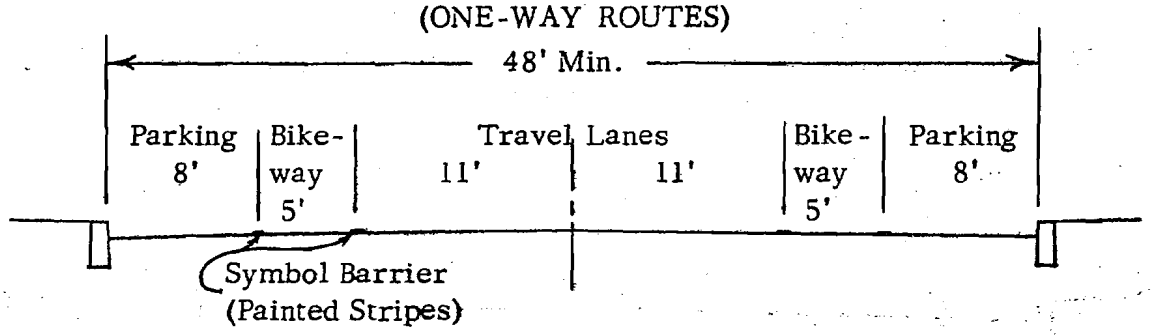
ALTERNATE #2 (Without Parking)

ESTIMATE OF COST (Idean Conditions)
Alternates #1 and #2

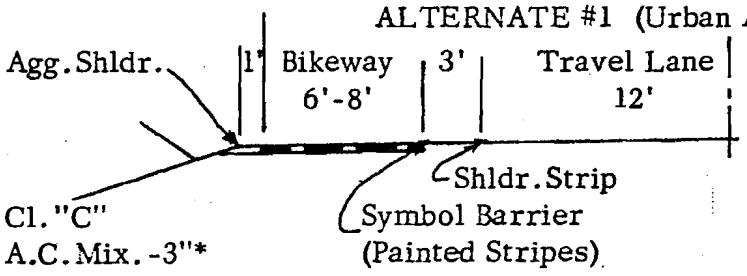
Item	Unit Cost	Cost/Lin. Ft.	Cost/Mile
Physical Barrier	$12.00 ea.	$1.35	$ 7,000
Signing and Striping	All		500
	Subtotal		$ 7,500
	+ 20% Engineering & Contingencies		1,500
	Total Cost		$ 9,000

Figure 2

CLASS III SHARED BIKEWAY
(ONE-WAY ROUTES)



ALTERNATE #1 (Urban Areas)



*Based on an existing stable shoulder.

ALTERNATE #2 (Rural Areas)

ESTIMATE OF COST (Ideal Conditions)
Alternate #1 (Urban Areas)

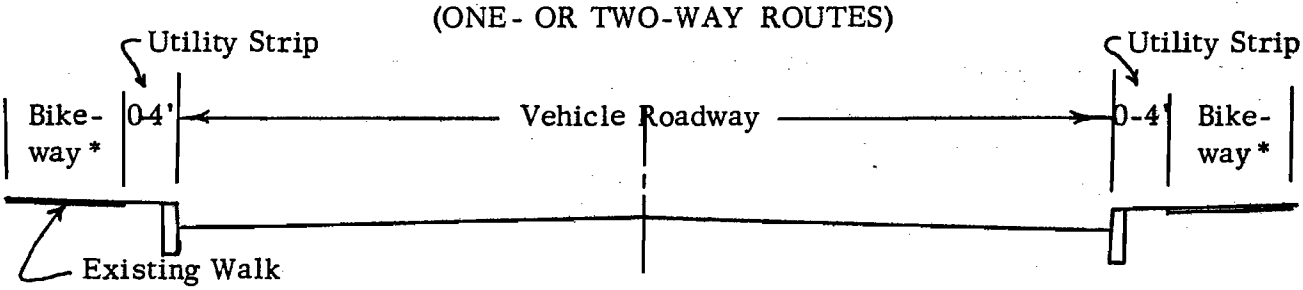
Item	Unit Cost	Cost/Lin. Ft.	Cost/Mile
Striping	$350.00 mile	$0.06	$ 350
Signing	$200.00 mile	$0.04	200
	Total Cost		$ 550

ESTIMATE OF GRADING AND PAVING (Rural)
Alternate #2
Based on 6' Width (Ideal Conditions)

Item	Unit Cost	Cost/Lin. Ft.	Cost/Mile
Grading Exis ting Shoulder	$0.22 sq.yd.	$0.37	$ 1,700
Class "C" A.C. Mix	$1.55 sq.yd.	$2.27	$ 12,000
Striping	$350 mile	$0.06	$ 350
Signing	$200 mile	$0.04	$ 200
	Subtotal		$ 14,490
	+ 20% Engineering and Contingencies		3,010
	6' Width Bikeway Total Cost		$ 17,500
	8' Width Bikeway Total Cost		23,000

Figure 3

CLASS III SHARED BIKEWAY
Sidewalk Alternate
(ONE- OR TWO-WAY ROUTES)



* 5' Bikeway (one-way only)
6.5' Bikeway (two-way minimum)

ESTIMATE OF COST (Ideal Conditions)

Item	Unit Cost	Cost/Lin. Ft.	Cost/Mile
Curb Cuts & Resurfacing	$75.00 ea.	$13.25	$ 70,000
Signing	$200.00 mi.		400
	Subtotal		$ 70,400
	+ 20% Engineering & Contingencies		14,600
One-way Routes (each side)	Total Cost		$ 85,000
Two-way Route (one side)	Total Cost		$ 55,000

Figure 4

CURRENT STATUS OF BIKEWAYS AND USE EVALUATION

Following enactment of the law, the Highway Division developed four separate programs for the establishment of footpaths and bike routes. These programs have been undertaken by our Location Section, our Maintenance Section and through our Parks Section. The current status of these programs is as follows:

1. As part of highway projects, footpaths and bike routes under construction or obligation will produce 12 miles of walks and trails at an approximate cost of $668,600.
2. Specific bicycle route construction projects. Eight projects are planned providing 15.9 miles of bikeways at an approximate cost of $955,000.
3. The Maintenance Section has constructed 28 miles of routes with an additional 22 miles planned at an estimated cost of $607,000 for the 50 miles of bike routes.
4. Bicycle routes in parks will provide 4 miles of trails at an estimated cost of $142,300.

These projects total approximately 82 miles of bicycle trails and footpaths at an estimated cost of $2,372,900.

A complete summary by project of these programs is included as Appendix "C" of this report.

Use Evaluation

As bicycle facilities are constructed, monitoring devices will be installed to determine actual bicycle usage. Loop detectors are presently being installed on Maintenance constructed bike routes in the Portland, Albany, Eugene and Monmouth areas. These devices will also be placed on new routes in parks and on newly constructed bike route projects. User volumes will benefit the planner and designer in developing new routes based on projected volumes and cost-benefit justifications.

APPENDIX "A"

BENEFITS OF BICYCLE ROUTE CONSTRUCTION

BACKGROUND

The United States has experienced a bicycle boom in the past decade. Bicycle sales have increased 20 percent per year for the last seven years and it is estimated that there are now eighty million American riders and over fifty million bicycles in use. [1] While cyclists under fifteen years of age still comprise the majority of riders, much of the bicycle boom is attributable to adult purchases. Adult riding has increased about 50 percent in the past two years and approximately five to eight percent of the adult population are now riders. [2] In 1971, automobile sales totaled eleven million vehicles while bicycle sales reached seven million. [3] It is suggested by some bicycle enthusiasts and publications that bicycle sales will overtake automobile sales within the next few years.

Since bicycles are now more than children's playthings and exercise vehicles, there are some important implications for the other highway users who must co-exist with the additional cyclists and compete with them for facilities. There are now approximately 15,000 miles in the nation designed partially or completely for bicycle use and the trend clearly favors the construction of increased mileage. [4] While there are strong proponents for additional recreational and rural bicycle routes, the bicycle advocates do not emphasize these routes alone. In fact, the Bureau of Outdoor Recreation has recommended fifty miles of urban routes per 100,000 urban residents. [5]

1/ Data are from an early draft of "Footpaths and Bike Routes: Standards and Guidelines", a January 1972 publication of the OSHD and "Bicycling for Recreation and Commuting", a 1972 joint publication of the US Department of Transportation and the US Department of Interior.

2/ Data are from the draft of "Footpaths and Bike Routes" and "The Bikeway Plan", published by the Bicycle Institute of America, Inc.

3/ "Footpaths and Bike Routes" draft.

4/ "Wheeling Their Way", Time, July 27, 1970.

5/ Ibid.

Oregon does not have as many bicycle routes as some other states, but House Bill 1700 places it in the forefront of bicycle route legislation with respect to generating funds for construction. 6/ House Bill 1700 states that no less than one percent of the funds received by the Highway Commission or by the cities and counties from the State Highway Fund be allocated to the establishment of footpaths and bicycle trails. It was designed to complement present modes of transportation and to create additional commuting and recreational opportunities in both urban and rural areas. In fact, each highway construction, reconstruction and relocation project must include bicycle routes or footpaths unless:

1. They are contrary to public safety;
2. The cost of the trails is disproportionate to their use;
3. The sparsity of population or other factors indicate no need.

The three qualifications effectively leave one without guidelines in choosing where bicycle routes should be placed and what qualities of routes should be constructed. An attempt will be made in this paper to outline some guidelines by estimating benefits to several classes of bicycle riders and by comparing these benefits with the costs of constructing and maintaining bicycle routes.

It will be seen that the question: "what benefits accrue to bicycle riders from the construction of bicycle routes?" is a complex one for several reasons.

6/ A description of this legislation can be found in "Footpaths and Bike Routes".

Mary Custy, in "The Bicycle in Contemporary Society" (Legislative Internship, April 16, 1972) suggests that "the State of Oregon is woefully lacking in bicycle legislation" regarding bicycle equipment and safety.

First, there has been very little research on the benefits question. It is easy to find statements that bicycle routes facilitate exercise and physical fitness, lead to a reduction of costs of transportation, diminsh pollution, and provide a psychological uplift for commuters. Few authors, however, have attempted to go beyond merely listing positive aspects of bicycle riding.

Second, bicycle riders are not a homogeneous group. They vary considerably in ages, skills and bicycle education. It is possible, however, to delineate three or four major groupings:

1. the business commuter;
2. the school commuter;
3. the recreationist and, perhaps a new category;
4. the "super-recreationist", or long distance rider.

Although there are some overlaps and a rider might conceivably fit in all categories, each grouping generally represents different types of riders with different bicycle needs. These varying demands must be recognized in bicycle route planning.

Third, bicycle routes come in many kinds and qualities. Each type of facility varies in attractiveness, safety features, desirability and, of course, in cost. A typical breakdown is:

1. the bicycle path or trail is a facility designed specifically for bicycle riders with motor vehicles prohibited;

2. the bicycle lane or bikeway provides the cyclist with a lane clearly marked with signs, striping, guardrails or other barriers;

3. the bicycle route is usually utilized where low traffic exists and is marked by signs to advise the motorist that cyclists use the facility;

4. the bike walk permits riders to use existing sidewalks, plazas, etc.

Since there is no such thing as a bicycle route or a bicycle rider without a number of qualifications or elaboration, the estimates of benefits and costs should be interpreted as ranges of values. In the following pages, "bicycle route" will be used as an all-encompassing term including the other categories.

BENEFITS OF BICYCLE ROUTES

The discussion of benefits and costs of bicycle routes requires some preliminary comments. First, the benefits and costs will be treated in the context of the existing transportation network. In this context, the construction of a bicycle route might have different effects than would be the case if an elaborate system of bicycle routes existed. On one hand, a bicycle route which is one of few in existence might attract proportionately more riders than otherwise would be expected, since cyclists have few other alternatives. On the other hand, under some circumstances, a new bicycle route which is part of a system could draw more riders since the existing route would already support many cyclists. It appears that accessibility is a crucial factor and this, of course, varies from project to project.

Second, and related, many bicycle enthusiasts argue that a society which substitutes bicycles for automobiles stands to gain a great deal in resource savings, reduced pollution, decreased medical expenditures resulting from the improved physical fitness of cyclists, reduced highway expenditures, etc. It is true that a bicycle-oriented society will receive these benefits to some or a great extent, but this point is not relevant to the decision maker considering whether or not an additional bicycle route should be built. In dealing with the benefits and costs of one more bicycle route, the larger, societal effects are usually negligible.

Third, the benefits and costs which will be treated are those that are quantifiable. The intangibles such as the annoyance of additional cyclists for automobile drivers or vice-versa, the enjoyment of riding, etc. are important and should be described for decision makers. To this date, however, the state of the art does not allow their quantification. Consequently, the analysis that follows has the strengths and weaknesses of the standard benefit-cost techniques.

The discussion which follows will treat separately business commuters, recreationists, and school commuters in order to establish the desirability of constructing routes for these different types of users. Emphasis will be placed on estimating benefits since the determination of expenditures for routes is a more straightforward procedure.

Costs per mile vary tremendously between projects, from less than $10,000 to over $50,000. It has been suggested that one should plan to spend from $40,000 to $60,000 per mile for a new facility and somewhat less for lower quality routes. The cost figures used in this paper represent the present values of construction and maintenance expenditures. 7/

BUSINESS COMMUTERS

One of the purposes of constructing bicycle paths is to draw commuters from their automobiles. The economist would say that commuters do not now use bicycles because

7/ Present value or present worth is the value of a future stream of income or benefits expressed in current dollars. For example, an annual benefit of $10,000 for twenty years would have to be discounted (i.e. divided by an appropriate discount or interest rate) in order to arrive at the value of these benefits in 1972 dollars. At a six percent discount rate, the present value would be $114,700 rather than $200,000 (10,000 x 20 years) since, because of people's preference for benefits now rather than in later years, future benefits are worth less in current dollars.

the price of bicycle transportation is too high. Price, in this sense, refers to vehicle operating costs, the value of one's time, risk, and less tangible items such as comfort and convenience, fitness, etc. If a bicycle route is to attract riders, it must lower the price of traveling in the eyes of its potential users. While the intangible items cannot be measured without a more detailed study, the quantifiable variables will be estimated by using values and concepts employed in highway user benefit-cost calculations.

Operating Costs

The following assumptions and analysis concerning automobile and bicycle operating costs are used through the discussion:

1. Automobile operating cost is eleven cents per mile, including depreciation, maintenance, gas and oil, parking, insurance, and state and federal taxes. 8/

2. The cost per mile of operating a bicycle is 1.5 to 2 cents.

   These figures were computed as follows:

a. Cost of bicycle	$100
Life of bicycle - according to insurance companies - 10 years	
Cost per year	$10
b. Miles per year	
Average	1,000
Longer commuters and recreationists	1,500
c. Present value of 10 year maintenance, accessories, etc.	$100
Cost per year	$10

8/ A 1971 Highway Division calculation showed the cost per mile to be 10.9 cents. This figure has been rounded to eleven.

d. $\frac{\text{Annual cost}}{\text{Annual mileage}} = \frac{20}{1{,}000 \text{ miles}} = \frac{2 \text{ cents}}{\text{mile}}$ for average rider

$\frac{\text{Annual cost}}{\text{Annual mileage}} = \frac{20}{1{,}500 \text{ miles}} = \frac{1.3 \text{ cents}}{\text{mile}}$ for long distance commuters and recreationists.

The latter figure is rounded to 1.5 cents per mile since the more avid rider probably uses a more expensive bicycle and more expensive equipment.

Value of Time

According to a recent Stanford Research Institute study, the value of time per commuting automobile is $2.80 per hour. 9/ Assuming 1.3 persons per car, this represents about $2.15 per person per hour or about 3.6 cents per minute. This value of time will be used for both bicycle and automobile commuters.

It is assumed that bicyclists will travel at ten miles per hour while automobile drivers travel at 20 miles per hour for the shorter trips and average 25 miles per hour for the longer trip which will be hypothesized. It is further assumed that the automobile driver requires an additional five minutes to park and walk each way.

Risk-Accident Costs

The accident rate for motorists is 5.4 per million vehicle miles of non-freeway state highway driving. The average cost per accident is $2,300, $390 of which is automobile damage. Consequently, the cost of accidents per million vehicle miles is $12,420.

Accident costs for bicycles are now known. To date, liability insurance does not exist specifically for bicycle accidents and data are not generally recorded systematically in terms of accidents per mile. 10/

9/ There is no general agreement in the literature as to what amount should be used. This is a representative figure.

10/ In Oregon, in 1971, there were 705 reported bicycle accidents, 12 of which were fatal. The accidents and fatalities were most frequent in the 5 to 14 age bracket and in "built-up" areas. It is not possible to say whether bicycle routes will lead to increases or reductions in these figures.

Although there is not sufficient information available to conclude that bicycle routes increase or decrease bicycle and automobile accidents, it can be hypothesized that accidents would increase as a few cyclists were added to crowded streets. However, after motorists became more aware of bicycles, bicyclists' safety practices improved, and better bicycle facilities were established, accidents per capita could be expected to decrease.

So that accident costs are not ignored, figures are computed to show the effect of increasing or decreasing automobile accidents by 25 percent--assuming that bicycle routes will have one of these effects--and presented in Table II.

Effects of Bicycle Route Construction

The following data in Table I show the effects of diverting 100, 500 or 1,000 commuters to bicycle routes of either four, five, or seven miles for 120 days per year (approximately one-half of the year's working days). The average one-way trip on these routes is assumed to be two, three, and five miles respectively.

The assumptions discussed in the previous pages are employed in the construction of the table; that is,

1. the cost of operating an automobile is eleven cents per mile;
2. the cost of operating a bicycle is 2 cents per mile for commuters who make the two and three mile trips and 1.5 cents per mile for bicyclists commuting five miles;
3. the value of time is 3.6 cents per minute;
4. bicycles travel at an average speed of 10 miles per hour;
5. automobiles making the two and three mile trips average 20 miles per hour and for the five mile trip, 25 miles per hour;
6. the automobile driver requires five minutes to park and walk each way, i.e. five minutes more than the bicyclist;
7. the average automobile occupancy is 1.3 persons.

A sample calculation for a case with 100 bicyclists or 77 automobiles with 1.3 persons per car traveling a four mile round trip follows:

Operating Cost:

Automobile - 11¢ /mile x 4 miles (round trip) x 77 automobiles x 120 days = $4,070

Bicycles - 2¢ /mile x 4 miles (round trip) x 100 bicycles x 120 days = $ 960

Annual saving to bicyclists $3,110.

Time Cost:

Automobile - 20 mph	=	12 minute round trip
park and walk	=	10 minutes
Total time	=	22 minutes
Bicycle - 10 mph	=	24 minutes
Annual loss to bicyclists		2 minutes x 3.6 cents/minute x 100 commuters x 120 days = $860

TABLE I

ANNUAL CHANGES IN COSTS WITH 100, 500, AND 1,000 BICYCLE RIDERS DRAWN FROM AUTOMOBILES

100 Commuters

Changes In	4 mile path (2 mile trip)	5 mile path (3 mile trip)	7 mile path (5 mile trip)
Operating Cost	$3,110 saving	$4,660 saving	$8,360 saving
Time Cost	860 loss	3,460 loss	11,230 loss
Net Change	$2,250 saving	$1,200 saving	$2,870 loss

500 Commuters

Operating Cost	$15,530 saving	$23,290 saving	$41,820 saving
Time Cost	4,300 loss	17,300 loss	56,160 loss
Net Change	$11,230 saving	$ 5,990 saving	$14,340 loss

TABLE I (Con't.)

1,000 Commuters

Changes In	4 mile path (2 mile trip)	5 mile path (3 mile trip)	7 mile path (5 mile trip)
Operating Cost	$31,060 saving	$46,580 saving	$83,640 saving
Time Cost	8,600 loss	34,600 loss	112,300 loss
Net Change	$22,460 saving	$11,980 saving	$28,660 loss

Source: Assumptions and computations explained in the text.

It is seen in Table I that savings are relatively large for the shorter bicycle route since the automobile has additional park and walk time. For longer distances, the speed advantages of the automobile outweigh the reduction in operating cost conveyed by the bicycle.

Table II shows the present value of the benefits calculated in Table I. Also, assuming a twenty year life for bicycle routes and a six percent rate of interest, Table II shows the expenditure justified per mile to just balance the twenty year benefits, i.e. which would yield a benefit-cost ratio of one.

The numbers in parentheses represent the present value per mile of an increase or decrease in accidents of 25 percent. It is interesting to note that changes in accidents of this magnitude have a relatively small effect.

TABLE II

PRESENT VALUE OF BENEFITS OF BICYCLE ROUTES AND EXPENDITURES JUSTIFIED PER MILE

	Present Value of Benefits	Expenditures Per Mile
		4 mile path (2 mile trip)
100 commuters	$ 25,800	$ 6,400 (±500)
500 commuters	128,800	32,200 (±750)
1,000 commuters	257,600	64,400 (± 1,500)
		5 mile path (3 mile trip)
100 commuters	13,800	2,800 (±500)
500 commuters	68,700	13,700 (±900)
1,000 commuters	137,400	27,500 (± 1,800)
		7 mile path (5 mile trip)
	Loss	
100 commuters	32,900	
500 commuters	164,500	None Justified
1,000 commuters	329,000	

NOTES: (1) Present value is defined in Footnote 7.
(2) Numbers in parentheses represent increases or decreases of 25 percent in the costs of automobile accidents.

Source: Table I.

Generally, it appears that 500 to 700 bicyclists will need to use a new bicycle route to justify an expenditure of approximately $40,000 per mile in a shorter bicycle route. As the length of a bicycle route increases, more bicyclists will be required. It seems unlikely that a route designed for commuters of over five miles would be feasible.

RECREATION

Benefits to recreational bicycle riders vary considerably according to the riders preferences, the quality of the bicycle, the quality of the route and numerous intangible factors. Many attempts have been made to measure the value of a recreation day, but there still is no general agreement on methodology. In this paper, a standard value suggested by the Water Resources Council will be used.

For an activity such as bicycling, which is not particularly specialized is practical by most people, a value of $.50 to $1.50 per user day is recommended. Since there are many opportunities to ride bicycles recreationally without bicycle routes, numbers at the upper end of the scale perhaps are less applicable. One dollar per bicycling day will be used although the actual value would vary among individuals.

The recreation benefits and expenditures justified per mile of bicycle route are shown in Table III. It is assumed that either 100, 500, 1,000 or 2,000 riders use routes of five or ten miles for either fifty or one hundred days per year.

TABLE III

RECREATION BENEFITS AND EXPENDITURES JUSTIFIED PER MILE OF BICYCLE ROUTE

50 Days

Users Per Day	Present Value of Benefits at $1.00 per day	Expenditures Justified Per Mile For 5 mile path	10 mile path
100	57,400	11,500	5,700
500	286,800	57,400	28,700
1,000	573,500	114,700	57,400
2,000	1,147,000	229,400	114,700

100 Days

100	114,700	23,000	11,500
500	573,500	114,700	57,400
1,000	1,147,000	229,400	114,700
2,000	2,294,000	458,800	229,400

Source: Computations described in the text.

It appears that approximately 20,000 annual user days (e.g. 400 users for 50 days) would be needed to justify an expenditure of about $50,000 per mile for a five mile route and twice that number of bicyclists would be required to justify a $50,000 per mile expenditure for a ten mile route.

SCHOOL RIDERS

School-oriented bicycle routes are the most difficult to evaluate. There are tremendous variations in the areas from which a school draws, in the number of students, in the number of students walking, riding with parents or riding the school bus, and in the costs of providing transportation. Also, school routes are likely to be used recreationally as well as for commuting. Consequently, any set of assumptions might appear to distort reality.

The example to be analyzed represents a grade school. Once one is dealing with driving age students, the commuter example discussed previously becomes more relevant.

It will be assumed that a school draws from a two mile radius and that either 50 or 100 students, who do not now ride to school, will be enticed into taking their bicycles to school from an average of one mile away. It is further assumed that they will commute for 120 days (approximately two-thirds of the total school days) and that they average 1,500 miles of riding per year. The results are shown in Table IV.

TABLE IV

BENEFITS OF STUDENT-ORIENTED BICYCLE ROUTES
AND INVESTIMENT JUSTIFIED PER MILE

Annual Benefits:

	50 students	100 students
(1) Reduced bus service:		
(a) Cost of one bus per year = $5,000 20 percent reduction in costs for one bus for 50 students	$1,000	
40 percent reduction in costs for one bus for 100 students		$2,000
(2) Reduced parent's trips (time savings and reduced auto costs for 2 mile round trip at 10 minutes per trip)		
(a) 20 fewer trips for 50 students	1,400	
(b) 40 fewer trips for 100 students		2,800
(3) Recreational value:		
(a) 25 students (1/2 of 50 bicyclists) for 120 days	3,000	
(b) 50 students (1/2 of 100 bicyclists) for 120 days		6,000
Total annual benefits with recreational use	$5,400	$10,800
Total annual benefits without recreational use	$2,400	$ 4,800

Annual Costs:

50 students (2 miles per day x 1.5 cents per mile x 120 days)	$180	
100 students (2 miles per day x 1.5 cents per mile x 120 days)		$360

	Investment Justified Per Mile			
	Present Value Without Recreation	Expenditure Justified	Present Value With Recreation	Expenditures Justified
50 students	$25,500	$12,800	$59,900	$30,000
100 students	$50,900	$25,400	$119,700	$59,800

NOTE: Assumptions about the school population merely indicate the types of benefits and costs arising from bicycle routes. Actual figures would vary greatly for any given school district.

Source: Conversation with John Sperr of the Department of Education - (He did not suggest any specific assumptions).

Given the assumptions employed, it appears that bicycle routes can more easily be justified if they can be used for recreational purposes as well as riding to and from school. Since school age children are frequently involved in accidents, more school routes could be justified if it could be clearly shown that they lead to reduced fatalities and property damage. It is not possible to demonstrate this point, however, with existing data.

CONCLUSION

The analysis in this paper provides a means of estimating benefits of bicycle routes and establishing rough guidelines for construction. It is possible to decide whether a bicycle route is in the range of feasibility if one knows how many bicycle riders it might attract. Once a feasible set of projects is selected, they can be analyzed individually. Comparisons between types of facilities, i.e. commuter, recreation, and school are made difficult by the different methods of evaluation, but experience should yield some insight into how accurate the estimates are. Also, experience, especially post-construction studies, should provide some expertise in estimating demand for bicycle routes and projecting how many bicycle trips will be generated by new facilities.

Brief conclusions were drawn following the discussion of the commuter, recreation, and school sections. Several additional comments regarding indirect or secondary effects are pertinent.

Commuter bicycle routes, as was suggested, give the bicyclist a comparative advantage over the automobile for trips of four to five miles or less. Actually, from

the point of view of operating and time costs, the bicycle probably has an advantage now. The fact that there are not currently more riders would seem to indicate that safety and convenience factors are less than adequate. Consequently, bicycle routes designed for commuters should emphasize these variables.

There is an important potential benefit from commuter routes which has not yet been mentioned. If they succeed in reducing automobile traffic, those people still driving stand to gain from reduced congestion and reduced park and walk time. Park and (bicycle) ride stations appear to be a means of capturing some of these benefits.

It should be noted that commuter routes are the most easily justified from the financing standpoint. Since funds for construction are provided by highway users, the argument can be made that users should benefit from their expenditure. Commuter routes provide some advantages to automobile drivers by removing cyclists from highways. It is more difficult to justify recreational and school routes on these grounds.

Since recreational routes apparently require a relatively large number of riders each year in order to justify their construction, they probably should be placed in readily accessible areas. It seems that bicycle routes and rental facilities around state parks could provide the required ridership and additional revenue as well.

School-oriented bicycle routes are perhaps more difficult to justify economically with the data available. It appears, however, that where they provide safety they are more easily justified since the value of fatal accidents is equivalent to many years economic benefits. School paths would also be more beneficial if they could provide a portion of physical education and bicycle education programs.

It should be re-emphasized that the numbers in the discussion represent ranges only and that the benefits and costs discussed at length are those that can be quantified. It might be worthwhile to undertake projects which the analysis implies are not desirable if they are consistent with unquantified goals, long run plans, or community preferences in general.

Prepared by Fred Miller
Planning Section

APPENDIX "B"

PART I: QUESTIONS TO BE ANSWERED BY THE HEAD OF THE HOUSEHOLD

1. How many bicycles are owned by your household?_____ Your Age_____
2. Are you a home owner? ☐ Yes ☐ No
3. If yes, for what might your house rent, if it were for rent? $_____ Mo.
4. If not a homeowner, what is your monthly rent? $_____ Mo.
5. How many years have you lived at your present address? _____
6. What is your zip code number? _____
7. In which city within the Los Angeles area do you live? _____
8. How many people live in your house or apartment? _____
9. How many years of school have you completed? _____
10. What is your present employment status?
    ☐ Armed forces ☐ Employed ☐ Unemployed ☐ Not looking for permanent employment
11. What kind of work do you do? _____
12. When you made the decision to move to your present address, did you consider whether the area was favorable for bicycle use?
    ☐ Yes ☐ No
13. Please indicate your FAMILY level of income from all sources for last year.

☐ Less than $2,000	☐ $6,000 to $7,999	☐ $12,000 to $14,999
☐ $2,000 to $3,999	☐ $8,000 to $9,999	☐ $15,000 to $24,999
☐ $4,000 to $5,999	☐ $10,000 to $11,999	☐ $25,000 or more

PART II: QUESTIONS TO BE ANSWERED BY THE BICYCLE USER

14. How many speeds does your bicycle have? _____ Your Age_____ Sex _____
15. What is your relation to the head of the household?
    ☐ Head ☐ Spouse of head ☐ Child of head ☐ Unrelated
16. Please indicate which of the following types of transportation YOU normally use during a typical week by placing a 1 next to the type YOU use most frequently, a 2 next to the second most frequent, and so on until you have ranked all types of transportation you normally use:
    _____ Auto _____ Motorcycle _____ Public Transportation _____ Bicycle _____ Walking _____ Other

NOTE: For questions 17–23, circle the appropriate number to the right of the question. If the question is not applicable, circle NA.

	Not At All						Extremely	
17. How favorable is your immediate neighborhood for bicycle use?	1	2	3	4	5	6	7	NA
18. How important to YOU is each reason for riding your bicycle?								
A. For touring	1	2	3	4	5	6	7	NA
B. For recreation	1	2	3	4	5	6	7	NA
C. To exercise	1	2	3	4	5	6	7	NA
D. For transportation	1	2	3	4	5	6	7	NA
E. To save time	1	2	3	4	5	6	7	NA
F. To save money	1	2	3	4	5	6	7	NA
G. For environmental reasons	1	2	3	4	5	6	7	NA
H. To ride with my friends	1	2	3	4	5	6	7	NA
I. To ride with my family	1	2	3	4	5	6	7	NA
J. Other (specify)_____	1	2	3	4	5	6	7	NA
19. To what extent do each of the following factors inhibit YOU from using your bicycle for NON-recreational trips (i.e., trips to work, for shopping, etc.)?								
A. Too much physical effort and sweating	1	2	3	4	5	6	7	NA
B. Personal safety	1	2	3	4	5	6	7	NA
C. Lack of bicycle racks at destination	1	2	3	4	5	6	7	NA
D. Danger of theft	1	2	3	4	5	6	7	NA
E. Bad weather	1	2	3	4	5	6	7	NA
F. Takes too long	1	2	3	4	5	6	7	NA
G. Social pressure (dress, ridicule, etc.)	1	2	3	4	5	6	7	NA
H. Too much starting and stopping	1	2	3	4	5	6	7	NA
I. Cannot carry packages	1	2	3	4	5	6	7	NA
J. Other (specify)_____	1	2	3	4	5	6	7	NA
20. To what extent do each of the following weather conditions inhibit YOU from riding your bicycle for NON-recreational trips?								
A. Raining	1	2	3	4	5	6	7	NA
B. Smoggy	1	2	3	4	5	6	7	NA
C. Hot	1	2	3	4	5	6	7	NA
D. Cold	1	2	3	4	5	6	7	NA
E. Windy	1	2	3	4	5	6	7	NA
F. Snowy	1	2	3	4	5	6	7	NA
G. Foggy	1	2	3	4	5	6	7	NA

(over)

The Questionnaire (1st Page)

21. From YOUR experience when riding a bicycle, how dangerous do YOU find the following conditions?

	Not At All						Extremely	
A. Bicyclist making left hand turn	1	2	3	4	5	6	7	NA
B. Car door opening	1	2	3	4	5	6	7	NA
C. Cross traffic	1	2	3	4	5	6	7	NA
D. Being hit from rear	1	2	3	4	5	6	7	NA
E. Car turning abruptly	1	2	3	4	5	6	7	NA
F. Car stopping abruptly	1	2	3	4	5	6	7	NA
G. Riding bicycle against traffic	1	2	3	4	5	6	7	NA
H. Riding bicycle at night	1	2	3	4	5	6	7	NA
I. Drainage ditches	1	2	3	4	5	6	7	NA
J. Bad weather	1	2	3	4	5	6	7	NA
K. Other (specify)_____	1	2	3	4	5	6	7	NA

22. To what extent is each of the following a reason for YOU to ride your bicycle along streets with high automobile traffic?

A. Fewer stop signs	1	2	3	4	5	6	7	NA
B. Less cross traffic	1	2	3	4	5	6	7	NA
C. Shorter distance	1	2	3	4	5	6	7	NA
D. Fewer hills	1	2	3	4	5	6	7	NA
E. Better road surface	1	2	3	4	5	6	7	NA
F. More attractive scenery	1	2	3	4	5	6	7	NA
G. Other (specify)_____	1	2	3	4	5	6	7	NA

23. To what extent would bicycle pathways (i.e., some designated pathway which is generally restricted to bicyclists) increase the number of times YOU use your bicycle if placed in the following places?

A. Pathways in downtown metropolitan areas	1	2	3	4	5	6	7	NA
B. Pathways along major arterial streets	1	2	3	4	5	6	7	NA
C. Pathways along residential or secondary streets	1	2	3	4	5	6	7	NA
D. Pathways through recreation areas or parks	1	2	3	4	5	6	7	NA

24. Please fill in the appropriate response under headings I and II for each of the types of bicycle trips YOU take. Under heading III, check whether MOST of these trips are made on weekdays OR weekends. Under IV, indicate the appropriate hour(s) you would be most likely to make this trip (e.g., a trip to and from work might have under "To" 8:30–9:00 AM and under "From" 5:00–5:30 PM)

Type of Trip	I No. of Round Trips Per Week	II Approx. Oneway Dist. in Miles On Bicycle	III Check One Week-Day (or) Week-End	IV Indicate Hr(s) of Day To	From
A. Travel to and from work	_____	_____	____ ____	_____	_____
B. Travel to and from school	_____	_____	____ ____	_____	_____
C. Shopping trip	_____	_____	____ ____	_____	_____
D. Recreational trip	_____	_____	____ ____	_____	_____
E. Other (specify)	_____	_____	____ ____	_____	_____

25. Please check each of the following ways YOU use your bicycle.
- ☐ A. To get to other means of transportation (e.g., bicycle to bus)
- ☐ B. Transport bicycle close enough to ride bicycle to work (e.g., auto with bicycle rack)
- ☐ C. Transport bicycle close enough to ride bicycle to school.
- ☐ D. Transport bicycle close enough to ride bicycle to shopping area.
- ☐ E. Transport bicycle close enough to ride bicycle to or in recreational area.
- ☐ F. Other (specify)_____

26. If a bicycle pathway were built parallel to the route that you now take for NON-recreational purposes, how many blocks would YOU be willing to go out of YOUR way to ride on the pathway?(Assume 10 blocks = 1 mile)

☐ None at all _____ Number of blocks

27. How many continuous years have YOU used a bicycle regularly for NON-recreational purposes? _____

28. Do you belong to a bicycle club or organization? ☐ Yes ☐ No

29. Do you own a car? ☐ Yes ☐ No A motorcycle? ☐ Yes ☐ No

30. If you have any ideas or comments on how to encourage wider use of bicycles and on how to create bicycle pathways in your area, please indicate below.

(Use an additional page if necessary)

Happy bicycling and thank you!

The Questionnaire (2nd Page)

APPENDIX "C"

TABLE 1

BIKEWAY AND FOOTPATH CONSTRUCTION - STATE MONEY - CONTRACT FORCES 1971-73 BIENNIUM

Section	*Type Work*	*Length Miles*	*Resident Engineer*	*Est. Bike Funds Obligated*	*Funds Spent 7-71 to 12-72*
1. Emigrant Frazier-Pendleton Cplt. Pendleton-John Day Hwy. Umatilla County	5.5' PC walks on each side of couplet sts.	2.8	M.M.Stump	48,212	48,212
2. Gresham St.-Indiana St. (Ashland) Rogue Valley Hwy. Jackson County	8' Extg. walks Constr. special bike ramps	1.1	B.E.Brown	16,900	14,638
3. 35th St.-Tyler Ave. (Corvallis) Corvallis-Newport Hwy. Benton County	Separated facility 8' Bikeway	2.4	R.Nelson	110,690	25,060
4. Portland St.-Campus Dr. (K. Falls) Klamath Falls-Malin Hwy. Klamath County	Separated facility 8' Bikeway	1.2	E.J.Dunn	34,307	8,204
5. Table Rock Rd.-Barnett Rd. (Medford) Pacific Hwy. Jackson County	Separated facility 10' Bikeway	3.4	B.E.Brown	283,853	21,444
6. Mult. Co. Line-Gaarde St. (Tigard) Pacific Hwy. West Washington County	5' Concrete walk on each side	0.8	J.Cochell	20,316	412
7. SW 12th-SW 18th (Goose Hollow) Sunset Hwy. Multnomah County	Separated facility 7' Bikeway	0.5	V.Butzer	38,411	9,280
8. 25th St.-37th Ave. (Salem) State Street Marion County	Separated facility 8' Bikeway	1.2	L.Weber	58,471	3,307
9. Independence Jct.-West Salem Willamina-Salem Hwy. Polk County	Class I & III (shared sidewalk) 6.5'-8.5' Bikeway	4.9	L.Weber	278,577	7,555
10. Delta Hwy.-Coburg Rd. (Eugene) Willamette Bikeway Lane County	Separated facility 10' Bikeway	1.2	-	55,300	37
				$945,037	$138,150

NOTE: N.A. - Not Available

TABLE 2

BIKEWAY AND FOOTPATH CONSTRUCTION - FEDERAL ASSISTANCE PROJECTS 1971-73 BIENNIUM

Section	*Type Work*	*Length Miles*	*Resident Engineer*	*Est. Bike Funds Obligated*	*Funds Spent 7-71 to 12-72*
1. Mission St. SE @ 25th St. SE City Street (Salem) Marion County	Separated facility	0.9	E.J.Hall	4,163	4,010
2. Patterson St.-Malin Jct. Klamath Falls-Lakeview Hwy. Klamath County	5' PC Walk on one side	2.0	E.J.Dunn	38,600	25,468
3. Walker Rd. Interchange Beaverton-Tigard Hwy. Washington County	8' AC walk & 7' on structure on one side	0.1	J.McNamee	54,463	54,463
4. Cascade Hwy. @ Pearl St. & Warner Milne Rd. (Oregon City) Clackamas County	5' PC walk	0.2	E.Rodriguez	4,354	2,964
5. Greenburg Rd. Interchange Beaverton-Tigard Hwy. Washington County	5' PC walk & 5' on structure on one side	0.3	J.Cochell	76,494	67,080
6. NW 185th Ave. Interchange Sunset Hwy. Washington County	7' AC walk & 7' on structure on one side	0.2	J.McNamee	49,826	45,543
7. Boring Rd. Interchange Mt. Hood Hwy. Clackamas County	7' AC walk & 7' on structure on one side	0.1	R.R. Cameron	113,674	37,666
8. Sodaville Rd.-Vail Creek Santiam Hwy. Linn County	6' PC walk on one side	1.5	K.Oliver	39,566	23,524
9. 5th St.-Oak St. (Phoenix) Rogue Valley Hwy. Jackson County	5' PC walk on each side	0.9	B.E.Brown	12,270	8,368
10. SE Foster Rd.-SE Causey Ave. East Portland Fwy. (I-205) Multnomah County	8' AC Bikeway	0.3	J.E. Holland	95,263	-
11. Rickreall-Independence Jct. Willamina-Salem Hwy. Polk County	5' & 8' PC Walks	1.3	E.J.Hall	39,559	1,043

TABLE 2 (Cont.)

BIKEWAY AND FOOTPATH CONSTRUCTION - FEDERAL ASSISTANCE PROJECTS 1971-73 BIENNIUM

Section	*Type Work*	*Length Miles*	*Resident Engineer*	*Est. Bike Funds Obligated*	*Funds Spent 7-71 to 12-72*
12. Park St.-Pacific Hwy. (Ashland) Green Springs Hwy. Jackson County	5' concrete walks on each side	1.1	B.E.Brown	108,746	9,539
13. 2nd St.-S. Railroad Blvd. (Redmond) FAS 926 Deschutes County	5' walk on each side of structure	30 ft.	M.D. Krehbiel	6,556	40
14. Ava Ave.-E. Burnside (Gresham) Mt. Hood Hwy. Multnomah County	5' concrete walks on each side	3.3	W.J. Scofield	89,957	462
15. Woodburn Intchge.-Hayesville Intchge. Pacific Hwy. (I-5) Marion County	8' on structures 10' AC footpaths	0.9	*2-22-73	149,420	
16. Cape Arago Hwy.-Woodland Dr. Empire-Coos Bay Hwy. Coos County	5' concrete walks on each side	4.0	*2-22-73	88,000	
17. UPRR O'xing (Hood River) Button Br. FAS 349 Hood River County	5' walk on structure	0.1	*2-22-73	66,000	
18. Pleasant Valley-Green Timber Rd. Oregon Coast Hwy. Tillamook County	8' AC Bikeway on one side	3.0	*3-29-73	82,500	
19. S. Tigard Int.-E. Portland Fwy. Pacific Hwy. Washington & Clackamas Hwy.	5' walk on structures 8' AC Bikeway	0.7	*4-26-73	44,000	
20. Adams Ave.-Old Ore. Trail (La Grande) Wallowa Lake Hwy. Union County	5' & 8' walk	0.7	*4-26-73	14,300	
21. 4th St.-5th St. (Grants Pass) Bridge Street Josephine County	5' concrete walks on each side	0.3	*6-21-73	8,600	
				$1,186,311	$280,170

**Scheduled Letting Date*

TABLE 3

BIKEWAY AND FOOTPATH CONSTRUCTION - PARKS
1971-73 BIENNIUM

Section	*Type Work*	*Length Miles*	*Resident Engineer*	*Est. Bike Funds Obligated*	*Funds Spent 7-71 to 12-72*
1. Mary S. Young Bicycle Trail Clackamas County	Class I 8' Bikeway	0.5	Enrique Rodriguez	4,050	4,013
2. Champoeg State Park Bicycle Trail Marion County	Class I 8' Bikeway	3.0	K.Wolfe	130,562	80,505
				$134,612	$84,518

TABLE 4

CONSTRUCTION AS PART OF STATE MAINTENANCE PROJECTS — 1971-73 BIENNIUM

	Section	Type of Work	Length in miles	Per Cent Complete	Est. Costs Chargeable to Footpath/Bicycle Program
1.	S.E. 136th - S.E.191st Mt. Hood Hwy. (Powell Blvd.) Multnomah County	widened shoulder bikeway	2.9	100%	$61,661
2.	Lake Oswego - Mary S. Young Park Oswego Highway Clackamas County	widened shoulder bikeway	1.8	100%	26,194
3.	Chemawa Rd. - Hayesville Intchge. Pacific Hwy. East Marion County	widened shoulder bikeway	1.3	100%	18,344
4.	Heffley St. - S. Fork Ash Cr. Monmouth - Independence Hwy. Polk County	Combination widened shoulder or separate path bikeway	1.4	100%	24,201
5.	Queen Ave. - 37th Ave. Albany - Junction City Hwy. Linn County	widened shoulder bikeway	1.2	100%	12,030
6.	Seaside - Cannon Beach Jct. Oregon Coast Hwy. Clatsop County	widened shoulder (not completed)	0	25%	18,621
7.	Wilkes Dr. - Fir Lane Junction City - Eugene Hwy. Lane County	widened shoulder bikeway	4.0	100%	46,570
8.	Winston Coos Bay - Roseburg Hwy. Douglas County	widened shoulder bikeway	0.8	100%	37,034
9.	S.W. Canyon Dr. - Redmond C.L. McKenzie Hwy. Deschutes County	Separate path bikeway	0.3	100%	4,308
10.	Ochoco Cr. - Prineville Madras - Prineville Hwy. Crook County	Separate path bikeway	1.4	100%	12,721
11.	Wallowa Lake State Park Joseph - Wallowa Lake Wallowa County	widened shoulder bikeway	1.0	100%	27,407
12.	Burns - Hines Central Oregon Hwy. Harney County	Separate path bikeway	2.3	100%	15,069
	Fiscal year 1971-72 Totals		18.4 miles		$304,160

TABLE 4 (Cont.)

CONSTRUCTION AS PART OF STATE MAINTENANCE PROJECTS -- 1971-73 BIENNIUM

	Section	Type of Work	Length in miles	Per Cent Complete	Est. Costs Chargeable to Footpath/Bicycle Program
13.	S.E. 191st - Gresham City Limits Mt. Hood Hwy. (Powell Blvd.) Multnomah County	widened shoulder bikeway	1.0	100%	$20,000
14.	Mary S. Young Park Vicinity Oswego Hwy. Clackamas County	Separate path bikeway	0.6	50%	36,000
15.	Nyberg Rd. - Killarney Beaverton - Tualatin Hwy. Clackamas County	Separate path bikeway	1.1	10%	40,000
16.	Interstate Bridge Pacific Hwy. Clackamas County	Signing and curbs on bridge	0.5	0%	2,000
17.	Heffley St. - S. Fork Ash Cr. Monmouth - Independence Hwy. Linn County	Repaving of bike route	-	100%	8,000
18.	Cannon Beach Jct. - Cannon Beach Oregon Coast Hwy. Linn County	widened shoulder bikeway	2.9	100%	58,000
19.	37th Ave. - Allen Lane Albany - Junction City Hwy. Linn County	widened shoulder bikeway	1.6	0%	50,000
20.	Beacon Dr. - Wilkes Dr. Junction City - Eugene Hwy. Lane County	widened shoulder bikeway	1.0	0%	15,000
21.	Brockway - Dillard Hwy. Jct. Coos Bay - Roseburg Hwy. Clatsop County	widened shoulder bikeway	0.5	0%	30,000
22.	Redwood Intchge. - Hubbard Lane Redwood Hwy. Josephine County	Separate path bikeway	3.1	0%	35,000
23.	Harmon St. - Old RR Grade Century Drive Hwy. Deschutes County	widened shoulder bikeway	0.8	0%	15,000
24.	John Day - Canyon City John Day - Burns Hwy. Grant County	widened shoulder bikeway	0.2	0%	8,000
	Fiscal year 1972-73 Totals		13.3 miles		$317,000
	1971-73 BIENNIUM TOTAL		31.7 miles		$621,160

TABLE 6

BICYCLE PATH COUNTS

Highway	*Location*	*Type of Route*	*1972 Monthly ADT* *July*	*Aug*	*Sept*	*Oct*	*Nov*	*Dec*
Pacific Hwy. East	Salem	1-way Widened Shld.	40	25	17	13	9	9
Oswego Hwy.	L. Oswego	1-way Widened Shld.		68	53	57	28	16
Mt. Hood	Portland	1-way Widened Shld.		24	14	8	4	5
Coos Bay-Roseburg	Winston	1-way Widened Shld.		45	26	13	3	3
Monmouth-Indep.	Monmouth	1-way Widened Shld.		84	57	45	20	14
Albany-Jct. City	Albany	1-way Widened Shld.		72	40	29	16	13
Jct. City-Eugene	Eugene	1-way Widened Shld.		130	79	66	41	16
Joseph-Wallowa L.	Wallowa L.	1-way Widened Shld.		14	Removed for winter			
Central Oregon	Burns	2-way Separated		79	29	11	4	3
McKenzie	Redmond	2-way Separated		3	2	2	2	*
Madras-Prineville	Prineville	2-way Separated		*	*	8	6	*
		Monthly ADT	40	54	35	25	13	10

Average ADT - 30 per day

*Recorder inoperative