McKinleyville Drainage Study

Prepared for

The County of Humboldt and

McKinleyville Community Services District

August 1982

WINZLER & KELLY
GROUP CONSULTING ENGINEERS

MCKINLEYVILLE DRAINAGE STUDY

August 1982

Prepared for:

Humboldt County and
McKinleyville Community Services District

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

A. PROJECT BACKGROUND

The McKinleyville Community Services District lies to the north of the Humboldt Bay Region and is one of several communities that make up the major urban area along the California North Coast. A location map of the District is shown on Figure I-1. The dominant physiographic feature of the mid-Humboldt County region is Humboldt Bay, located some six miles to the south of McKinleyville. The cities of Arcata and Eureka also lie to the south of McKinleyville. Figure I-2 depicts the boundary of the McKinleyville Community Services District. For over a decade Humboldt County has been working towards a solution to the storm water drainage problem in the McKinleyville area. Following is a brief summary of this work.

B. PAST HISTORY

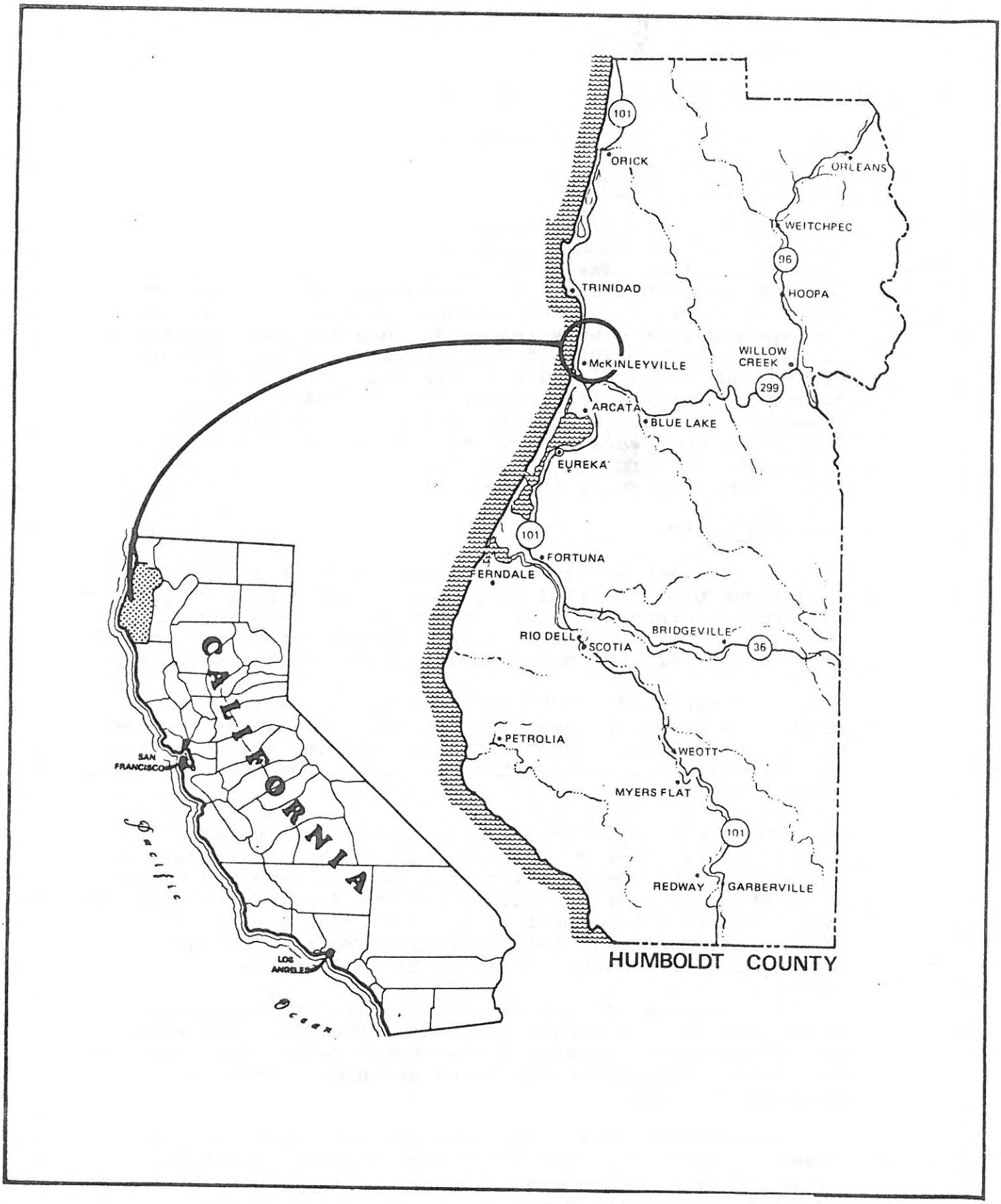
In the 1960's, recognizing the need for a comprehensive long-range plan for land development, and water, wastewater and storm drainage facilities, the County of Humboldt and various cities and districts in mid-Humboldt County joined together to form the Mid-Humboldt County Planning Program.

On January 24, 1969, the Governor of California designated Humboldt County as the Planning Agency for the Mid-Humboldt County Urban Planning Program, and delegated the responsibilities for this program to the Humboldt County Board of Supervisors.

The Planning Program consisted of five separate activities which were: Aerial Photography and Mapping of the Study Area; Preparation of a General Land Use Guide; development of a Master Plan for Water Supply, Treatment and Distribution; development of a Master Plan for the Collection, Treatment and Disposal of Wastewater; and development of a Master Plan for Storm Drainage.

The mapping and aerial photography were completed first, and in 1970 Baruth and Yoder, Engineers and Planners was contracted to develop a long-range master plan for land use, water, wastewater and storm drainage. This was completed in 1971.

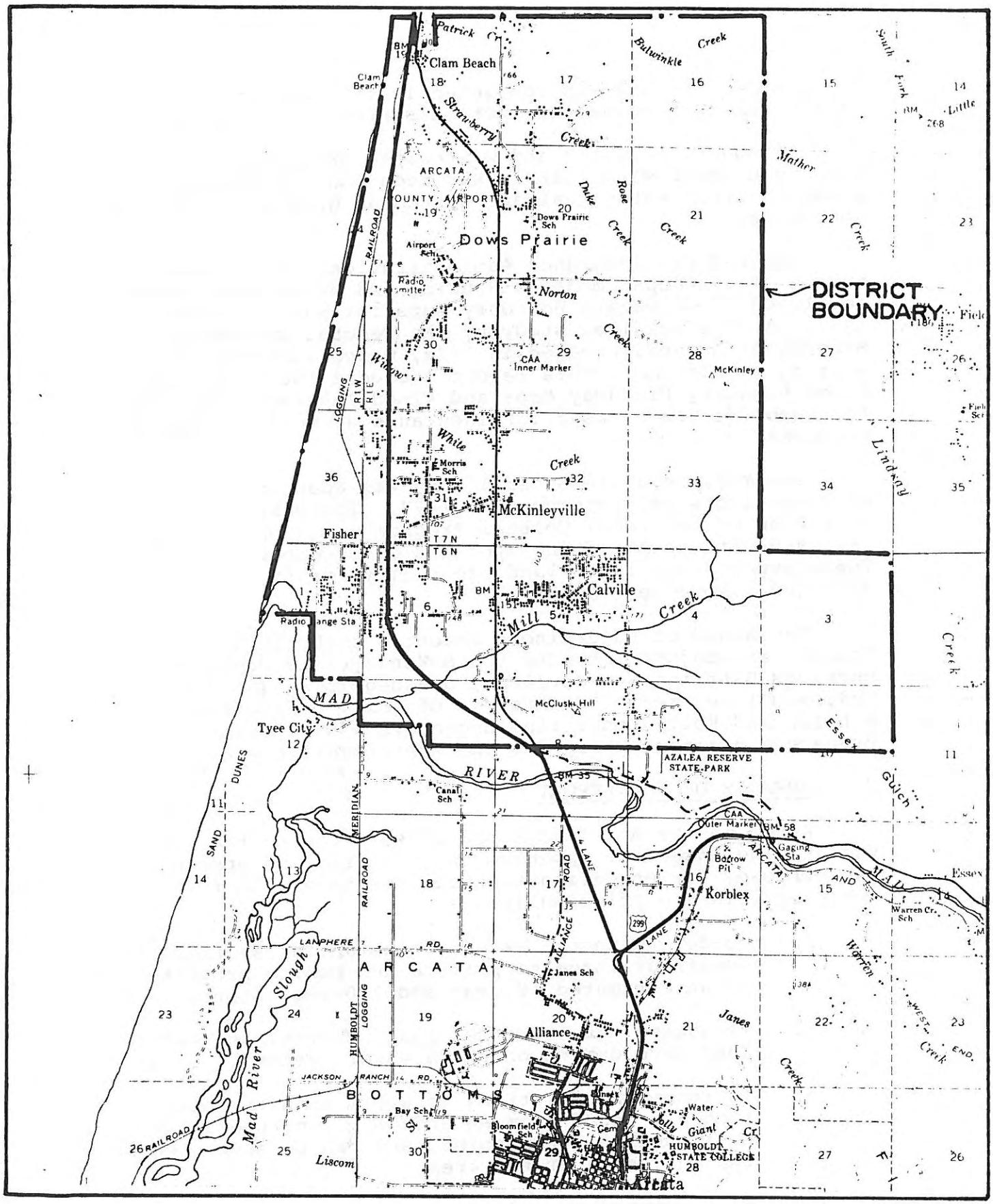
The McKinleyville Community Services District was formed on April 14, 1970 due to the concern of McKinleyville residents over the generally haphazard rapid growth in the area and the resulting water and wastewater problems. A



McKINLEYVILLE COMMUNITY SERVICES DISTRICT

PROJECT LOCATION MAP

FIGURE I - 1



McKINLEYVILLE COMMUNITY SERVICES DISTRICT

DISTRICT BOUNDARY

FIGURE I - 2

water supply system was completed in 1972 and in September 1978 a sanitary sewage collection system was completed.

Although the water and wastewater problems of the area have been dealt with, little has been done to provide an adequate storm water drainage system as growth in the area continues.

The Federal Insurance Administration, (FIA) then a branch of the Department of Housing and Urban Development, developed Flood Hazard Boundary Maps for Humboldt County in 1977. A more detailed study by the Federal Emergency Management Agency, created in 1979, which includes FIA, is nearing completion. This report includes the development of Flood Boundary Floodway Maps and Flood Insurance Rate Maps for Humboldt County used for insurance as well as regulatory purposes.

The McKinleyville General Plan was adopted by the Board of Supervisors on September 13, 1977. The McKinleyville Area Plan of the Local Coastal Program was adopted December 16, 1980 with an Amendment approved on December 14, 1981. These reports develop a land use policy for the area defining allowable growth.

The Board of Supervisors recently authorized the County, in conjunction with the McKinleyville Community Services District, to develop a drainage plan for the McKinleyville area. As a result of this joint effort, Winzler and Kelly Consulting Engineers was retained to prepare a drainage study for the McKinleyville area.

C. PURPOSE OF THE REPORT

Based on the detailed scope of services of the Engineering Agreement appended to this study as Appendix B, the purposes for preparing a master drainage plan for McKinleyville are principally:

1. To determine the extent of potential storm water runoff drainage to private and public property due to an estimated 10-year and 100-year storm.

2. To assess the impact of past, current and future land development on storm water systems.

3. To recommend solutions to storm water problems that are sound from an economic, engineering and environmental standpoint, and can be supported by the residents of the area.

4. To recommend an orderly systematic means for securing the desired improvements including methods of funding such improvements.

CHAPTER II

CONCLUSIONS AND RECOMMENDATIONS

A. GENERAL

The project study area, contained within the McKinleyville Community Services District, is located in mid-coastal Humboldt County and is part of the mid-Humboldt County region which is the major urban area along California north coast.

The majority of existing land use within the McKinleyville Service Area is devoted to non-developed uses, including agriculture, forest and open space which presently account for approximately 83 percent of the total area. The total area in the McKinleyville Community Services District is approximately 13,000 acres of which approximately 7,400 acres are within the study area.

B. SUMMARY

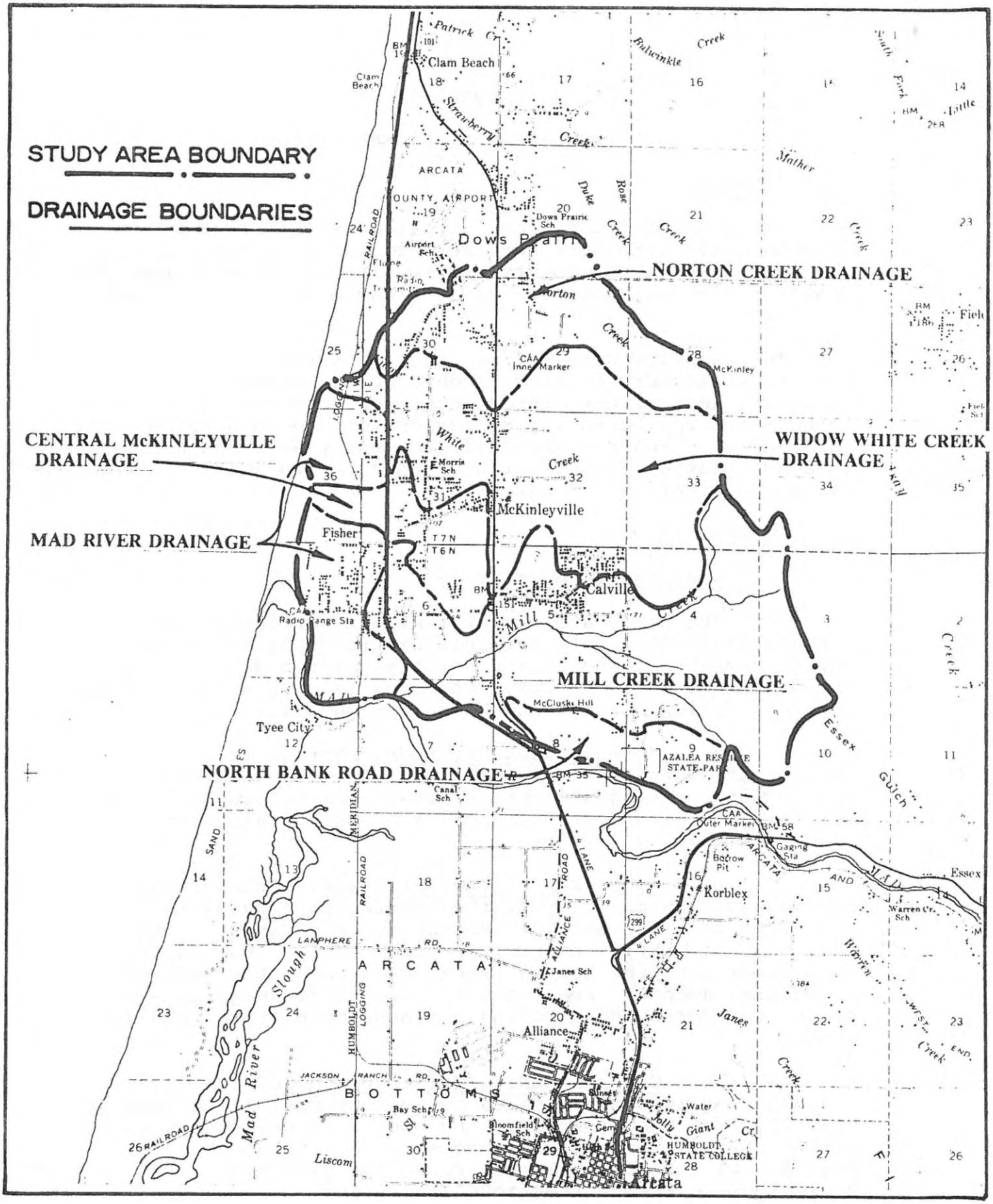
1. Drainage Boundaries

The study area incorporates a portion of the McKinleyville Community Services District bounded by the Norton Creek Drainage in the north and North Bank Road and the Mad River in the south. The area is divided up into six separate drainage areas as shown in Figure II-1. These are:

a. Norton Creek Drainage. Norton Creek is located at the northern extreme of the study area. It includes the area just south of Dows Prairie and the airport complex extending south to the north fork of Widow White Creek drainage.

b. Widow White Creek Drainage. This drainage encompasses the majority of the central portion of the study area from Calville north to Norton Creek drainage on the east side of Central Avenue, and essentially from Railroad Avenue north to the Norton Creek drainage on the west side of Central Avenue. West of U.S. 101 the drainage extends north from Murray Road to the northern boundary of the study area.

c. Central McKinelyville Drainage. This drainage encompasses the area between Central Avenue and U.S. 101 from School Road in the south, to Railroad Avenue in the north. The drainage crosses U.S. 101 north of Hiller Road and will be channelized around the proposed McKinelyville sewage treatment facilities, eventually discharging to the Mad River.



STUDY AREA AND DRAINAGE BOUNDARIES

FIGURE II - 1

d. Mill Creek Drainage. This drainage encompasses most of the southern portion of the study area. It is bounded on the north by the Calville area east of Central Avenue and by School Road west of Central Avenue. It crosses U.S. 101 south of School Road and discharges to the Mad River.

e. Mad River Drainage. This is not one particular area. Rather it is several areas that discharge at a number of discrete locations to the Mad River rather than into one of the three major creeks in the study area. The drainage boundary includes most of the study area west of U.S. 101 including the area south of Hiller Road and a portion of the area south of Murray Road.

f. North Bank Road Drainage. This drainage includes the area east of U.S. 101 and south of the Mill Creek drainage boundary. It essentially consists of a number of natural drainages that cross North Bank Road and discharge to the Mad River.

2. Population and Projected Growth

The McKinleyville Community Services District has an estimated population of 8,200 (1980 estimate). Based on the Land Use Plan of the McKinleyville General Plan, the population would expand to approximately 50,000 at maximum development. This, of course, will not occur as much of the area will not develop to its full capacity.

A large portion of the district and most of the study area is presently served by the district water and sewer facilities. They are, however, undersized in the core area of the District based on the maximum potential buildout. The sewer was sized on an estimated two residents per acre. Using this criteria the district population would be limited to approximately 25,000 persons or half the projected population. Although this maximum buildout is not expected, certain areas in the district will almost certainly develop beyond the capacity of the existing facilities. Thus a systematic and orderly upsizing of both sewer and water should be implemented as needed.

3. Existing Problem Areas

There are a number of areas in McKinleyville where occasional flooding occurs. There is very little serious flooding where private property is threatened. Rather, the majority of flooding occurs in streets, occasionally reaching into neighboring yards.

The most obvious and visible flooding problem occurs at the intersection of Railroad Avenue and McKinleyville Avenue. The flooding at times encompasses various neighboring yards and is several feet deep in the intersection. It also floods fields to the west bordering the ditch that carries flows to the U.S. Highway 101 crossing. Access to various residents is hindered during periods of high water.

A potentially serious flooding problem is in the Mill Creek Drainage, where Mill Creek crosses Bartow Road. Bartow serves a proposed residential development and is the only access to the area. Therefore, it is important that it remains open at all times. The north fork of Mill Creek tops its banks at times and floods neighboring yards. Additional flow from the new Eklund Ranch Subdivision will only exacerbate this problem.

Problem areas in the Widow White Creek Drainage include a culvert crossing of First Street in the Calville area. The culvert crosses under a house at the corner of First Street and "B" Street coming very close to flooding the house during heavy rain storms. Widow White Creek upstream of the Central Avenue crossing at Glen's Auto, as well as ditches that flow into it, flood the surrounding low lying areas including the yards of a nearby residence, the parking lot of McKinelyville Muffler, and a portion of Glen's Auto yard during heavy runoff.

Several road intersections also tend to flood such as at Sutter and Park and at Azalea and Cochran. The Mill Creek crossing of Azalea occasionally tops the road making it impassible for short periods of time.

4. Storm Water Restrictions

Humboldt County has denied subdivision approvals in certain areas of the District until existing storm water problems are corrected. It is generally the responsibility of the developer to obtain drainage easements to a point that can accept the proposed increase in flow. The area of major concern is the Central McKinleyville drainage area. This is the most densely populated area in McKinleyville and shows the most potential for immediate growth. Some areas are not presently under a restriction, but before much new development can proceed, several of the proposed storm water facilities projects must be implemented.

5. Proposed Drainage Projects

The storm water plan developed assumes maximum buildout based on the Land Use Plan of the McKinelyville General Plan. Based on this assumption, estimated flows at various nodes were developed by the Humboldt County Department of Public Works and confirmed in this report. Storm water facilities to accommodate these flows were sized and estimated costs for the individual projects were calculated. Table II-1 summarizes these costs by drainage area.

These costs assume that all work will be completed by competitive bid and all required drainage easements be purchased. Costs of some of the proposed projects can be substantially reduced by completing them over a period of time as a long-term maintenance program or by using volunteer labor such as the National Guard. In addition, some rights-of-way could be obtained as easements dedicated as a condition for development in certain instances.

The use of ponds and detention basins was explored as an option to sizing the storm water facilities to accommodate peak discharge. This plan defines certain existing natural restrictions that act to moderate peak runoff. The dense underbrush growth along Mill Creek upstream of Azalea as well as the existing culverts crossing Azalea both aid in restricting downstream flow. The Norton Creek crossing of Dows Prairie Road is also a restriction. Similar basins could be constructed on Widow White Creek and also in the Central McKinelyville drainage system.

6. Administration

Various means of administering the drainage plan were explored. It is essentially limited to the McKinelyville Community Services District, Humboldt County Department of Public Works, Humboldt County Flood Control District or some type of cooperative agreement.

7. Methods of Financing Proposed Storm Water Facilities

In order to solve existing flooding problems, up front dollars are required. There are essentially three methods of obtaining these funds. They are Assessment Districts, Benefit Assessments and Grants. Based on sentiments expressed at public meetings, Assessment Districts and Benefit Assessment areas do not appear to be implementable at this time due to a lack of public support. Various government agencies have grant programs to fund

TABLE II-1 - PROJECT AREA COST SUMMARY

Norton Creek Drainage		
Total Estimated Cost		$240,300
County Road Fund Share	$6,500	
Local Share	$233,800	
Widow White Creek Drainage		
Total Estimated Cost		$848,800
County Road Fund Share	40,700	
Local Share	808,100	
Central McKinleyville Drainage		
Total Estimated Cost		$796,000
County Road Fund Share	255,500	
Local Share	540,500	
Mill Creek Drainage		
Total Estimated Cost		$902,200
County Road Fund Share	37,300	
Local Share	864,900	
Mad River Drainage		
Total Estimated Cost		$694,000
County Road Fund Share	0	
Local Share	694,000	
TOTAL ESTIMATED COST		$3,481,300
County Road Fund Share	$340,000	
Local Share	$3,141,300	

storm water projects, but there has been a cut back of available funds under the present administration and there is sharp competition for the remaining funds.

Methods of obtaining capital over a period of time include Subdivision Drainage Fees, Building Permit Fees and User Charges.

A final method of implementing the projects would be to put the burden of costs on the developer requiring that they install both the necessary on-site and off-site facilities as a condition for developing.

The County Public Works has a road fund that is used for maintenance and for upsizing undersized culverts crossing county roads. A number of proposed projects refer to this as a source of funding. However, recent discussion with county staff indicates that these funds will probably not be available to any extent.

C. RECOMMENDATIONS AND CONCLUSIONS

1. General

It is recommended that this Storm Drainage Master Plan be adopted as a guide for construction of future drainage facilities. Other specific recommendations are set forth below.

2. Recommended Projects

The eleven projects listed as priority projects in Chapter VII should be implemented as funds are available. These projects and methods of financing are summarized in Table II-2 below. This listing is not intended to be a recommendation for order of implementation, rather these should be the focus projects as funding oportunities become available for any one or combination of projects.

The proposed easements for all the projects should be obtained as early as possible either by purchasing them or preferably by having them deeded as a condition for development. This would allow maintenance personnel to widen channels over a number of years as funding permits.

TABLE II-2. PRIORITY PROJECTS AND FINANCING

Project[1]	Cost	Methods of Financing		
		County Road Fund[2]	Grant Funds[3]	Sub-division Fees
Central McKinleyville Drainage Project (g)	$113,700	36%	64%	
Mill Creek Drainge Project (i)	14,200	100%		
Widow White Creek Drainge Project (b)	7,600	62%	33%	
Mill Creek Drainge Project (h)	24,400		100%	
Widow White Creek Drainage Project (e) & (g)	34,500		100%	
Norton Creek Drainage Project (f)	13,400			100%
Widow White Creek Drainage Project (i)	215,600			100%
Central McKinleyville Drainage Project (b)	133,400	100%		
Norton Creek Drainage Project (e)	62,900			100%
Mad River Drainge Project (c)	179,100			100%
Mill Creek Drainage Project (j)	135,700		100%	

[1] See Chapter VI, Proposed Storm Drainage Master Plan and Chapter VII, Priorities, Financing, and Administration for detailed descriptions of individual projects.

[2] Recent discussion with County staff indicate that County Road Funds may not be available as a funding source.

[3] If grant funds are not available these costs will by necessity be funded by subdivision drainage fees.

3. Cost Savings

It is recommended that a long-term maintenance program be implemented to help defray the costs of various projects. Ditches and channels should be cleaned out and widened over a period of time rather than completing the improvements all at one time.

The channel improvements in Central McKinleyville Drainage Project g; Mill Creek Drainage Project h; Widow White Creek Project e and g; and Norton Creek Drainage Project e would all lend themselves well to a maintenance program and/or volunteer labor once required drainage easements are obtained.

4. Implementation of Orderly Development

It is necessary that the overall drainage area be considered when constructing any drainage facilities. It would be advisable to design an entire trunk system throughout a given drainage area to make sure that the various facilities mesh together.

The use of detention basins can have a substantial effect on ultimate sizing of storm water facilities. It should be determined relatively early, before many of the proposed projects are implemented whether detention basins will be installed especially at key nodal points such as on Widow White Creek and somewhere in the Central McKinleyville drainage perhaps near the McKinelyville Avenue, Hiller Road intersection.

5. Administration

Humboldt County Flood Control District must be the lead agency for storm drain master planning and implementation, operation and maintenance of all general benefit facilities throughout the County.

Humboldt County Public Works should be the lead agency in collecting an appropriate level of subdivision and building permit fees. At the time of processing and granting such permits Humboldt County Public Works should retain responsibility of assuring that proper level of on-site and off-site drainage facilities are dedicated and constructed or calculate an appropriate cash contribution to be collected and a General Benefit Drainage Improvement Fund established.

6. Financing

It is apparent that there is little community support at this time for any type of assessment proceedings to help implement the proposed drainage projects. It is further apparent that the Humboldt County Flood Control District should not adopt a drainage user charge system at this time. After analyzing the experiences of other municipalities, it is not believed that such a charging mechanism is politically viable for the District, and that it would invite public opposition which could result in litigation against the District.

It is concluded that drainage user charge systems work best in those communities in which several conditions are present. Fist, there must be a broad-based consensus in the community that the levy of fees for financing flood control and drainage is equitable. Secondly, there must be an awareness among local residents of the possiblity of flood damage to their property. Thirdly, if flood hazards are not present, then there should be strong community support for and the willingness to pay for the maintenance of natural flood control channels to preserve or restore the "natural" environment. Lastly, the drainage user fee system must be coupled with an effective method for collecting and enforcing payment of fees. It is not believed that these prerequisites can be satisfied in sufficient magnitude by the District at the present time.

This essentially places the burden of storm drain facility improvements on the developer in the form of Subdivision Drainage Fees, Building Permit Fees, and developer financed projects; on the County Road Fund; and on grants. The various government agency grant programs should be closely monitored in an attempt to obtain funds for proposed storm water projects.

7. Ordinance

A draft drainage ordinance that addresses storm drainage improvements and implementation is attached as Appendix A. It is recommended that this be reviewed by County Counsel and adopted in order to implement the funding methods set forth above.

CHAPTER III

EXISTING AND PROJECTED STUDY AREA CHARACTERISTICS

A. INTRODUCTION

The intent of this chapter is to describe pertinent physical, demographic, environmental, and economic characteristics of the study area to provide a basis for development of the master drainage plan. Included are descriptions of the geographical setting, land-use patterns, economic activity, population, environmental setting, and institutions within the study area. Some characteristics can be related to the individual service area, while others are best described on a broader regional basis.

B. SERVICE AREA BOUNDARIES AND COMPOSITION

The project service area, contained within the McKinleyville Community Services District, is located in mid-coastal Humboldt County, as shown in Figure III-1. The total area of the McKinleyville Community Services District (MCSD) encompasses almost 13,000 acres, of which 7,400 acres are included in the project service area. Significant portions of the service area are located within the Coastal Zone as defined by the California Coastal Commission. Also, existing and proposed wildlife refuges are situated in the vicinity of the planning area. The relation of these areas to the service area is discussed in Section D, Land Use.

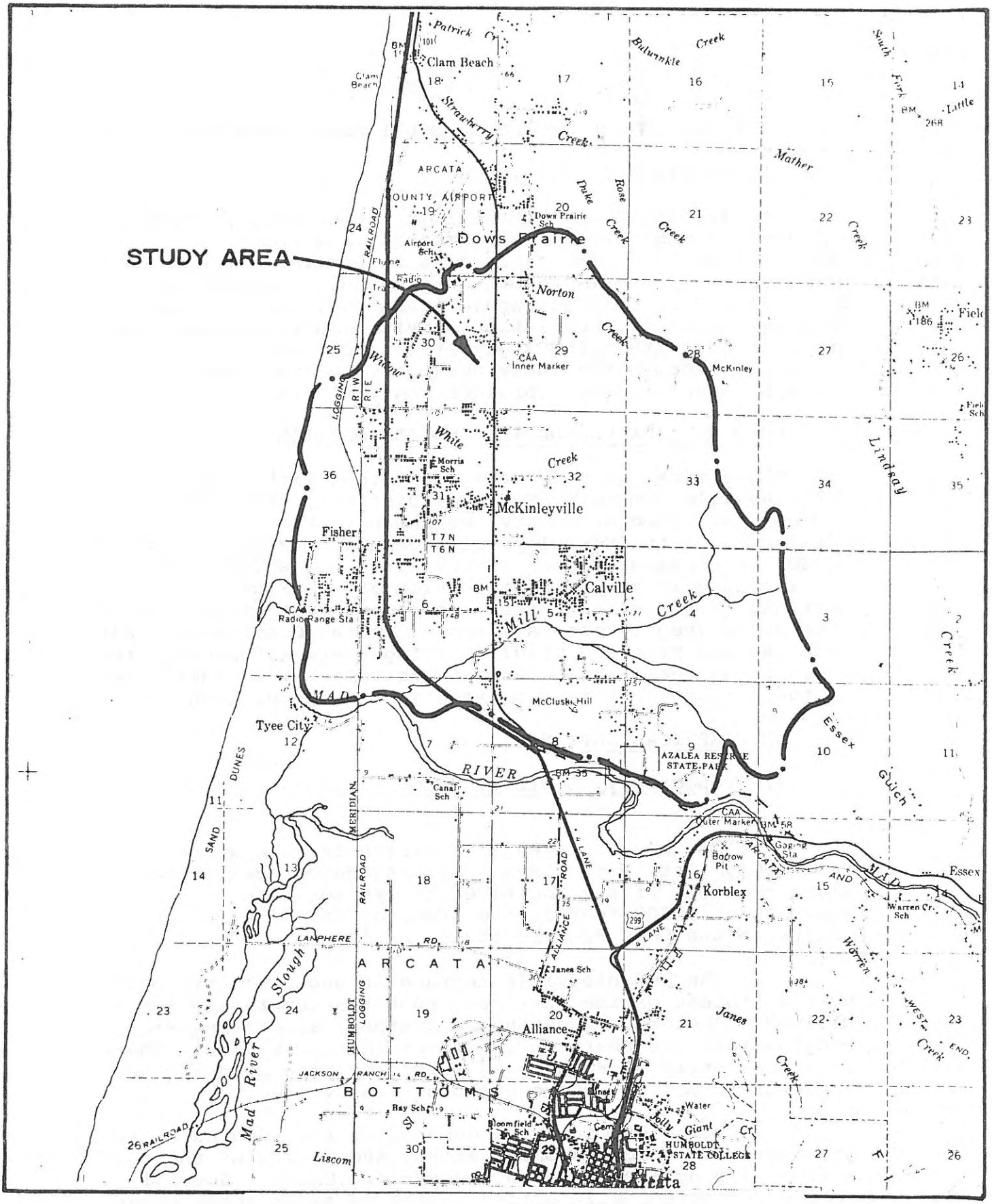
C. GEOGRAPHICAL SETTING

1. Topography, Geology, Seismicity

The project area is a marine terrace which is relatively flat, with elevations ranging between 10 feet along portions of the Mad River to the south to approximately 200 feet in the areas of Calville to the southeast and Dows Prairie to the north.

The McKinleyville terrace is underlain primarily by Pleistocene marine terrace composites comprising the Hookton formation. Mudstone, claystone, sandstone, and conglomerate are characteristics of this formation. There is also a strip of Franciscan formation, the principal hardrock formation in the Humboldt County area.

Humboldt County in general is regarded as an area of moderate to high seismic hazard, and is one of the most seismically active areas on the Pacific Coast. Several active and potentially active faults or fault zones occur within the Greater McKinleyville area.



STUDY AREA

FIGURE III - 1

Alluvium, comprised of unconsolidated clays, sand, and gravel, has been deposited by successive floods through the years. Alluvial deposits are associated with the low-lying areas of the creeks in the community and are encountered to a depth of several hundred feet in the board ?BROAD? low lying plains on each side of the Mad River.

2. Soils

The project area contains two major land forms: the McKinleyville terrace and the Mad River floodplain. The McKinleyville terrace is probably a result of wind-deposited sand, as indicated by the high sand content of the soils (McLaughlin and Harradine, 1965). The soils of the Mad River floodplain are a result of the deposition of silt on the land surface from periodic overflows.

The soils series units found in McKinleyville represent a diversity of soils types. Soil types range from the poorly drained Bayside soils of the reclaimed tidal marshes to the better-drained and more productive Arcata, Ferndale, Loleta, Hookton, Russ, and Timmons soil types. Riverwash is apparent near the Mad River and sand dunes predominate in the western portion of the project area.

3. Rainfall

The average precipitation in the Eureka area is 39.13 inches per year, with the major portion falling from October through April (Table III-1). Central McKinleyville and areas to the east generally exceed rainfall in Eureka, by as much as ten inches per year. Most of this rainfall results from migratory low pressure systems moving landward from the Pacific Ocean. Snowfall is infrequent in the area and is not persistent.

4. Hydrology

Four major streams occur in the McKinleyville area: Strawberry Creek in the northern portion, which lies outside the study area, Norton Creek, which has been channelized in the past to feed into Widow White Creek; Widow White Creek, which empties directly into the Pacific Ocean; and Mill Creek, in the southern portion of the community, which empties into the Mad River.

The Mad River separates the prairies of McKinleyville from the broad alluvial plains of Arcata, and it supplies the major portion of water required for domestic and industrial purposes within the Humboldt Bay region. The drainage area of the river is 497 square miles and its length is approximately 100 miles. The Mad River originates

TABLE III-1.
AVERAGE MONTHLY PRECIPITATION

Month	Inches of Precipitation[1]
January	6.86
February	5.83
March	5.29
April	3.05
May	1.85
June	0.72
July	0.12
August	0.23
September	0.90
October	2.66
November	5.37
December	6.28

[1] Record mean (1939-1978); from Local Climatological Data, Annual Summary with Comparative Data Eureka, California, Department of Commerce, NOAA, 1978.

in northern Trinity County and flows northwesterly through Humboldt County. Instantaneous discharge from the Mad River to the Pacific Ocean varies greatly during the year. Based on 31 years of measurement, the yearly average streamflow is 1,513 cfs, with a recorded maximum of 81,000 cfs (22 December 1964) and a minimum of 0.10 cfs (29 August 1977). The extent of the 100-year floodplain is delineated in Figure III-2.

Most of the surface runoff in the project area is channelized into the existing creekbeds or into fields. In several low-lying areas intermittent ponding occurs during the winter months.

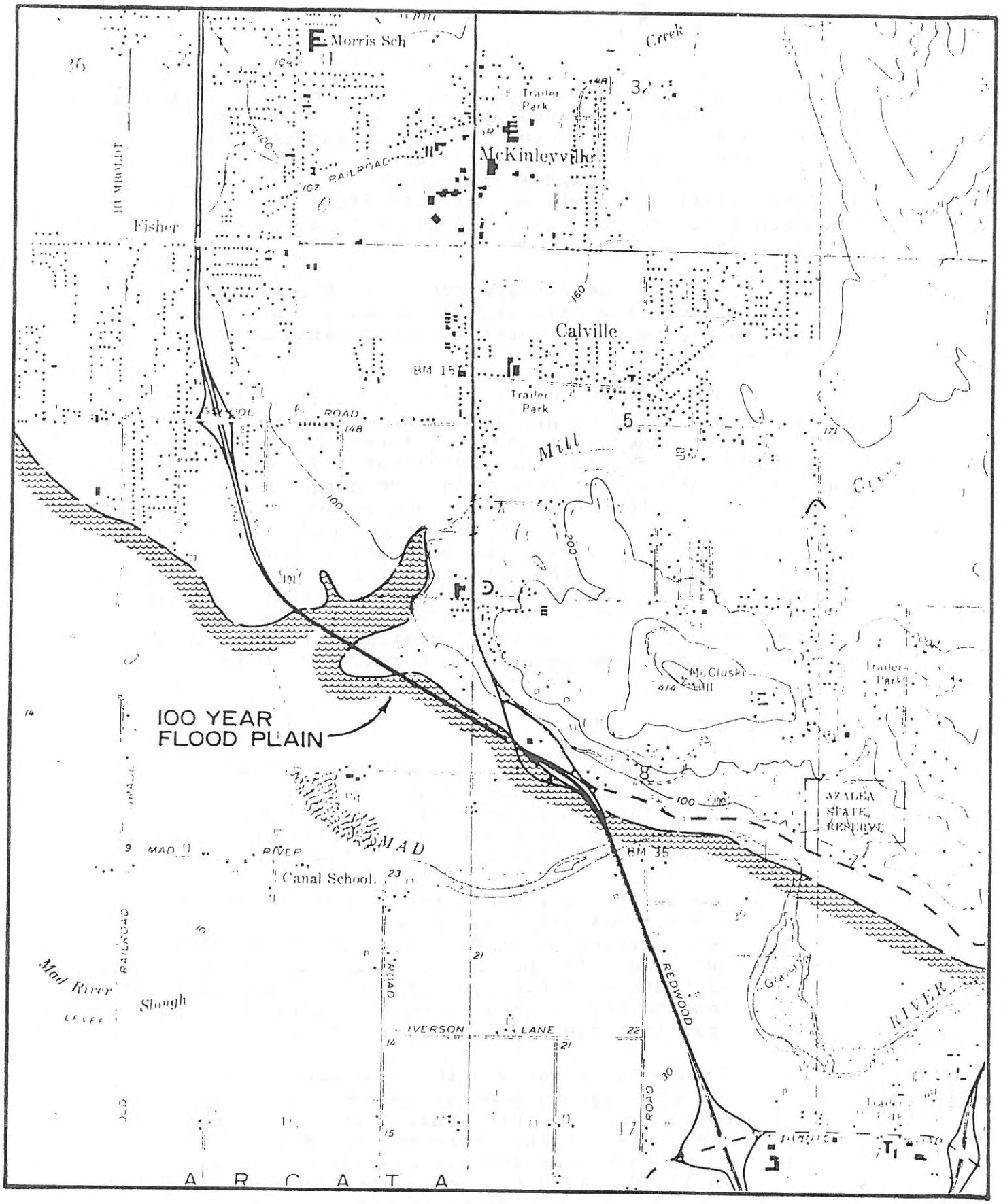
Depth of the water table is variable throughout the area, depending on proximity to streams and on the nature of the underlying geologic formations. Groundwater is recharged by rain during the winter and spring months in those areas of Hookton Formation. Recharge in the alluvial plains adjacent to the Mad River and adjacent to Mill Creek and Widow White Creek is additionally aided by percolation from those water courses. The majority of McKinleyville project service area consists primarily of Hookton Formation composed of fine-grained marine sediments that underlie raised marine terraces. This formation yields water readily to wells and is second in water availability only to the alluvium of the Lower Arcata and Eureka plains (Johnson, 1978).

D. LAND USE

Land uses within the 20.8 square mile McKinleyville planning area are representative of a growing rural community. The factors responsible for the direction of current land uses are identified in the McKinleyville Community General Plan (1977):

- The low density character of the residential areas. McKinleyville's residential areas have been developing at densities averaging from 1 to 3 dwelling units per acre. While densities similar to those of McKinleyville area not unusual, they tend to result in a sprawling residential pattern that increases public service cost.

- Commercial areas within the Community are dispersed along Central Avenue. The pattern of development in this area is similar to that of a commercial strip. However, the McKinleyville shopping center located between Hiller and Railroad Avenue has become the primary shopping area for the residents of McKinleyville.



100 - YEAR MAD RIVER FLOODPLAIN HAZARD ZONE

FIGURE III - 2

- Open spaces within the McKinleyville Planning Area include the Azalea Preserve, existing agricultural lands, forest/hillside areas, golf course, creek systems and the sand dune or beach areas.

  These existing open space areas provide a major structuring element to the Community, and if integrated into the Community's development pattern will provide strong community identity and direction to the nature and type of growth that will occur.

The following elements are considered to be responsible for the identity and physical structure of the planning area (McKinleyville Community General Plan, 1977):

- The mountain and foothill areas to the east of the Community.
- The Central Avenue commercial core area.
- McKinleyville High School.
- U.S. 101 freeway.
- The sand dune and beach lands along the western boundary of the planning area.
- The Arcata Airport.
- Productive agricultural lands.

The existing land uses, and proposed land uses, as presented in the McKinleyville Community General Plan (1977), are listed in Table III-2. The development pattern associated with the inventory of existing land use is expressed in Figure III-3, and proposed land use is shown in Figure III-4.

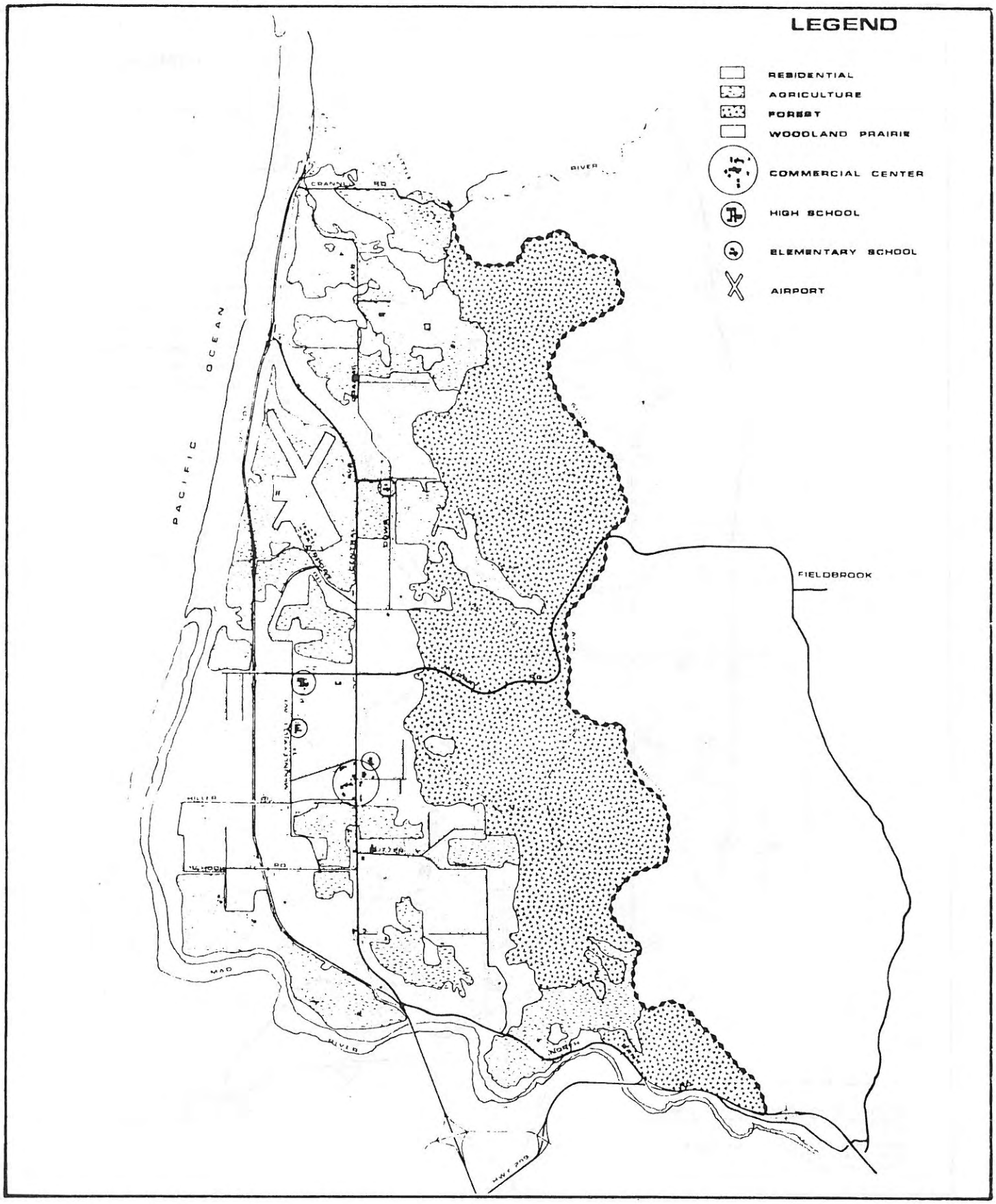
Parcel sizes within the planning area range from residential-size lots to parcels greater than 20 acres, with most of the parcels under 5 acres as shown in Figure III-5. The parcels under five acres are experiencing a high rate of development build-out (McKinleyville Community General Plan, 1977).

Most of the private land in the planning area is unzoned, and only a small amount of agricultural land is currently zoned for agricultural use. Current zoning is shown in Figure III-6.

TABLE III-2. EXISTING AND PROPOSED LAND USE

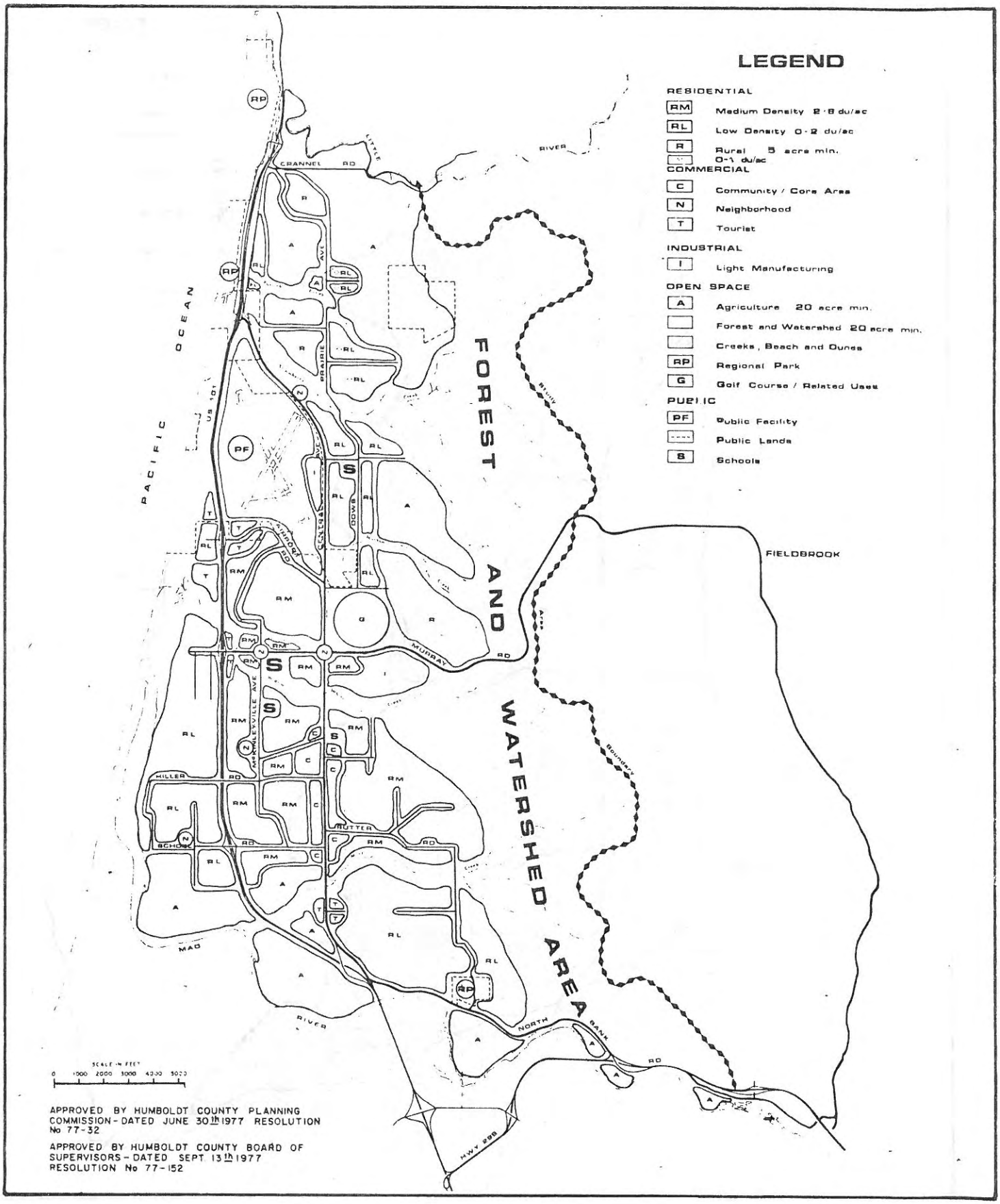
	Existing		Proposed	
Use	Acres	Percent	Acres	Percent
Residential	1,996	15.0	4,072	30.6
Commercial	97	0.7	346	2.6
Airport and Other Public Facilities	153	1.1	200	1.5
Industrial	45	0.4	140	1.1
Agriculture	3,270	24.6	3,132	16.0
Forest	4,475	33.6	4,475	33.6
Open Space	3,276	24.6	1.947	14.6
Total	13,312	100%	13,312	100%

Source: McKinleyville Community General Plan, 1977



EXISTING LAND USE

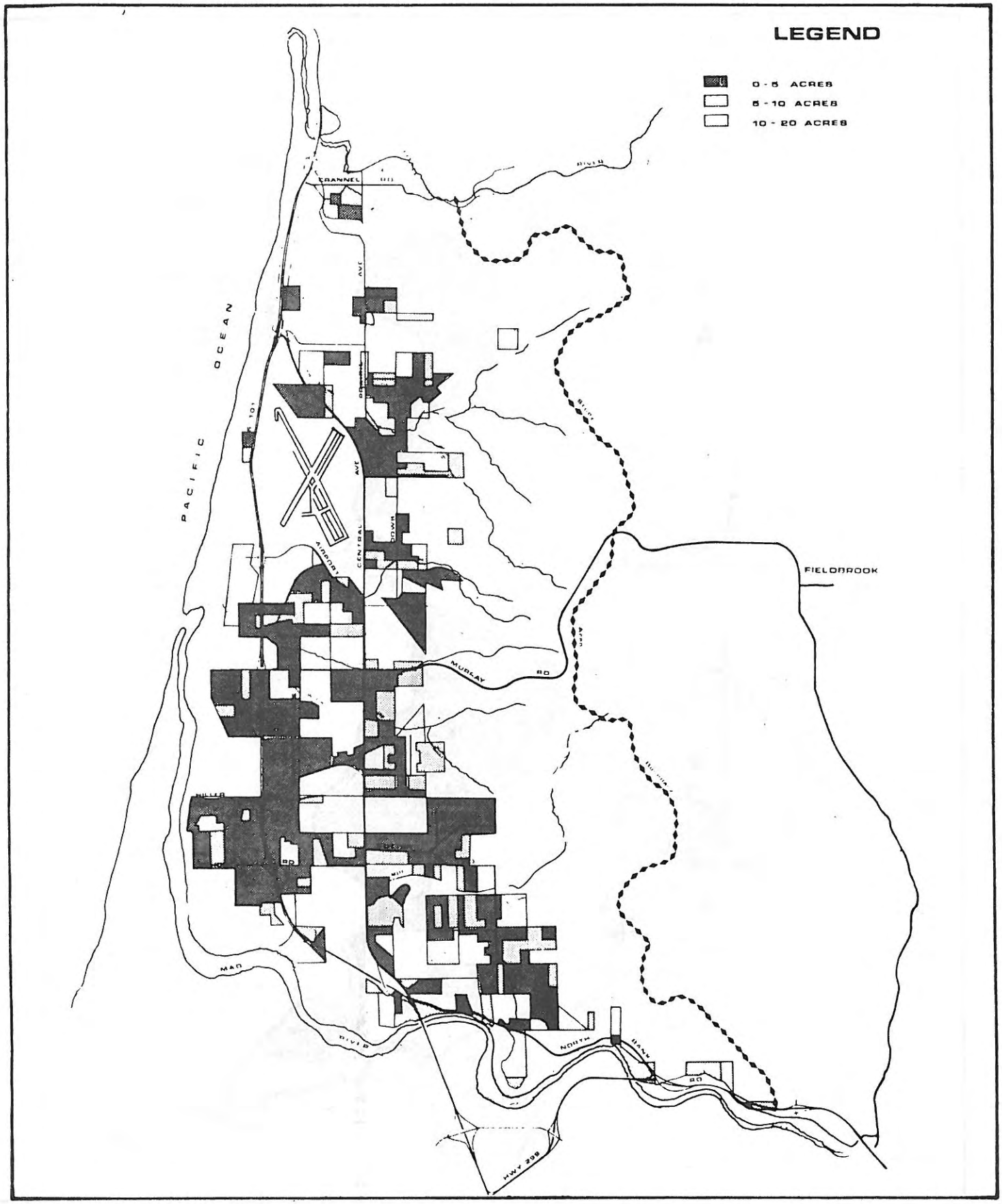
FIGURE III - 3



McKINLEYVILLE COMMUNITY SERVICES DISTRICT

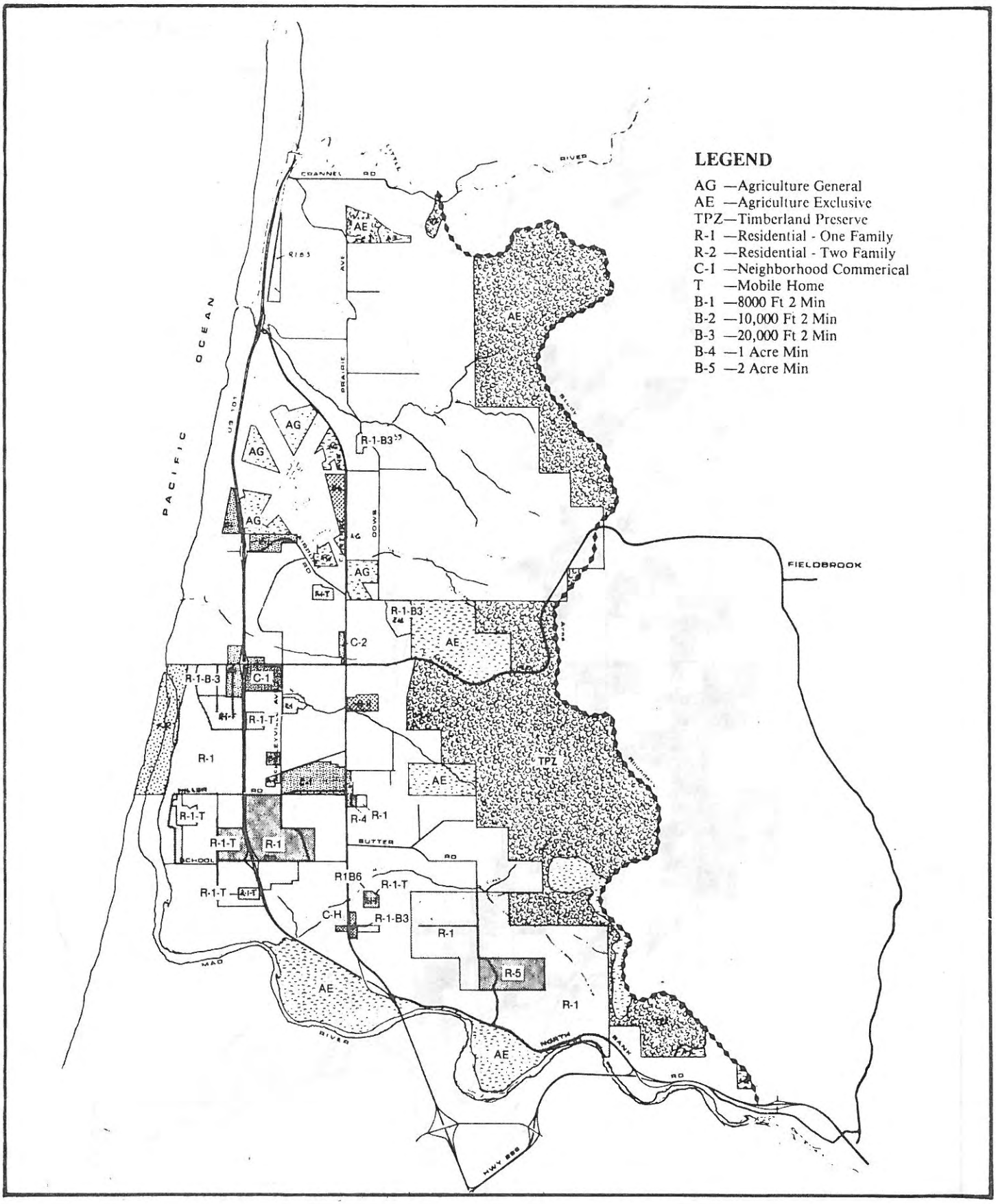
McKINLEYVILLE LAND USE PLAN

FIGURE III - 4



EXISTING PARCEL SIZES

FIGURE III - 5



ZONING

FIGURE III - 6

The protection of prime agricultural lands and agricultural land uses is an important feature of the Coastal Act, and agricultural use is an important component of the rural nature of McKinleyville.

The Storie Index is a numerical rating of agricultural soils that expresses their relative degree of suitability for agriculture. The index is obtained by evaluating character of the soil profile and soil depth; texture of the surface soil; slope; and other factors, such as drainage, pH, nutrient level, erosion, and microrelief.

Thus far, the Storie Index has been the only criterion used to map prime agricultural land in McKinleyville. This was done by the Local Coastal Program (Humboldt County, 1979) and by Shapiro and Assoc., Inc. (1979). Figure III-7 shows prime agricultural land, based on a Storie Index of 80 to 100 percent, in McKinleyville and vicinity.

E. ECONOMIC ACTIVITY

Unemployment in Humboldt County has averaged around 3.5 percent above the state average. Much of the economic activity in Humboldt County shows seasonal trends. Logging and tourism are greatly reduced during the rainy season, and the secondary sector is affected as a result. At present there are no existing industrial developments in the McKinleyville area. The economic activity is limited to a 2-mile commercial center on both sides of Central Avenue.

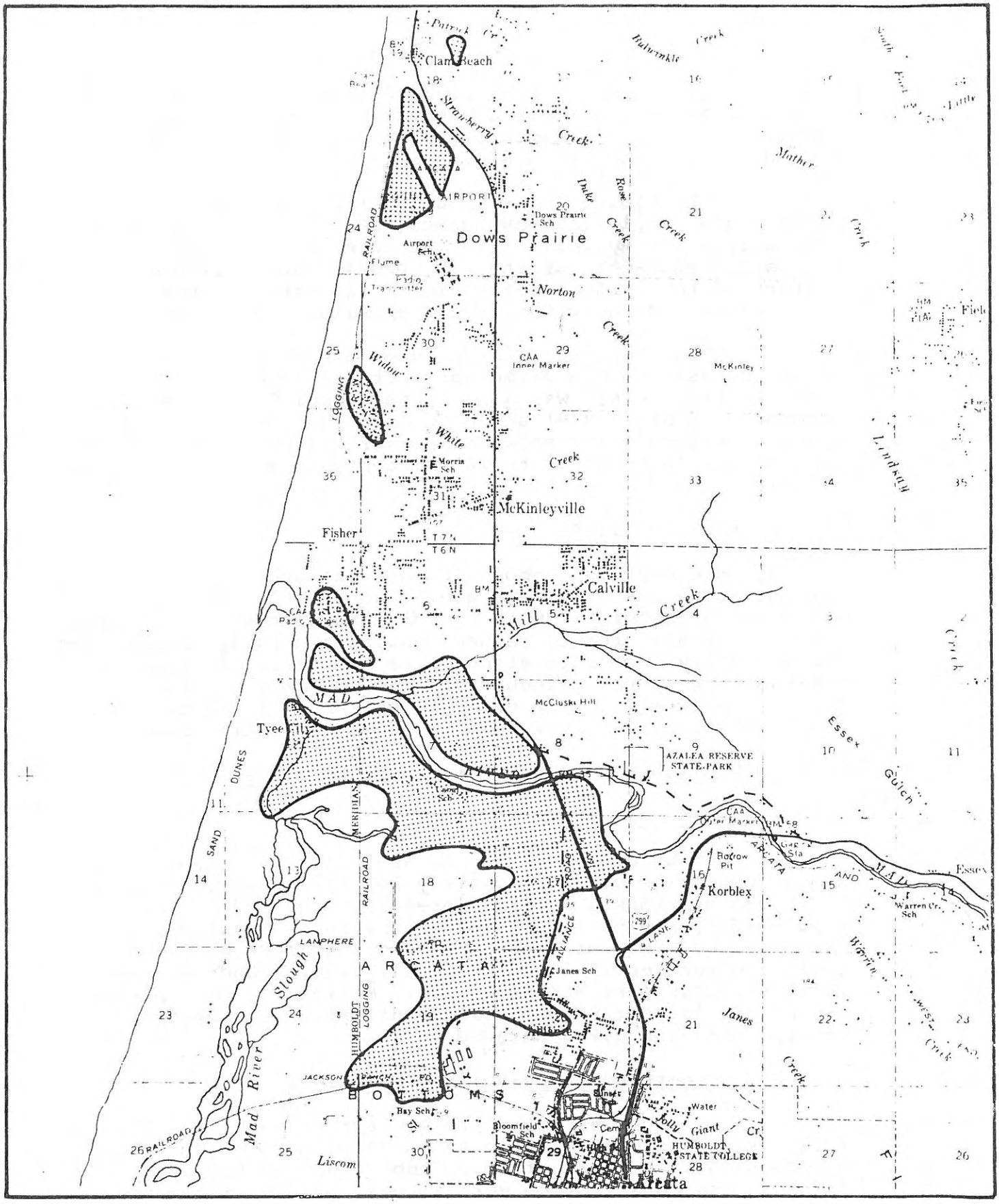
F. POPULATION AND POPULATION CHARACTERISTICS

1. General

Humboldt County has an area of 3,600 square miles and a population of approximately 108,000 (Humboldt County Planning Department, 1978). Based upon the 1978 populations, approximately 42% of the count is within the incorporated areas of Eureka, Arcata, and Fortuna. The remaining residences lie outside city limits and suburban or rural settings like McKinleyville. McKinleyville represents one of the largest unincorporated districts in Humboldt County, totaling 8,200 persons.

2. Growth and Population Projections

Growth within the project service area was heavily influenced during the 1970's by building moratoriums which encompassed five years, from December 1973 to February 1979. Prior to the construction moratoriums, growth within the service area was related to the economic health of the local timber industry. Prior to the 1940's fewer than 700 persons



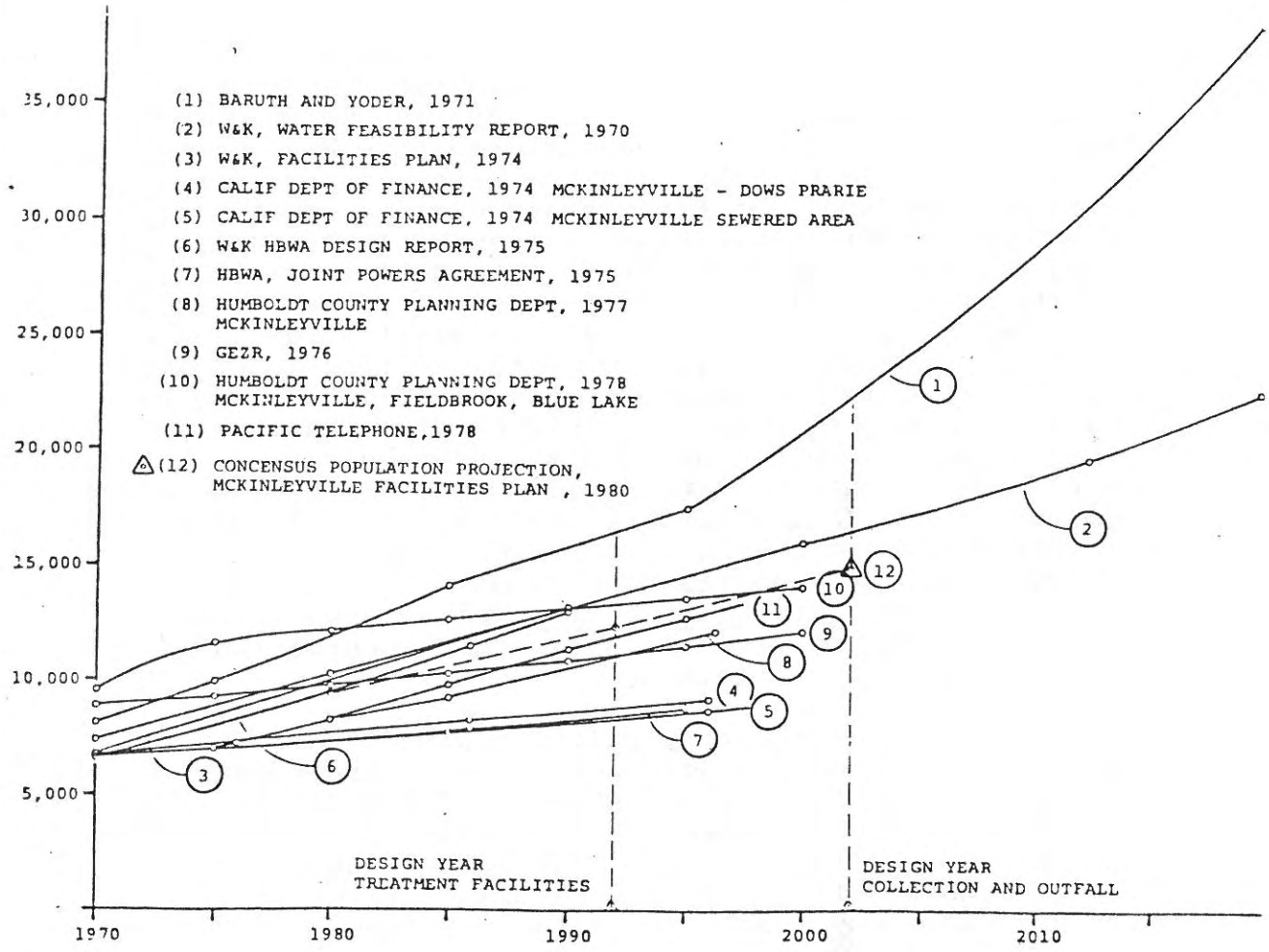
PRIME AGRICULTURAL LANDS
(STORIE INDEX 80 to 100 PERCENT)

FIGURE III - 7

lived in the McKinleyville area. From 1940 to 1960, the area expanded along with the economic expansion of the timber industry. A slowdown within the timber industry following 1960 caused a decline of the growth rate in the area into the 1970's.

Population projections from prior reports discussing the McKinleyville area are summarized in Figure III-8. Considerable variation can be seen in terms of predicted annual growth. The most recent projections specific to the McKinleyville area have been developed by the State Department of Finance and Winzler and Kelly for the original McKinleyville Facilities Plan (December 1974) and by the County of Humboldt for the McKinleyville General Plan (February 1977). The 1980 base population of 7,130 was calculated by increasing the 1970 census figures 1.5 percent annually, based on predictions by the California Department of Finance. This approximation was confirmed by the Avon Corporation, which in January 1979 performed a detailed marketing survey which included a street by street house count of the greater McKinleyville area. Within the service area, the study indicated that there were 2,162 residential structures. Based on the county-wide average of 3.2 persons per residence, the equivalent population is 6,916. It should be noted that the effective annual growth rate for the 1970 decade was actually 3 percent, considering five years of building prohibition.

The most recent population projections for the McKinleyville Community Services District are taken from the 1980 Facilities Plan and are shown in Table III-3. The projections shown represent the consensus of opinion based on a review of prior planning studies, discussions with County planning officials, and recommendations of a Citizens' Advisory Committee to the McKinleyville Community Services Board, formed during the preparation of a 1980 Wastewater Facilities Plan. The projections indicate a rapid growth rate over the next several years. This will result from lifting of the building moratoriums and increased growth as a result of the McKinleyville area serving as a bedroom community. Presently, a number of developments in the service area have been approved for construction or are under construction. These developments consist of over 200 single family homes, 200 mobile homes, and 30 townhouses, which correspond to a population increase of approximately 1,400 persons. Following the initial rapid growth period, it is expected that the population growth will eventually stabilize to a rate of approximately 2 percent annually. The current economic instability of the area may restrict the projected growth rate until such time as improvements in the lumber and housing industry occur.



RECENT GROWTH IN McKINLEYVILLE AREA

FIGURE III - 8

At any rate, it will take many years to reach maximum development based on the General Plan, although certain areas within McKinleyville are already near or past proposed capacities. A more detailed description of growth and population predictions can be found in the Facilities Plan for the proposed sewage treatment facilities.

TABLE III-3. POPULATION PROJECTION
MCKINLEYVILLE COMMUNITY SERVICES DISTRICT
FACILITIES PLAN

1980	1982	1992	2002
7,130	8,250	12,190	14,860

G. ENVIRONMENTAL SETTING

1. Physical Characteristics

The physical characteristics of the project area have been discussed in detail in previous sections of this chapter.

2. Biotic Environment

The major portion of the undeveloped property in McKinleyville is characterized at present by a woodland prairie vegetative community. Much of the original coniferous forest that once occurred in McKinleyville has been cleared, leaving a considerable portion of the community covered with sparsely treed grassy areas. Many of these trees, especially eucalyptus, pine, and cypress, were planted in rows as windbreaks. Riparian woodlands characterize the vegetation along the streams, especially portions of Mill Creek, Widow White Creek and Strawberry Creek. Several localized portions of the planning area have a water table at or near the surface of the ground, which supports vegetative communities comprised of hydrophytic species.

Several species of fish may be found in Strawberry, Widow White, and Mill Creeks, while the majority of the fish found in the Mad River are anadromous species, specifically king salmon (Oncorhynchus tshawytscha), silver salmon, steelhead, and coastal cutthroat trout. Migration of these species generally begins in the early fall with spawning occurring from late fall through winter.

H. INSTITUTIONS WITHIN THE PROJECT SERVICE AREA

1. Municipalities

At present there are no existing incorporated areas within the project service area. Urban services within the project service area are divided between two agencies: the Humboldt County Department of Public Works and the McKinleyville Community Services District. Incorporated areas outside the project service area include the cities of Trinidad and Arcata. The City of Arcata presently provides sewage treatment and disposal on a contractual basis for the McKinleyville Community Services District, although McKinleyville is in the process of developing their own sewage treatment facilities. This work is scheduled for completion in 1983.

The McKinleyville Community Services District presently provides distribution of potable water and wastewater collection services within the project service area. Treated potable water is delivered for repumping by the Humboldt Bay Municipal Water District to the McKinleyville Community Services District.

The County maintains the streets and associated drainage structures included in their road system. It also maintains the traffic signals and intersection lighting on Central Avenue. The McKinleyville Community Services District funds the remaining street lights along Central Avenue.

2. Planning Agencies

Planning within the service area is provided by the following agencies:

Humboldt County Planning Department
California Coastal Zone Conservation Commission

The Humboldt County Planning Department serves as the lead land-use planning agency within the project service area. The Humboldt County Planning Department is also responsible for establishing current zoning within the project service area. The California Coastal Zone Commission provides planning within the Coastal Zone and the California Department of Fish and Game is involved through its permit process in planning within areas classified as wetlands.

CHAPTER IV

DESIGN CONSIDERATIONS

A. INTRODUCTION

One of the principle purposes of this study is to develop criteria applicable to the design of the drainage facilities. This chapter reviews existing data including design reports, mapping and planning documents and establishes pertinent design criteria.

B. LAND USE CLASSIFICATIONS

1. Existing Land Use

The majority of existing land use within the McKinleyville Service Area is devoted to non-developed uses, including agriculture, forest and open space, which account for approximately 83% of the total area. (Refer to Chapter III, Section D, Table III-2).

The most densely populated area is the 2 mile commercial strip along both sides of Central Avenue. Other areas of relatively dense build-up occur along Sutter Road, School Road west of U.S. 101, Ocean Drive and Hiller Road west of McKinleyville avenue, as well as sections of McKinleyville Avenue and Murray Road. For the most part, these areas are developed at or beyond the capacities recommended by the McKinleyville General Plan. However, these areas are generally residential in nature with no commercial activity.

2. Future Land Use

Table III-2 in Chapter III identifies the future land use as proposed by the McKinleyville General Plan. It calls for a substantial increase in residential development mainly at the expense of agricultural and open space areas. Agriculture, forest and open space is reduced from the existing 83% to 72% of the total area.

C. EXISTING FACILITIES

1. Water System

The entire study area is served by the McKinleyville Community Service District water system which was completed in 1972. It has a 60-year design life and was sized based on population increases somewhat higher than more recent predictions. It is doubtful that the water system size will be a determining factor in limiting growth potential in the foreseeable future although predicted

population growth for the 60-year design life is certainly lower than maximum growth potential based on the McKinleyville General Plan.

There is more than adequate water storage for optimum fire flows of 3500 gpm for 4 hours (840,000 gallons) and it would be a relatively simple matter to increase the storage capacity when population growth requires it. The one area of concern is in the commercial core area. Normally 8-inch looped mains would be adequate, although to obtain adequate fire flows of 3500 gpm it might be advisable to have the developer install larger diameter lines where new lines are required.

2. Sanitary Sewer System

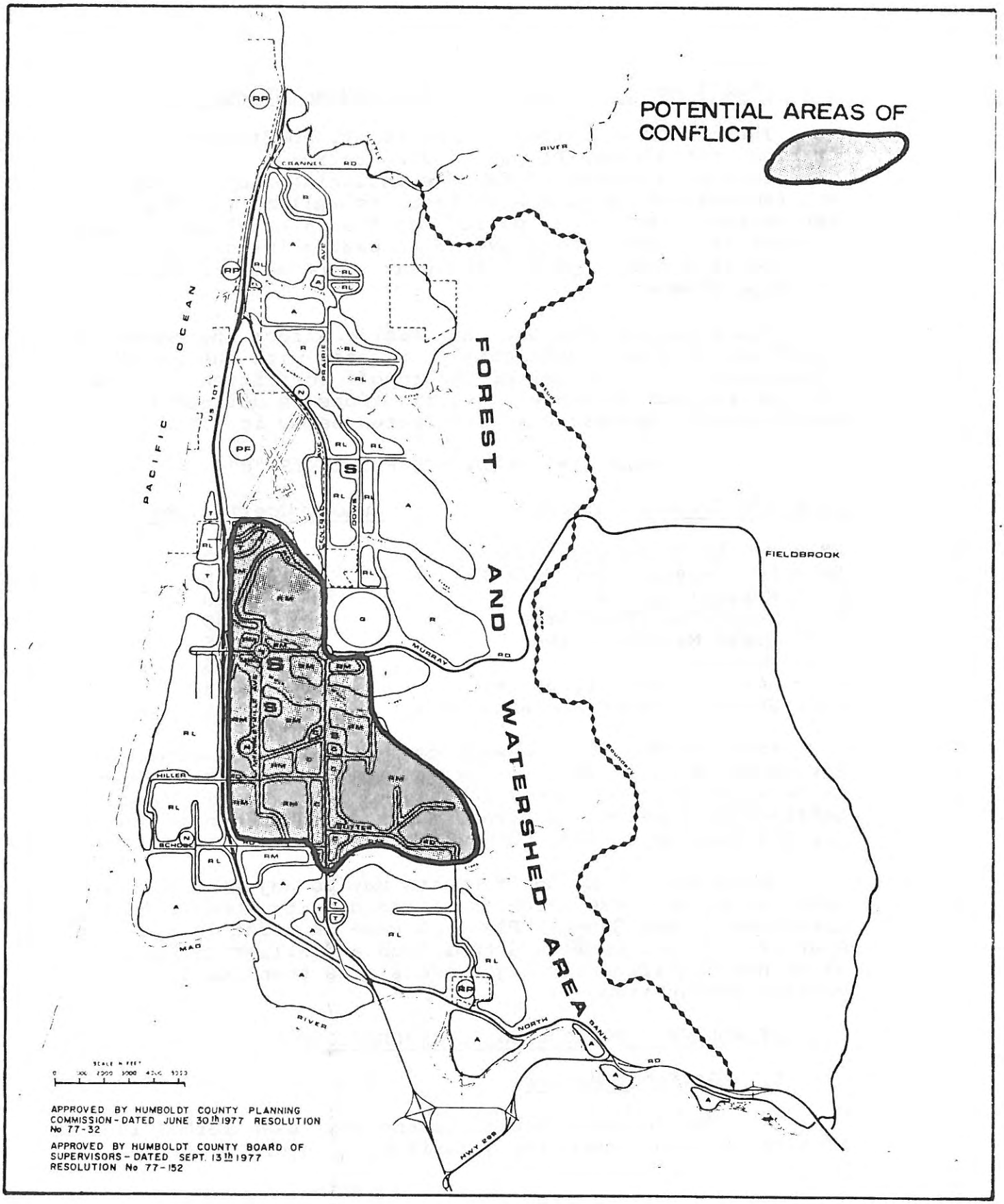
The majority of the study area is served by a sanitary sewer collection system completed in 1978. Central Avenue north of Airport Road and Dows Prairie Road is not presently sewered although there are unscheduled plans to provide sewer in the future. The system was sized based on an ultimate build-out of 2 dwellings per acre with a density of 3.1 persons per dwelling with appropriate peaking factors. It is possible, therefore, that the sewer system could limit growth in certain areas that are designated medium density. As is true for the water system, the area of particular concern is the high density core area in the vicinity of Central and Hiller. In general, the sewer is not adequately sized to handle maximum development in medium density zones of 8 units per acre, but will adequately handle 2 to 5 dwellings per acre which is probably a more realistic maximum growth figure when one subtracts out areas that are not acceptable building lots and areas taken up as new streets. Figure IV-1 delineates areas of potential conflict between utilities and designated land use.

Although the sewer system is undersized for maximum development it is not expected that this development will be so rapid as to prevent any organized upsizing of utilities as the need arises.

3. Storm Water Drainage System

There is presently not an adequate drainage plan for the area and many existing culverts and drainage ditches are undersized. An adequate storm water system was recently constructed along Central Avenue carrying the majority of the flows north to Widow White Creek, with a portion of the flows carried south to Mill Creek.

The major drainage crossings of U.S. 101 are adequately sized especially since some upstream ponding causes little problems at the various crossings.



POTENTIAL CONFLICT BETWEEN UTILITIES AND LAND USE DESIGNATION

FIGURE IV - 1

D. RELATIONSHIP OF LAND USE TO STORM WATER RUNOFF

The proper selection of the runoff coefficient "c" is critical for stormwater runoff computations. It is dependent on a number of factors including slope condition and imperviousness of the surface, as well as the degree of saturation. The County policy for design of storm drainage systems is to design the system to pass a 10-year storm with no surcharge and to pass a 100-year storm with no major flooding damages.

The expected land use can greatly affect the amount of runoff which will significantly increase with increased development. The values of the runoff coefficient "c" used for the various land use classifications as defined in the McKinleyville General Plan are listed below in Table IV-1.

TABLE IV-1 RUNOFF COEFFICIENTS "c"

Land Use Classification	Runoff Coefficient "c"
RM - Medium Density (2-8 du/ac)	0.55
RL - Low Density (0-2 du/ac)	0.40
R - Rural (5 ac. min.)	0.30
C - Commercial/Core Area	0.85
I - Light Manufacturing	0.85
T - Tourist	0.85
A - Agricultural (20 ac. min.)	0.25
Open Space - Forest and Watershed	0.20

These values are somewhat conservative when used for entire areas as it assumes maximum build-out in all these areas which will not occur for a very long time if ever. Substantial portions of rural, low and medium density areas may not develop to full potential.

Conversely, some coefficients may be adjusted higher based on present use which is higher density than that specified in the General Plan. A case in point is the area west of U.S. 101 between School Road and Hiller Avenue, which has significantly higher densities than its low density designation.

E. HYDROLOGY - HYDRAULICS CONSIDERATIONS

1. Rational Method

The Rational Method is the most used method in this country for computing quantities of storm water runoff.

It allows consideration of local conditions and relates runoff directly to rainfall by the following equation:

$$Q = cia$$

where: Q = peak runoff rate in cubic feet per second

c = runoff coefficient which is actually the ratio of the peak runoff rate to the average rainfall rate for a period known as the time of concentration (the values of "c" used in this study are described in section D of this chapter and listed in Table IV-1).

i = average rainfall intensity in inches per hour for a period equal to the time of concentration (refer to Section E. 2. of this Chapter)

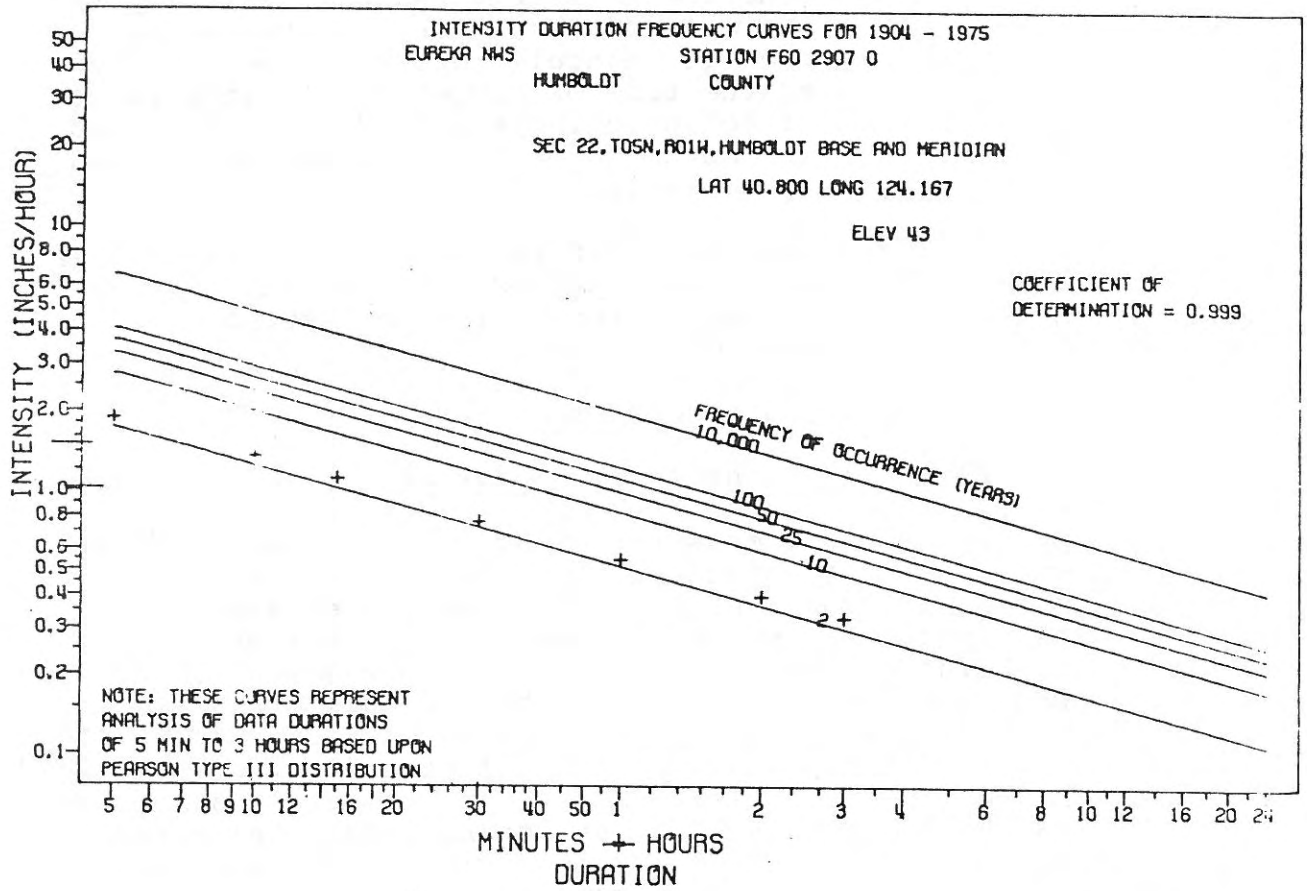
a = drainage area in acres

2. Rainfall Intensity and Duration

An accurate measurement of rainfall intensity and its duration, "i" is necessary to determine storm water flows for a particular area. The closest area with available long term records is the U.S. Weather Bureau in Eureka. Rainfall intensity-duration curves have been developed from the available data by the California State Division of Highways and are delineated on Figure IV-2. The Baruth and Yoder report developed a factor "R" representing the ratio of the rainfall intensity at various locations with respect to the intensity at Eureka. This value for the McKinleyville area is 1.04 and this will be incorporated in the Rational Formula in this report.

3. Time of Concentration

The time of concentration, "t_c", is defined as the flow time from the most remote point in the drainage area to the point in question. It is composed of two parts, inlet time and conduit travel time. Inlet time consists of the time required for water to flow overland from the most remote point in the watershed to a defined channel such as a street gutter plus the gutter flow time to the first inlet. Inlet time for unimproved areas was determined from the nomograph shown on Figure IV-3. Inlet time for improved areas can vary widely and accurate values are difficult to obtain. Values between 5 and 30 minutes are normally used. Design inlet times of from 5 to 15 minutes are used for developed areas with steep slopes or closely spaced inlets. 10 to 15 minute periods are common for

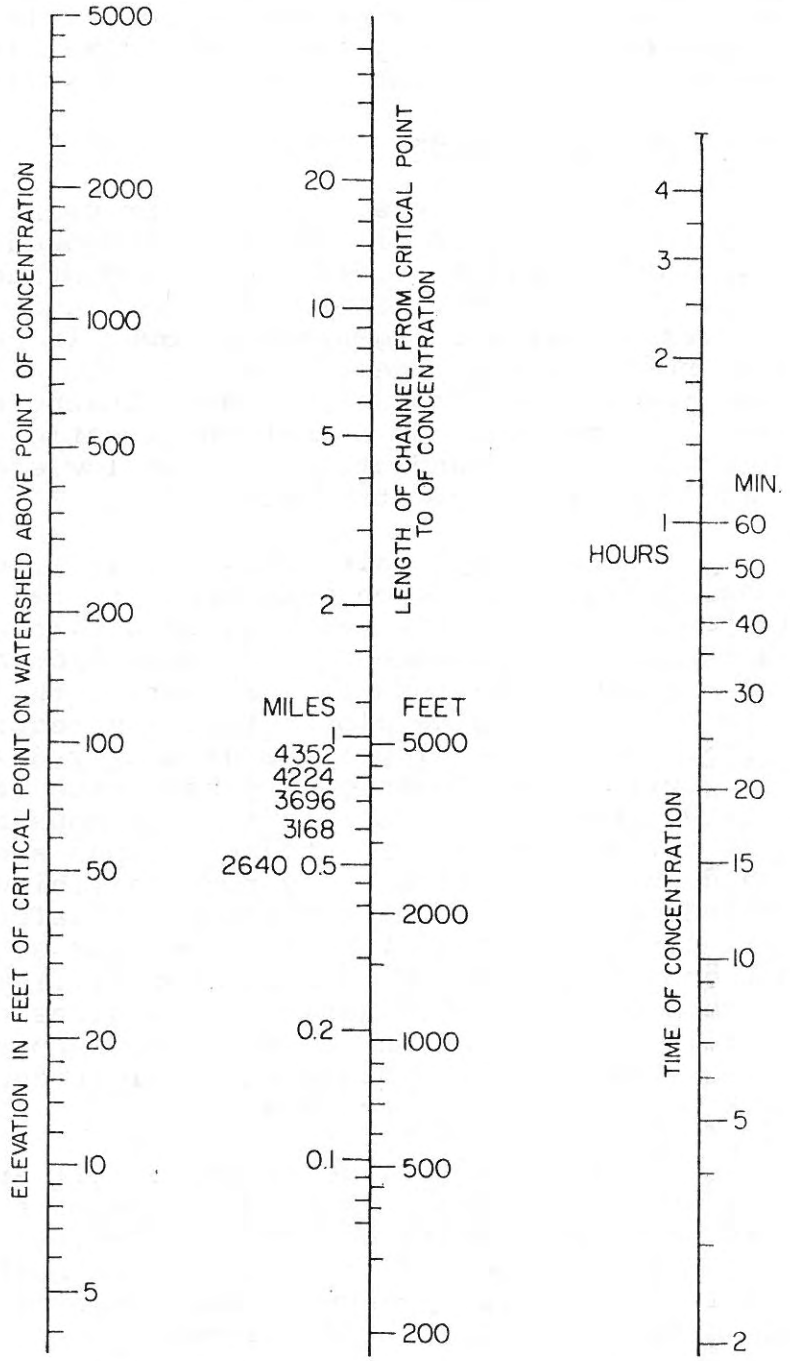


DRAINAGE?

From: "Rainfall Analysis For Drawing Design Vol. I." Bulletin 195, Oct. 1976
California Department of Water Resources.

INTENSITY DURATION FREQUENCY CURVES - 1904 - 1975

FIGURE IV - 2



THIS IS A PORTION OF THE NOMOGRAPH FROM THE CALIFORNIA STATE DIVISION OF HIGHWAYS "CALIFORNIA CULVERT PRACTICE"

TIME OF CONCENTRATION NOMOGRAPH

similar areas with flatter slopes and for areas with widely spaced inlets and or very gentle slopes, inlet times of 20 to 30 minutes are normally used. A minimum inlet time of 10 minutes for improved areas is used in this study.

4. Channel Design

There are several reasons for using open channels to carry storm water runoff instead of closed conduits. Probably the biggest consideration is construction costs are generally significantly lower. Another major consideration is that velocities are generally lower in channels which in-turn increases the time of concentration thus decreasing the required design flow downstream. Channels also allow overland flow to enter at almost any location along their reach, and if the groundwater table is low enough, some water may percolate into the soil.

Perhaps their main drawback is space requirement. A channel designed for even moderate flow can occupy considerable space. This may require obtaining substantial drainage easements in excess of 20 feet wide and may not be feasible in many locations thus requiring the use of conduits or steeper side slopes that may require some sort of lining. Flat side slopes are generally desirable for erosion control, maintenance purposes, ease of construction and safety. However, this is often not possible if the space is not available. If steeper slopes are used it will require deeper trenches and may require lining to prevent erosion and may also require fencing for safety purposes. High velocities, generally over 5 feet per second, can cause serious erosion problems. It is often difficult to design around this problem as it generally requires a relatively wide shallow cross section to obtain non-erodable velocities. Seeding the banks will help reduce erosion and cut back on required maintenance.

In this study, side slopes of 2:1 are used on off-road areas except 3:1 is used in the marshy section of Widow White Creek downstream from the Central Avenue crossing. Side slopes of 1:1 are used in restricted areas especially along roads. Many of the existing road side ditches have slopes of 1:1 or steeper.

If space is available it is desirable, and should be encouraged, to use very flat side slopes, essentially constructing a swale as opposed to a formal ditch. However, due to costs of potential easements this is often not feasible unless they are located in an area where the entire easement could be deeded as a condition for development. At the design stage this should be considered in more detail on a site by site basis.

The existing stream channels are not adequate to handle projected flows in all cases. A specific trapezoidal cross section can be calculated to handle these flows. However, should this work be done it is recommended during the design phase that a narrow deeper channel be kept that will contain normal summer flows and a wider shallower section be constructed to handle the peak estimated flows as delineated in Figure IV-4. This will maintain a better habitat for the existing fish and insect populations keeping summer water temperatures cooler. This low water channel should be kept in as natural a state as possible. Pools should be created or left if already existing. It is recommended that the Department of Fish and Game and Engineer work closely together during the design stage to make sure adequate protection is given to the existing aquatic populations.

5. Conduit Design

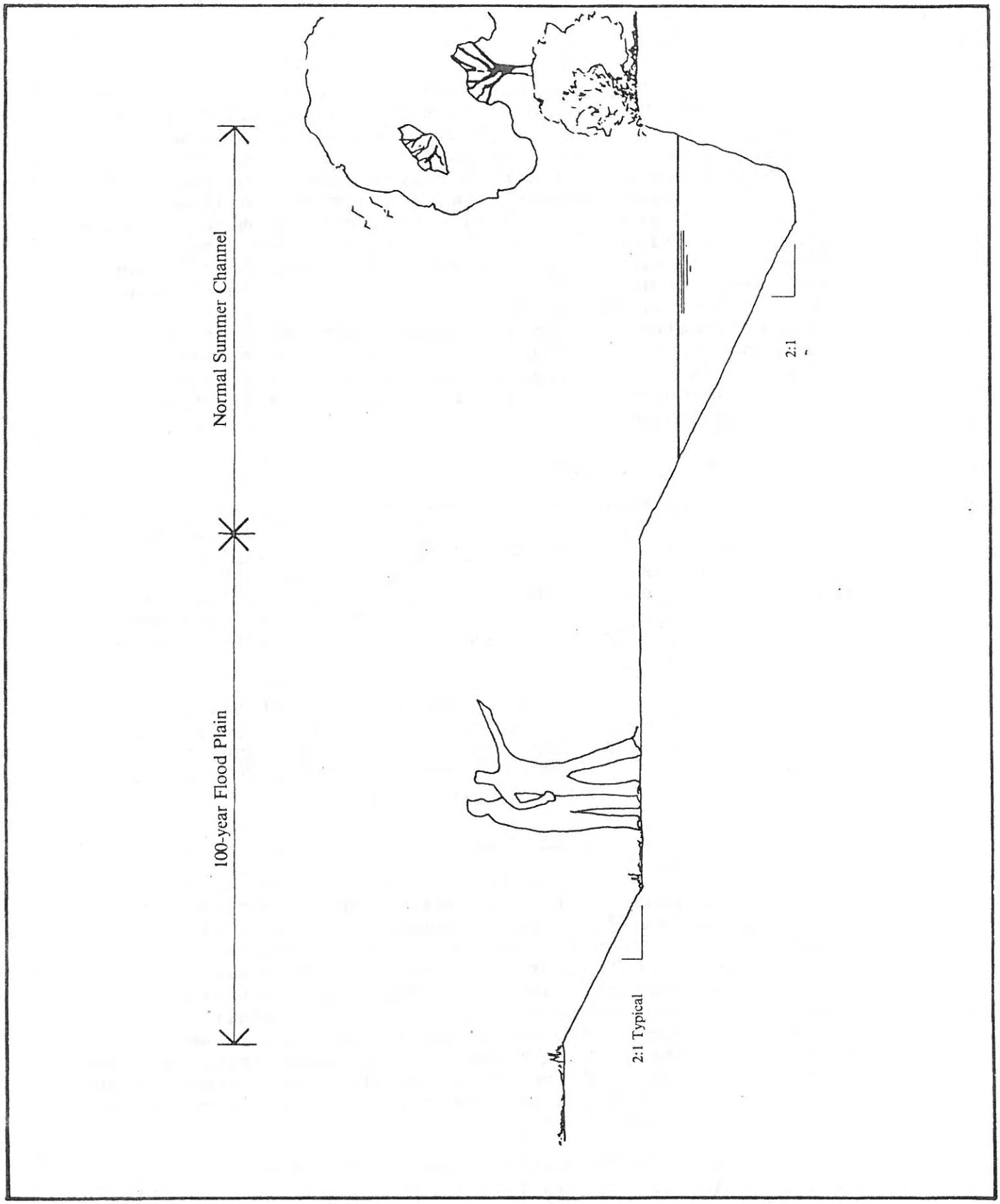
In certain circumstances it is not feasible to use open channels. Conduits, if required, should be reinforced concrete pipe as opposed to corregated metal pipe. The concrete pipe has a substantially larger capacity per diameter over the CMP. The manning friction factor, "n", generally used for RCP is 0.013 and for CMP is 0.024 which equates to a 1.85 fold increase capacity for RCP all other factors being equal.

In some cases it may not be cost effective or prudent to replace substandard, undersized culverts. Unless the resulting ponding upstream of the culvert causes a serious hazard it would be desirable to leave the culvert, which will help in controlling downstream flow.

6. Detention Reservoirs

Detention reservoirs are normally dry or near dry areas that decrease peak flows downstream by acting as storage basins and limiting the amount of flow that is released to less than the inflow. This is generally accomplished by restricting the outflow pipe sizes. If space is available this is a very desirable, potentially low-cost method of decreasing the impacts of additional runoff. Road berms at creek crossings can act as detention reservoirs if the culvert crossings are undersized. As long as upstream ponding or the threat of the stream cresting the top of the road is not a problem this is a viable method of reducing downstream flows.

The existing Wallis Subdivision, east of Washington Avenue, has an infiltration basin. It is sized for a 10 year storm and in theory the water was expected to percolate into the soil. It worked to an extent the first



PROPOSED MAJOR CREEK IMPROVEMENTS

FIGURE IV - 4

year, but this last winter it did not appear to function properly. Percolation was retarded either due to high ground water or siltation. It would have functioned better had it been designed with a restricted pipe outlet rather than relying on percolation.

Humboldt County has shown a reluctance to consider infiltration basins as a storm control method due to the problems with the Wallis Subdivision. However, detention basins can be used although certain problems need to be resolved. There is a problem of maintenance and liability. It is unclear who should take over responsibility of the basin once constructed. The county would prefer that the developer maintain responsibility, whereas the developer would most likely prefer that the County take over the maintenance. In addition to the question of maintenance, some residents have expressed concern over the safety aspects of detention reservoirs. For this reason, the existing basin in the Wallis Subdivision is fenced. (Since the writing of this report, the Wallis Subdivision infiltration pond has been filled and an outlet pipe installed.)

F. COMPARISON OF REPORTS

A substantial portion of the study area is within the coastal zone and as such, growth is controlled by the Local Coastal Program McKinleyville Area Plan approved in December 1980 and subsequent amendments adopted in December 1981. For the most part, the Coastal Program for McKinleyville follows the land use classification recommendations in the McKinleyville General Plan adopted in September 1977. The Coastal Program does state that new subdivisions be required to dedicate land for public recreation or provide an in lieu fee as contribution to public park facilities.

In general, the proposed growth is for a high density core area along Central Avenue mainly between Hiller to the south and Railroad to the north. Radiating out from this central core area, population densities decrease to medium density (2-8 dwelling per acre) then to light density (0 to 2 dwellings per acre) and finally to rural (5 acre minimum) and agriculture (20 acre minimum). The majority of the McKinleyville area within the coastal zone is classified as light density and agriculture although a substantial area, mainly between School Road and Hiller Road, is already built up beyond the low density recommendation.

The design capacity for the water and sewer systems as related to the McKinleyville General Plan growth potential is discussed earlier in Section IV. C.

Baruth and Yoder completed a storm drainage plan for mid-Humboldt County in April 1971 which included the present study area. The population projections were much higher than the actual increases that are occurring. Their drainage boundaries are, for the most part, comparable to later Humboldt County Public Works calculations although their runoff coefficients "c" are generally higher than county values due in part to higher expected growth. The flows (calculated by the County) appear to be closer to expected flows and are used in this report after being multiplied by the "R" Factor 1.04 developed by Baruth and Yoder that relates rainfall intensity in McKinleyville with rainfall intensity in Eureka.

The recommendations in Baruth and Yoder generally call for storm water conduit systems as opposed to open ditches. Due to cost considerations ditches will be recommended whenever feasible, however, many of the streets in the McKinleyville area are narrow with little space available for ditches along their sides. In these cases it will be necessary to use storm conduits unless a wider easement can be obtained.

The Federal Insurance Administration developed a series of Flood Hazard Boundary Maps for Humboldt County in September 1977. These maps delineate the 100-year flood zone and label it as zone A. This has been done for the Mad River, Mill Creek, Widow White Creek and Norton Creek in the study area.

A more detailed study by the Federal Emergency Management Agency has developed Floodway Maps for the major river drainages and Flood Insurance Rate Maps (FIRM) for the major as well as smaller drainages in Humboldt County. The original 1977 report data was used for this updated report for Mill Creek, Widow White Creek and Norton Creek. The 100-year flood plains were developed using available 7.5 minute U.S.G.S. Flood Prone Quad Maps developed in 1973, and are very approximate.

The Federal policy is that no construction can occur within this zone A that would cause a rise in water surface in excess of one foot. A problem is the maps are 2000 scale and the exact boundaries are very difficult to ascertain. In order to determine these 100-year flood plains accurately, considerable time and effort would be needed at a sizable expense. There is really no funding available for such a task. Presently the County is adopting a minimum 100-foot setback from the centerline of any creek or pond to the grading limits of any proposed development. This helps keep the flood plain clear and follows the recommendations of the Open Space portion of the General Plan that calls for

protected corridors along creeks. However, this is a somewhat arbitrary decision and the 100-year flood plain exceeds this 100-feet setback in numerous instances. Ongoing talks between the county and FEMA are proceeding in hopes of developing a standard method of treating all zone A regions.

The Humboldt County Trails Plan for the McKinleyville area generally coincides well with potential drainage easements especially where the trails parallel the creek drainages, such as along north and south Widow White Creek. There is presently no proposed trails along Mill Creek between Central Avenue and Azalea Road, although this would be an ideal location as much of the area is paralleled by a sewer line easement at the present time and is a very scenic area.

G. FIELD INSPECTION AND INTERVIEWS

Field inspection of the major drainages and interviews with some of the local residents were conducted in an attempt to verify if calculations of flows at various nodes throughout the systems compared with actual flows. Present flows would be expected to be less than calculated flows except in areas where maximum development has already occurred as the calculated flows are based on future growth as recommended in the McKinleyville General Plan.

Chris Peterson, the existing County Road Maintenance Crew Supervisor for the area and Charles Giannini, the former Supervisor, now retired, each spent a day in the field. Their expertise and help was invaluable in pinpointing areas of concern that have proved to be maintenance problems in the past.

Results of the field investigations and interviews are discussed on a drainage by drainage basis in Section V.A. "Existing Deficiencies".

CHAPTER V

SPECIAL CONSIDERATIONS

A. EXISTING DEFICIENCIES

1. General

The study area is divided into six separate drainage areas. These are:

- Norton Creek drainage.
- Widow White Creek drainage.
- Central McKinleyville drainage, which essentially encompasses the area north of School Road east of U.S. 101, west of Central Avenue and south of Widow White Creek drainage.
- Mill Creek drainage.
- Mad River drainage, which essentially encompasses the area west of U.S. 101 and south of Hiller Road.
- North Bank Road drainage.

2. Norton Creek Drainage

Norton Creek is located at the northern extreme of the study area. The North Arcata Quad map shows it paralleling Central Avenue on the east side and crossing under Central Avenue at Murray Street. In fact, the majority of flow crosses Central Avenue at the intersection with Norton Road and continues south along the west side of Central. It apparently originally traversed south westerly somewhat south of Halfway Avenue, but as growth occurred the flow was diverted south along Central Avenue where it ties into the north branch of Widow White Creek.

Some flooding has occurred on the west side of Central where Norton Creek crosses in a 24 inch culvert. This appears to occur mainly when the channel becomes plugged with debris. Little or no flooding occurs to the south although the channel is not very large and most culverts crossing existing driveways are 24 inch.

The majority of Norton Creek Drainage east of Dows Prairie Road is relatively steep and classified as either rural or agriculture. Thus build-up in this area should be minimal. The area between Dows Prairie Road and Central is in the Airport flight path which again should keep growth to a minimum. A golf course is located on the east

side of Central Avenue along with a subdivision just under construction. The west side of Central Avenue between Airport Road and Murray Road is classified medium density. Present densities are fairly light with houses bordering Central, but with little build-out to the west.

County data shows expected 10-year storm runoff at Central and Norton of 173 cfs which would require a 66-inch RCP culvert assuming inlet control. This appears to be excessive as little growth is expected in the future upstream from this point and there is little sign of serious flooding occurring with the existing facilities which only has the capacity for 15 cfs to 20 cfs. Downstream where Norton Creek ties into the North Fork of Widow White Creek along the north side of Murray Road the flows are well channelized and rarely if ever top their banks.

Although not part of the actual Norton Creek drainage, the northern portion of the Study Area including part of the airport complex and Halfway Avenue will be included in this section. Runoff from a large portion of the Airport Complex flows under Airport Road and thence south along a ditch on the west side of Airport Road to Halfway Avenue.

There is a ditch along Halfway Avenue at its intersection with Airport Road, but it soon stops and runoff proceeds down the edge of the road. There is space available on the north side of the road, but it is a bank with trees and brush and it would be a major undertaking to form a ditch.

Much of the area is very flat and the water tends to pond up in certain areas with no place to run off. Presently there are existing open fields to the north, but they are classified medium density. Should this area develop, it could prove a real problem with increased runoff and no place to divert this flow.

3. Widow White Creek Drainage

Widow White drainage encompasses the majority of the central portion of the study area from Calville north to Norton Creek drainage on the east side of Central Avenue and essentially from Railroad Avenue north to the Norton Creek drainage on the west side of Central Avenue. The majority of the area between Calville, and Central Avenue where Widow White crosses to the north of Glen's Auto is undeveloped pasture and heavily wooded land. That portion west of the actual creek channel is classified medium density while the area to the east of the channel is classified as forest and watershed. There is presently

little increase in runoff in this upper drainage area because of its undeveloped heavily wooded nature. However, should this area develop in the future substantial fluctuation in flow would be expected. The drainage essentially begins at the end of First Street off of Park Avenue. A small culvert crosses the road and continues under an existing foundation and discharges into a channel that proceeds north between houses. Flooding often occurs in the immediate vicinity of First Street as the culvert is undersized and in fact may be plugged or damaged (according to Chris Peterson). Downstream, flows appear to be fairly well contained. The channel continues through an urbanized area for approximately a quarter of a mile before reaching the wooded, undeveloped section mentioned above.

Widow White Creek again passes through urbanized development just east of Central Avenue where it meanders through Glen's Auto Wrecking yard before crossing under Central Avenue through a 9' by 3' box culvert. The creek tops its banks occasionally in this area during periods of intense rainfall although it does not create a serious problem. Although the creek has never topped Central Avenue at the crossing, the box culvert inlet is often totally submerged.

The culvert is too small for the flows, but another problem is there is definite downstream control of the flow. The outlet is submerged during periods of high runoff. Widow White Creek for a distance downstream of Central Avenue is fairly flat and very brushy with no distinct channel. There is a wide marshy band that is silted in which definitely impedes the flow downstream. Until recently, there was an old road crossing with two culverts that handled the flow approximately 1600 feet west of Central Avenue. There was an elevation difference of several feet at this location which may account for the siltation and marshy conditions upstream. This blockage has since been removed and may help alleviate the upstream problem.

Very recently this stretch of creek has been cleared by an individual property owner, who essentially went down the channel several hundred feet with a backhoe clearing debris, mud and trees. This channel clearing should allow unrestricted flows at the culvert crossing. It should be noted that this work was done without Fish & Game approval and the individual was cited. This type of work is not recommended. It does point out the need for a master drainage plan to address such existing restrictions and correct them in an orderly fashion. It would be interesting

to monitor this area during the next heavy rainfall to see if the downstream restriction is the main reason for backup of flows or if the culvert is too small to handle existing flows.

Downstream of this point the flows are well contained within the channel. Flows cross under McKinleyville Avenue through an existing 8-foot by 6-foot box culvert and continue through Ocean West Mobile Home Park and under Murray Road through an 8-foot by 7-foot box culvert. The banks are steep and high in this area and the flows are well contained. Widow White passes under U.S. 101 through a 138 inch steel culvert.

Calculated 10-year flows at various nodes are: at Central, 312 cfs (100-year flow of 426 cfs); at McKinleyville Avenue, 378 cfs (100-year flow of 515 cfs); at Murray Road, 433 cfs (100-year flow of 624 cfs); and at U.S. 101, 1076 cfs (100-year flow of 1518 cfs). Except for the box culvert at Central Avenue the crossings are adequately sized to handle a 10-year storm. Since the majority of the stream is contained within relatively steep well defined banks in its lower reach, flows in excess of the 10-year storm should not cause serious flooding problems.

The North Fork of Widow White Creek begins east of Central Avenue and north of Murray Road. The creek is channelized in a road side ditch along the north side of Murray Road and crosses under Central Avenue through a 4 foot by 3 foot box culvert near the Big Foot Gas Station. Central Avenue has never been flooded at this point although the flows, including flow from the north along the east side of Central Avenue, have taxed the ditches to their capacity. Calculations estimate 10-year flows at 277 cfs (100-year flows of 392 cfs). Presently a golf course is located to the north of Murray with rural zoning to the east. There is a subdivision under construction bordering the east side of Central Avenue which will increase flows beyond the present runoff. However, a major increase in runoff should not occur in the foreseeable future and it appears that the above calculated estimated runoffs are high as the present system is only capable of carrying approximately 70 cfs with entrance control and no surcharging.

Downstream of Central Avenue the creek, for the most part, is contained in a well developed channel. It crosses Halfway Avenue in a 60-inch RCP which is undersized for estimated flows. However, some upstream ponding in this area should not pose a flooding hazard. It eventually ties to the main fork of Widow White Creek east of U.S. 101.

4. Central McKinelyville Drainage

Central McKinleyville is not really an existing well defined creek or channel. Rather it encompasses the area essentially from School Road in the south, east of U.S. 101, to Widow White Creek drainage in the north. The eastern boundary is essentially Central Avenue. The major areas of concern are developments near the Washington Avenue, Worth Avenue intersection and along portions of McKinleyville Avenue especially at its intersection with Railroad Avenue. There is little place for the water to drain in the Washington, Worth area and street flooding is relatively common. There is presently an existing on-site storage pond, but it fills up rapidly during heavy rains with resulting standing water at the street drains to the pond. Much of this water eventually drains to open fields to the north, east of McKinleyville Avenue and south of Hiller Road. However, this area is classified medium density which will only exacerbate the problem once development begins.

The flows in the field and some flows from a drainage ditch along the south side of Hiller Road cross Hiller Road and proceed in well maintained ditches along the north side of Hiller. Flows turn north along the east side of McKinleyville Avenue. The flows are well contained until reaching Railroad Avenue. At this point an 18-inch culvert crosses Railroad and a 24-inch culvert crosses McKinleyville Avenue into a drainage ditch to the west. Both the crossings are seriously undersized. To make matters worse, a drainage ditch east of McKinleyville Avenue that at one time carried flows from the Railroad Avenue and Central Avenue area north to a storm drain in McKinleyville Avenue and eventually to Widow White Creek, has been filled in over the years. Thus, the source of the flows are diverted west down Railroad Avenue causing flooding on Railroad Avenue. A portion of the flow that crosses Railroad to the north, reaches McKinleyville Avenue and flows back south to the intersection with Railroad Avenue. All the flow from Hiller Road and the south as well as east from Railroad Avenue and McKinleyville Avenue concentrate at the intersection of Railroad Avenue and McKinleyville Avenue causing major street flooding. Few, if any, houses are actually flooded although yards will flood and water can be several feet deep in the street.

The ditch that carries flows west and north away from the intersection is undersized, and the open fields in the area are under water for much of the winter. This problem would be even more severe if the upstream drainage were large enough to handle the existing flows as higher concentrations would reach this area. A 30-inch RCP carries flows through a developed area to a ditch that drains to the U.S. 101 crossing. This entire system is presently

undersized. Estimated 10-year flows at Railroad and McKinleyville are 213 cfs (100-year flows of 296 cfs) and 10-year flows at U.S. 101 are 250 cfs (100-year flows of 354 cfs). Present estimated flows are considerably less than projected flows in the neighborhood of 120 cfs. Thus once development begins in the existing open fields, all classified medium density, a much more serious problem will exist.

The existing crossing at U.S. 101, two 5 foot by 4 foot box culverts, is adequately sized to handle a 10-year storm and there is considerable open area that could be utilized as a storage reservoir for higher flows without causing major problems. There is also an existing 30-inch RCP crossing U.S. 101 approximately 850 feet south of the two box culverts. An easement exists along the west extension of Railroad Avenue to Walker Avenue, north on Walker Avenue approximately 250 feet and then east to U.S. 101 near the existing 30-inch crossing.

5. Mill Creek Drainage

Mill Creek drainage encompasses most of the southern portion of the study area. Its upper drainage begins in the eastern foothills. Its water shed is substantial and estimated 10-year flows at Azalea, where it first meets the urbanized area, are 332 cfs (100-year flows of 452 cfs). The channel is very overgrown and brushy upstream of Azalea and there is a marshy area several 100 feet wide bordering the east side of Azalea. The present existing channel has nowhere near the estimated capacity of 332 cfs. This probably accounts for the large marshy area where the water spreads out and drains slowly during dryer periods when runoff is less.

The drainage downstream of Azalea Road is relatively flat and marshy. The creek has been cleaned out at various times to help alleviate the flooding that occurs at Azalea Road. Two 36-inch CMP's at Azalea Road are not adequate for expected flows. Silted in conditions downstream make matters worse. Further downstream the creek is in a more definite channel although it tends to top its banks during high flows and flood nearby fields. There is an inadequate 48-inch culvert crossing at Bartow Road and this road floods during high flows. Below this point the channel banks become steeper and downstream of the 6 foot by 6 foot box culvert Central Avenue crossing the creek runs in a steep canyon. There is no problem in this area and little or no development will occur due to the steep terrain. Mill Creek eventually leaves this steep terrain and continues through pasture land. It crosses U.S. 101 through an adequate 96" culvert. Estimated 10-year flows at U.S. 101

are 609 cfs (100-year flows of 863 cfs). Ponding in this area is not a problem and serves as a storage reservoir. Mill Creek eventually empties into the Mad River.

There are small drainages both from the south across Cochran Road and the north across Sutter Road that can cause flooding at the existing street crossing during periods of heavy rain. The north fork of Mill Creek flows between Waters and Mygina, two private roads running north off of Sutter Road in a channelized ditch which is somewhat overgrown. Yards presently flood in its vicinity during high flows. It crosses Sutter via an existing 36-inch culvert and continues in a well defined channel to the main branch. A smaller drainage flows into the north fork from the east upstream of Sutter Road.

A portion of Central Avenue drains south into Mill Creek via a storm drain system recently installed, and the area south of School Road and east of U.S. 101 also drain toward Mill Creek. Drainage ditches along U.S. 101 south of School Road drain to the creek. There is a drop inlet in the centerline divider of the freeway at the Mill Creek crossing.

6. Mad River Drainage

The Mad River bounds the southern and western limits of the study area. Most of the area to the west of U.S. 101 and south of the McKinleyville Central drainage crossing at U.S. 101 eventually drains to the Mad River. The area of main concern is bordered by Hiller Road to the north and School Road to the south along with the subdivision south of School Road including Anderson and Whitmire.

This area is generally very flat and ponding occurs in various low lying areas where runoff concentrates. Sections of Hiller, Ocean, School, Fisher and Anderson Roads flood quite readily with only moderate rainfall. There is no place for the water to drain and these ponds often remain for most of the winter months.

One reason for ponding in the streets, is improper grading of existing streets. Many of the existing ponds could be taken care of with proper grading of streets so flows would sheet off.

Also included in this drainage system is the area west of U.S. 101 and south of Murray Road including Daffodil Avenue, Bolier Avenue and Kelly Avenue. A low drainage swale crosses Eucalyptus Avenue in an 18-inch CMP from the south between Daffodil and Bolier and continues north west across Bolier through a 12-inch RCP to the new Knox

Subdivision and eventually discharges in the Mad River. No major flooding occurs although the existing street crossing are definitely undersized for maximum development.

7. North Bank Road Drainage

This drainage includes the area east of U.S. 101 and south of the Mill Creek Drainage. It is characterized by very steep terrain adjacent to North Bank Road and includes Azalea State Reserve. It extends east just past Hunts Drive. The area is very sparsely populated and is currently classified as light density.

There does not appear to be any serious flooding occurring in this drainage and there are numerous culvert crossings of North Bank Road carrying flow to the Mad River. However, should development begin, serious problems could arise. If water is allowed to be discharged down existing roads or out onto the hillside, erosions and slumping could occur due to the steep terrain.

B. FLOOD-ZONING

Flood zoning regulations have been described earlier in section III.F. There is presently a dispute between Federal and County flood regulations and it is difficult to tell when it may be resolved. The FIRM maps delineate the existing 100-year flood plains for Norton Creek, Widow White Creek and Mill Creek. However, U.S.G.S. quad sheets were used in making these determinations. A more detailed investigation has been done using existing 100 scale maps. Cross sections at 500 foot stations were taken and the flood plain determined. The flood plains are delineated on Figures V-1; V-2 and V-3. Although the boundaries shown are only approximate, it should be noted that there can be substantial encroachment beyond the 100-foot construction setback recommending by the Humboldt County Planning Department. Thus, it is obvious that some sort of channel improvement will be required as development proceeds or this offset will have to correspond to the existing 100-year flood plain boundary.

C. GRADING ORDINANCES

Some of the drainage problems currently being experienced in the McKinleyville area could have been prevented or at least alleviated through regulation of activities related to grading and filling. A case in point is the drainage ditch that at one time drained the Railroad Avenue area north to Widow White Creek but is now filled in. Another example is the old railroad grade that parallels Fischer Avenue on its east side. There used to be a drainage ditch along this grade but homeowners have slowly

Legend

Main Creek Drainage

100-year Flood Plain

County Building Setback

N

ARCATA COUNTY AIRPORT

AIRPORT SCHOOL

ORANGE ROAD

ORANGE HALL

DOWS PRAIRIE SCHOOL

DOWS PRAIRIE

DOWS PRAIRIE ROAD

CENTRAL AVE

EXTREMELY DENSE TREE COVER

DUNES CREEK

ROSE CREEK

OCEAN

PACIFIC

SAND DUNES

RAILROAD

ABANDONED

LOGGING

AIRPORT

HUMBOLDT

VALLEY

WIDOW

NORTH FORK

WIDOW WHITE CREEK

WHITE CREEK

NORTON

NORTON ROAD

GOLF COURSE

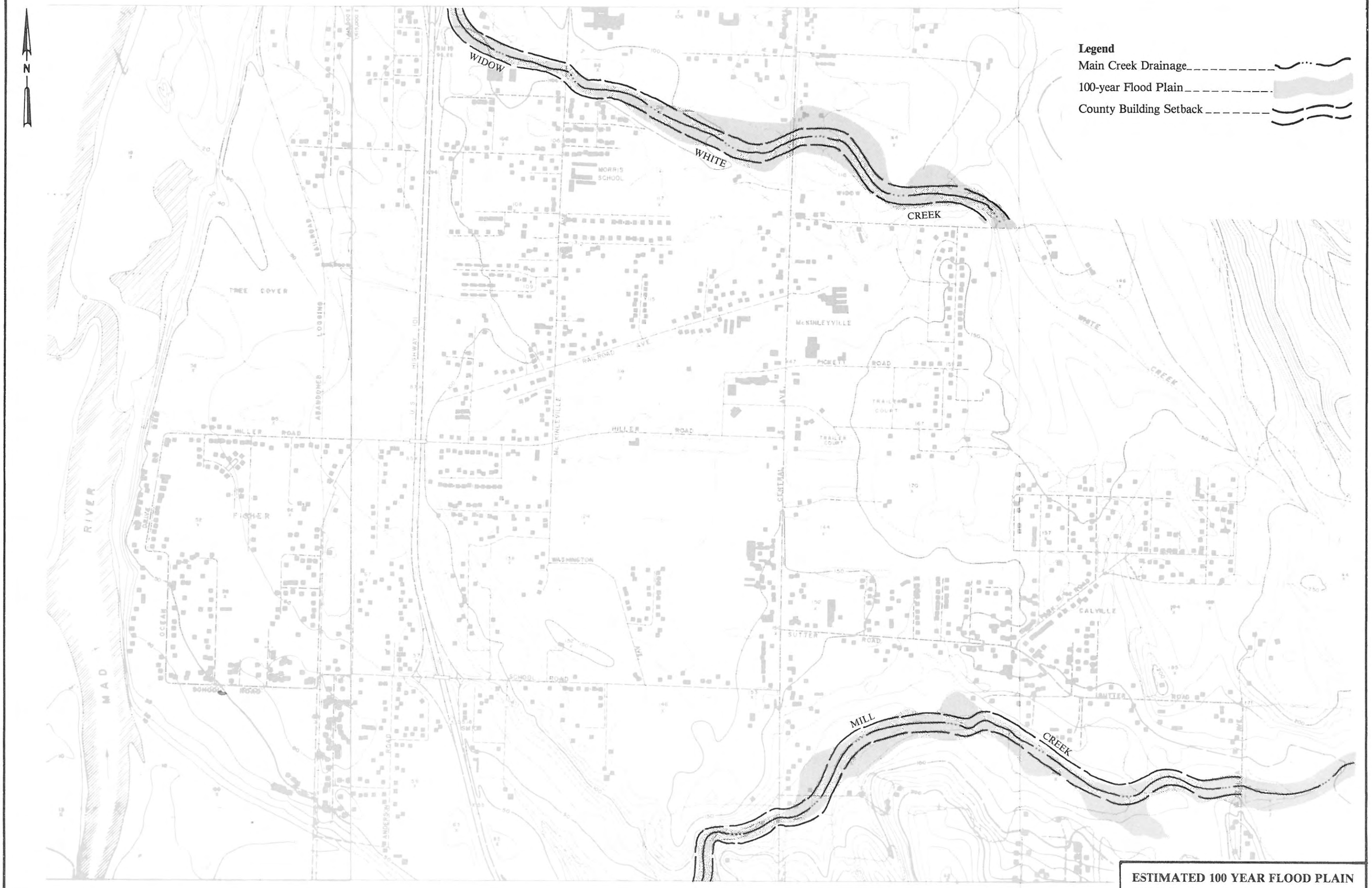
WEST DOWS

MURRAY ROAD

MURRAY ROAD EXT.

ESTIMATED 100 YEAR FLOOD PLAIN

FIGURE V - 1



ESTIMATED 100 YEAR FLOOD PLAIN
FIGURE V - 2

ESTIMATED 100 YEAR FLOOD PLAIN

FIGURE V - 3

CHAPTER VI

PROPOSED STORM DRAINAGE MASTER PLAN

A. GENERAL

In this chapter, the ultimate capacities based on calculated flows generated from maximum development are determined for the six individual drainage systems defined in the previous chapter.

Alternate proposals for routing and controlling flooding are developed and cost estimates for the various proposals are set forth.

Major emphasis was placed on developing a plan that would minimize costs and fit in well with the general rural setting of the McKinleyville area. Where possible flows are maintained in drainage ditches as opposed to storm sewers. Changes in the existing stream channels are kept to a minimum, and where widening is required as much of the natural foliage and creek channel should be saved as possible. A secondary widened channel that will contain excessive winter flows should be constructed allowing normal low summer flows to remain in the existing channels so as not to cause temperature extremes during low flow conditions.

Because this plan is intended as a guide for development of future drainage facilities and it is somewhat unclear how future development will proceed, it does not attempt to present detailed drainage designs for individual areas. Rather it determines peak flows for individual drainage systems and sizes trunk lines to serve these areas. It should be noted that detailed designs and construction plans will be required before individual proposed projects are constructed.

B. ESTIMATES OF COST

Preliminary cost estimates for the various proposed projects within the individual drainage basins are necessary for economic feasibility evaluations. Cost estimates are based on the premise that all construction will be accomplished by competitively bid contracts.

1. Storm Drains

Storm drain costs were developed using the 1982 Dodge Guide to Public Works and Heavy Construction Costs Part II. Reinforced concrete pipe is used in the estimating. An adjustment index of 1.43 for northern California (San Francisco) was used for labor costs and

an additional 40% was added to the labor costs for overhead. 15% was added to the subtotal cost for profit to arrive at a total cost per foot of pipe installed. $1200 per storm drain inlet is used as an average cost. Table V-1 summarizes the costs of pipe from 12 inch to 78 inch.

TABLE V-1 - COST ESTIMATES FOR RCP INSTALLED

Size	Cost/L.F. Installed
12"	$ 12.84
15"	17.14
18"	23.43
21"	26.57
24"	31.71
27"	38.20
30"	44.64
33"	52.36
36"	61.01
42"	72.37
48"	87.74
54"	111.31
60"	140.87
66"	170.17
72"	192.16
78"	220.32

An additional cost of $12 per foot is used for paving and $5 per foot for gravel.

2. Channel Construction

Channel construction costs can vary substantially depending on accessibility and type of ground. An excavation cost of $5 per cubic yard is used for road side channels and easily accessible areas located on firm ground. In marshy areas particularly along the major creek beds an excavation cost of $10 per cubic yard is used. Clearing costs range from $0.50 per linear foot to $2 per linear foot and seeding is estimated at $2 per linear foot.

3. Contingencies

Contingencies are funds set aside for unexpected complications that may arise. For these estimates a 10% contingency of construction costs is assumed.

4. Engineering

Estimated engineering fees would include predesign and design services as well as bid phase and construction inspection services. An estimate of 15% of construction costs is used in this report.

5. Administration

An estimate of 5% of construction costs is assumed for administration costs during the design and construction of the proposed projects.

6. Right-of-Way

Right-of-way costs will vary depending on property values. It is possible that some easements will be dedicated as a condition for development. A value of $10,000 per acre is used as an average. This entire value is assumed for drainage channels while 60% of total value is assumed for pipe installations. The drainage easement costs are listed as separate costs in the tables and can easily be deleted from the total cost if obtained as a requirement for development. Although it is recommended that easements be deeded as a requirement for building, in many instances off-site easements may be requried to allow an area to develop and may need to be purchased.

C. PROPOSED IMPROVEMENTS

The proposed improvements are described below for the six individual drainage systems. They are referenced to figures VI-1; VI-2 and VI-3.

1. Norton Creek Drainage

Norton Creek upstream of Dows Prairie Road is contained in a steep gorge. The land use to the east of Dows Prairie is designated agricultural and rural except for a narrow strip along the road designated low density thus it is anticipated that little additional growth will occur in this area. An existing 30-inch CMP crosses Dows Prairie. Although this is undersized for predicted future flows it is recommended that it remain with the steep gorge acting as a storage basin for excess flows.

A summary of proposed modifications to Norton Creek are listed below.

a) Install a 54-inch RCP across Norton Road just east of its intersection with Central Avenue as development warrants. This would be a County Road funded project as it entails the upsizing of an existing 24-inch County road culvert.

b) Upsize ditch along the east side of Central Avenue from Norton Road to the intersection with the north fork of Widow White Creek with 54-inch pipe crossings of existing driveways to be used for peak flows that cannot be

handled by the existing Norton Creek channel on the west side of Central Avenue.

The required cross section would be 4.5 feet deep with 1:1 side slopes and a 1 foot bottom width. This would require additional fill at driveways to obtain minimum cover over the culvert crossings.

An alternate solution would be to install 54-inch RCP for the entire length as a ditch 4.5 feet deep and 10 feet wide next to a main thoroughfare could be a safety hazard.

c) Upsize the north fork of Widow White Creek Central Avenue crossing to dual 66-inch RCP culverts paralleling the existing 4 foot by 3 foot box culvert. This would be a County Road project and is discussed in more detail under the Widow White Drainage system.

d) Maintain the existing 24-inch culvert crossing at Central Avenue and Norton Road as well as the existing channel along the west side of Central Avenue. Overflow water should be directed to the east side of Central Avenue. All other flows should be maintained on the west side as these flows are used by residences for irrigation and by wildlife.

e) Obtain a 30-foot easement for the old Norton Creek Drainage east of Halfway Avenue and improve the existing channel to handle increased flows as development warrants. The required cross section would be 4-feet deep with 2:1 side slope and a 1 foot bottom width.

f) Install a 54-inch culvert crossing of Meyers Road and obtain a 30-foot easement to the south tying to the old Norton Creek drainage as development between Halfway Avenue and Airport Road warrants.

g) Flows from the Airport Complex to Halfway Avenue should be diverted to the field north of Halfway Avenue. Drainage of this area will depend on development, however, according to latest available development plans, flows will eventually end up crossing Myers Road at the proposed culvert crossing in f) above.

h) Install a 24-inch RCP on Halfway Avenue tying to the old Norton Creek crossing and proceeding approximately 2080 feet north. There is a section on the southeast side of Halfway Avenue about 350 feet wide that drains to the street rather than to the old Norton Creek channel. Without a storm sewer, the flows would proceed down the road to the channel crossing. The road here is fairly steep so it is doubtful that serious flooding would occur or that it would last for any length of time even without this storm drain.

2. Widow White Creek Drainage

The Widow White drainage is composed of both the north fork and south fork of Widow White Creek. The north fork of Widow White is found on the north side of Murray Road and crosses Central Avenue just north of Murray Road at the Big Foot Gas Station. The south fork of Widow White begins in the Calville area proceeding northwest to the Central Avenue crossing at Glen's Auto. The two forks join north of Murray Road and west of Halfway Avenue.

a) Install dual 66-inch RCP culverts at Central Avenue paralleling the existing 4-foot by 3-foot box culvert crossing for the north fork of Widow White Creek at the Big Foot Gas Station. The 66-inch culverts are required due to the additional flows from Norton Creek. Projected flows from the north fork of Widow White require a dual 54-inch - 60-inch crossing. (This would be a County Road funded project.)

b) Install a new 24-inch culvert crossing on First Street in the Calville area to bypass the existing pipe crossing under a house at the head of the Widow White Creek drainage. The portion actually crossing the street would be a County Road funded project.

c) Obtain a 30-foot wide easement and improve the ditch north and south of Pickett Road and replace the existing 18-inch CMP with a dual 24-inch culvert crossing of Pickett to drain the area south of Pickett, including the trailer court. The culvert crossing would be a County Road funded project. The typical cross section of the ditch would be 2-feet deep with 2:1 side slopes and a bottom width of 3 feet.

d) Obtain a 30-foot wide east drainage easement from Martin Road south to Widow White Creek and construct a drainage channel 3 feet deep with 2:1 side slopes and a bottom width of 1 foot.

e) Obtain a 30-foot wide west drainage easement from Martin Road south and west to the drainage ditch on Central Avenue just north of McKinleyville Tire and Muffler and improve the existing drainage channel to 3 feet deep with 2:1 side slopes and a bottom width of 1 foot.

f) Obtain a 100-foot drainage easement along Widow White Creek east of Central Avenue upstream to Goldfinch Road and widen the channel to handle projected flows. A typical cross section would be 4 feet deep with 2:1 side slopes and a bottom width of 20 feet.

g) Install dual 48-inch; 54-inch culverts at Central Avenue paralleling the existing 9-foot by 3-foot box culvert crossing for Widow White Creek at Glen's Auto. This would be a County Road funded project.

h) Obtain a 100-foot drainage easement along Widow White Creek west of Central Avenue and east of McKinleyville Avenue and widen the channel to handle projected flows. a typical cross section would be 5 feet deep with 3:1 side slopes and a bottom width of 20 feet. The worst area, which was heavily silted was recently cleaned out by a private individual which will help alleviate existing flooding in this area and postpone any required work in this stretch.

i) Obtain a 30-foot drainage easement north from Railroad Avenue to Widow White Creek east of McKinleyville Avenue and install a combination 24-inch; 27-inch; 36-inch storm drain.

j) Improve existing ditches along Central Avenue north and south of the Widow White Creek crossing and install 36-inch culverts at driveway crossings where required.

k) Install a 36-inch culvert across Babler Road and obtain a 30-foot drainage easement from Babler Road northwest to the drainage ditch

on Central Avenue and improve the existing drainage channel as development warrants. A typical cross section would be 3-feet deep with 2:1 side slopes and a bottom width of 1 foot.

l) Obtain a 100-foot wide drainage easement along the north fork of Widow White Creek between Central Avenue and Halfway Avenue for possible future maintenance should development warrant it.

m) Obtain a 30-foot wide drainage easement north of Second Street, approximately 150 feet west of the intersection of Second Street and "B" Street to Widow White Creek in the Calville area. Flows from the proposed Ecklund Ranch Subdivision east of the section already under construction could perhaps flow this direction. There is an existing sanitary sewer easement from Dahlia Avenue east to a lift station located just north of Second Street that could be utilized, connecting to this proposed easement.

There is potential for increased flooding on Widow White Creek upstream of the Central Avenue crossing at Glen's Auto. A new subdivision has just been installed south of Babler. Once houses are built additional flows will be generated. There is the possibility of using the area just south of Babler at the pipe crossing as a retention basin by restricting the pipe outlet. There is presently open area that may be available although it is a prime building location. Another possible location for a retention basin would be just upstream of where the flows from Babler enter Widow White Creek. The creek passes through a relatively steep gorge for a short distance upstream. A dam with restrictive pipes could be placed across the creek so as to restrict downstream flows. However, there is not much area for storage available without topping Babler Road to the east where Widow White crosses it.

3. Central McKinleyville Drainage

This drainage is not a defined creek basin, but rather the central McKinleyville core area essentially including the area west of Central Avenue and east of U.S. 101 from School Road in the south to the Widow White Drainage in the north. An area south of School Road drains naturally north toward School and this area is included in the Central McKinleyville Drainage. However, it would be

possible during development to drain this area south to Mill Creek and keep it out of the Central McKinleyville Drainage System. This would reduce estimated 10-year flows by approximately 20 cfs which could result in a substantial cost savings by allowing smaller pipes downstream. This is the recommended option.

The majority of flow from this drainage impinges on the intersection of McKinleyville Avenue and Railroad Avenue creating the most noticeable flooding in the district. The flows continue northwest, via a ditch and 30-inch RCP, to a dual 5 foot by 4 foot box culvert crossing under U.S. 101. The proposed modifications to the Central McKinleyville Drainage are summarized below.

a) Obtain a 30-foot wide drainage easement and install a 24-inch RCP north of School Road to Worth Avenue as development warrants. (If flows south of School Road are drained, a 30-inch RCP would be required across School to Worth.)

b) Install a combination 36-inch - 48-inch RCP from Worth Avenue to McKinleyville Avenue discharging into the field east of McKinleyville Avenue and south of Hiller Road. (A 48-inch; 54-inch pipe would be required if flows from School were drained this way.)

c) Obtain a 30-foot wide drainage easement and construct a drainage channel across the field east of McKinleyville Avenue to Hiller Road and install a 60-inch RCP culvert across Hiller Road as development warrants. The typical cross section would be 4 feet deep with 2:1 side slopes and a bottom width of 2 feet.

d) Obtain a 30-foot wide drainage easement and construct a drainage channel along the south side of Hiller Road as development warrants. A typical cross section of this channel would be 2-feet deep with 1:1 side slopes and a bottom width of 2 feet.

e) Install a 27-inch RCP paralleling the existing 18-inch pipe that crosses from the west side to the east side of McKinleyville Avenue just south of Hiller then crosses Hiller discharging into the existing ditch on the northeast corner of Hiller Road and McKinleyville Avenue. This would be a County Road funded project.

f) Install dual 42-inch; 48-inch RCP's along the east side of McKinleyville Avenue from Hiller Road to Railroad Avenue. (Dual 48-inch RCP's would be required to handle additional flows from School Road.)

g) Obtain required drainage easements and install ditches and pipes as required to handle projected flows in the McKinleyville-Railroad intersection area to the U.S. 101 crossing. There are several alternate solutions to the problem. There are essentially three separate potential easements that are available. One would be down Midfield Court just south of Railroad Avenue to an existing easement that proceeds north to the existing drainage ditch that carries flows to U.S. 101. Presently, an existing 18-inch pipe drains the Midfield Court Subdivision. A second route would be down the west extention of Railroad Avenue west of McKinleyville Avenue to the existing ditch. This is the routing of the existing 24-inch pipe that carries the flows reaching the intersection of Railroad and McKinleyville. There is an existing County easement for this routing. A third route is located approximately 800 feet north of the McKinelyville-Railroad intersection along the north side of the Vukonich development.

Flows can be diverted to any one or all of the proposed easements. Flows from the east side of McKinleyville Avenue can be diverted down Railroad Avenue or contained in a pipe north of Railroad Avenue to the potential Vukonich easement.

Three alternate solutions are considered in detail:

Alternate 1 would involve 48-inch RCP's along the Railroad and the Vukonich easements with a 42-inch down Midfield Court tying to the existing drainage ditch which would require upsizing. A typical cross section of the ditch would be 3-feet deep with 2:1 side slopes and a bottom width of 15 feet. This ditch cannot be much deeper due to the existing grade. Thus it is relatively wide requiring a 40-foot easement. It would have to be deeper than the 3-feet near its shart to accommodate the 48-inch pipes. A 48-inch

RCP would drain the area north of Railroad Avenue and east of McKinelyville Avenue to the potential Vukonich easement.

Alternate 2 would involve a single 48-inch pipe down Railroad Avenue east of McKinelyville Avenue and dual 48-inch RCP's west on the Railroad Avenue extention as well as a 42-inch RCP along the Midfield easement, all tying to the existing drainage channel that would require upsizing as described in Alternate 1.

Alternate 3 would involve dual 42-inch; 48-inch RCP's north on McKinleyville Avenue from Railroad Avenue to the potential Vukonich easement. A single 48-inch RCP would carry flows north of Railroad Avenue and east of McKinleyville Avenue to the VuOonich easement. Dual 54-inch RCP's would proceed west along the proposed Vukonich easement to the tie with the existing drainage channel. (If flows from the area south of School Road are included, the 42-inch RCP should be upsized to a 48-inch pipe in all three alternatives.)

A portion of these costs could be borne by the County Road fund if a route is chosen where an existing culvert would require upsizing. This would be true for a portion of the Midfield Court route and also for the west extention of Railroad Avenue.

An existing 30-inch RCP is located behind a subdivision dividing the existing ditch into two sections. It is a potential restriction for projected flows. Rather than removing the pipe it is recommended that a ditch be constructed over the top of it to act as a high flow bypass system.

h) Obtain a 30-foot wide drainage easement and construct a ditch along the east side of U.S. 101 north of the dual box culvert crossing to handle flows from the north, west of McKinelyville Avenue. The typical cross section would be 4 feet deep with 2:1 side slopes and a bottom width of 3 feet.

This central McKinleyville core area has considerable area still available for development. The possibility of onsite detention ponds or basins to help alleviate peak runoff flows should be considered as development proceeds. Two potential areas where these detention ponds or basins could be used would be the field south of Hiller or the area between Railroad and Hiller although they could be applied in any potential subdivision.

4. Mill Creek Drainage

This drainage begins in the foothills east of the Calville area and Azalea Avenue. It crosses Azalea Avenue just south of Sutter Road in dual 36-inch CMP's which are undersized for projected flows. The area east of Azalea Avenue is a wide marshy area that has little potential for development. It is recommended that the culverts crossing Azalea Avenue remain and that the wet lands to the east be used as a storage basin for excess flows. Flooding has occurred at this crossing, but it has not caused serious problems and rarely lasts more than several hours. There are two methods of access to the area, via Sutter Road or via Northbank Road. Thus even if flooding occurs, normal and emergency traffic would not be seriously hampered. Most of the flooding problems that occur could be aleviated by raising the road grade. If this crossing were opened up, a much larger downstream flow would have to be designed for, adding considerably to the cost.

The proposed modifications to the Mill Creek Drainage are summarized below.

a) Obtain a 100-foot wide drainage easement along Mill Creek between Azalea Avenue and Bartow Road and improve and widen the existing channel as development warrants. The proposed cross section of Mill Creek increases downstream at the various nodes where flows enter from proposed drainage easements. The typical cross section varies from 4 feet deep with 2:1 side slopes and a bottom width of 8 feet in the upper reaches of the drainage to 5 feet deep with 2:1 side slopes and a bottom width of 26 feet in the lower reaches. These would be approximate and actual cross sections should be calculated during the design stage with the idea of both a summer channel and a winter overflow channel (refer to figure IV-4).

b) Obtain a 30-foot wide west drainage easement from Cochran Road north to Mill Creek and improve the existing drainage channel and replace the existing 12-inch RCP with dual 42-inch culverts across Cochran Road and across a private road north of Cochran Road. This drainage is located approximately 200 feet west on Cochran Road. The typical drainage cross section would be 3 feet deep with 2:1 side slopes and a bottom width of 3 feet. The crossing of Cochran Road would be a County Road funded project.

c) Install a combination 30-inch; 36-inch; 48-inch RCP along Cochran Road and a 42-inch RCP culvert crossing of Azalea Avenue replacing the existing 12-inch CMP. The Azalea Avenue crossing would be a County Road funded project.

d) Obtain a 30-foot wide central drainage easement from Cochran Road north to Mill Creek and construct a drainage channel and a 42-inch RCP culvert across Cochran Road as development warrants. This proposed easement is located approximately 1500 feet west of the Azalea Avenue intersection with Cochran Road. The typical cross section would be 2 feet deep with 2:1 side slopes and a bottom width of 2 feet.

e) Obtain a 30-foot wide west drainage easement from Cochran Road north to Mill Creek and construct a drainage channel and 30-inch RCP culvert crossing of Cochran Road. This proposed easement is located approximately 2200 feet west of the Azalea Avenue intersection with Cochran Road. The typical cross section would be 2 feet deep with 2:1 side slopes and a bottom width of 2 feet.

f) Obtain a 30-foot wide drainage easement north and south of Sutter Road approximately 300 feet west of its intersection with Azalea Avenue and improve the existing drainage ditch to the south of Sutter Road and upsize the existing 12-inch culvert crossing to 42 inches as development warrants. This culvert crossing would be a County Road funded project. The typical drainage ditch cross section would be 2 feet deep with 2:1 side slopes and a bottom width of 2 feet.

g) Obtain a 30-foot wide drainage easement south of Sutter Road at Church Avenue and improve the existing drainage ditch and upsize the existing 12-inch Sutter Road culvert to 42 inches as development warrants. This culvert crossing would be a County Road funded project. The typical drainage ditch cross section would be 3 feet deep with 2:1 side slopes and a bottom width of 2 feet.

h) Obtain a 30-foot wide drainage easement for the flows tying into the north fork of Mill Creek from the east just north of Sutter Road and improve the existing channel including installing one 30-inch and two 36-inch culverts across private roads. In addition, obtain a 30-foot wide drainage easement for the north fork of Mill Creek north of Sutter Road, improve the north fork of Mill Creek channel and install a 33-inch RCP culvert paralleling the existing 36-inch culvert crossing Sutter Road. The culvert crossing would be a County Road funded project. The typical cross section for the north fork of Mill Creek would be 2 feet deep with 2:1 side slopes and a bottom width of 3 feet while the drainage from the east tying to the north fork would have a typical cross section 3 feet deep with 1:1 side slopes and a bottom width of 1 foot.

i) Replace the existing 48-inch culvert crossing across Bartow Road with a 10 foot by 6 foot box culvert. This would be a County Road funded project.

j) Install a combination 24-inch; 36-inch RCP on School Road from the intersection of Vine Avenue east to U.S. 101. This section of School Road just west of U.S. 101 can best be drained to U.S. 101 and eventually to Mill Creek. Thus it is included in the Mill Creek Drainage as opposed to the Mad River Drainage. It would perhaps be desirable to extend a line to the intersection of School and Fischer to pick up the flooding that occurs at this intersection although the line would have to be deepened considerably due to adverse grades.

Ponding occurs on Vine Avenue north of School Road approximately 240 feet. There is also ponding that occurs on Anderson approximately 240 feet south of School Road. It is proposed that 24-inch RCP be installed on Vine and Anderson to drain these areas. They would tie to a main on School Road. A 24-inch pipe would be required between Vine and Anderson. At this point it should be sized as a 36-inch main east to its discharge in the existing drainage ditch on the west side of U.S. 101 at the School Road exit.

5. Mad River Drainage

The Mad River drainage is not an individual creek but rather various areas that eventually drain to the Mad River. The area includes a large portion of land located west of U.S. 101 and south of Hiller Road excluding a short section of School Road and intersecting roads east of Fischer Road which drains east to U.S. 101 and eventually into Mill Creek. Another area included in the Mad River Drainage is the area west of U.S. 101 and south of Murray Road. An existing 18-inch CMP crosses Eucalyptus Avenue from the south between Bolier Avenue and Daffodil Avenue. Flows proceed north west crossing Bolier Avenue via a 12-inch RCP and through the Knox Subdivision eventually exiting to the Mad River.

The proposed modifications to the Mad River Drainage are summarized below.

a) Install a pipe network on Fischer Road. Flows from the north pond up on Fischer Road approximately 400 feet north of School Road. There is another major problem at the intersection of Fischer and School Roads. It is recommended that a 24-inch RCP be installed on Fischer Road continuing south of the School Road intersection to the bottom of the hill. A 24-inch RCP 700 feet long on School Road to the west of Fischer Road would tie to this main. Flows from Anderson and Witmire to the east intersect Fischer Road approximately 200 feet from the bottom of the hill. From this point south a 36-inch RCP should continue crossing Fischer Road to the west and discharging to the fields. A ditch 3 feet deep with 2:1 side slopes and a bottom width of 2 feet should be constructed to the west across the field discharging to the Mad River. This field will still have the

potential to flood during periods of high runoff and high tides as the ditch and field are as low as elevation 0. A flap gate to prevent brackish water from inundating the fields should be installed.

An alternative for this area would be to drain Fischer north of School east to U.S. 101 as part of project j in Mill Creek. Grades do not really favor this solution although it would solve an existing flooding problem at School and Fishcer at much less expense. The flows on Fischer Road south of School Road and to the east would drain as they always have along the road and out into the field to the west of Fischer Road.

b) Install a pipe network on School Road. Flows west of Fischer Road generally travel westerly. There is ponding occurring on Bird Avenue approximately 750 feet north of School Road. A substantial portion of the flows eventually reach Ocean Drive. It is recommended that a 24-inch RCP be installed on School Road approximately 200 feet east of the intersection with Bird Avenue. The main should continue west from the intersection with Bird as a 36-inch RCP to the intersection with Ocean Drive. From this point it should continue to the Mad River as a 48-inch RCP. A 30-inch RCP should pick up flows on Bird Avenue tying to School Road and a 24-inch RCP should carry flows south on Ocean Drive to School Road.

c) Install a pipe network exiting via an existing Ocean Drive easement. There is an existing easement west of Ocean Drive to the Mad River approximately half way between Hiller and School Roads. A new subdivision, Ocean Side Unit 4 is presently being constructed and flows from this subdivision will exit via this drainage easement. The drainage system is being sized to handle flows from the east across the old railroad grade. The County has potential agreements with owners in the area for an easement from the east. There is an existing sewer line from Montana Road west tying to the sewer main on Ocean Drive. This would be a logical location for the storm sewer as there is already an existing easement.

It is proposed that a 30-inch RCP proceed south from Hiller along Berg Avenue then continuing east as a 36-inch RCP along Montana Road and the existing sewer easement. This would tie to the existing subdivision drainage system to the east of Ocean Drive.

d) Install a pipe and ditch network south of Murray Road. There is an existing ditch south of Eucalyptus that is adequately sized. An easement for this should be obtained so maintenance will not be a problem.

An 18-inch CMP crosses Eucalyptus avenue. This should be upsized to a 24-inch RCP. A 30-foot wide drainage easement should be obtained along the existing drainage channel between Eucalyptus and Bolier. A typical channel cross section to handle the estimated flows would be 4 feet deep with 2:1 side slopes and a bottom width of 1 foot. Bolier should be crossed with a 48-inch RCP and flows would then proceed west along an existing sanitary sewer easement. The County Planning Department recently allowed a lot split east of Bolier with the condition that the Bolier crossing be upsized. The County supposedly has funds for this project. If the existing sewer easement west of Bolier is to be used, the channel should be rerouted a short way east of Bolier as the easement is located somewhat south of the existing crossing.

6. North Bank Road Drainage

This drainage area essentially encompasses the area north of North Bank Road to the top of the ridge. It is characterized by very steep terrain and very sparse growth. It is classified at light density, but it is doubtful that development would ever reach the maximum of half acre lots due to the nature of the terrain.

There are essentially five natural drainage channels that drain the area and it is recommended that any additional development be required to run flows to one of these drainages.

Twelve separate culvert crossings of North Bank Road were located ranging from 12-inches to 30-inches in size. These are adequate for expected runoff although ditches along North Bank Road carrying flows to the culverts should be cleaned out and maintained. One or two of the culvert inlets were plugged with debris and weed growth, but a regular maintenance program would solve this problem.

D. COST SUMMARY

1. General

Estimated costs are discussed in Section B for the development of project costs that are described below. These costs are based on competitive bidding and possible methods of cost savings will be described in Section E. These costs should be considered preliminary as a detailed design has not been done. It should also be noted that costs are in 1982 dollars. Costs for drainage easements are probably high as easements are often granted as a condition for building.

2. Project Cost Summary

The estimated project costs are summarized by drainage system in Table VI-2 through VI-6. There are no projected costs for the North Bank Road Drainage system as a normal maintenance program is all that is required. The total costs for the study area are summarized in Table VI-7.

Costs to replace or parellel existing culverts crossing County roads that are not adequately sized may be legitimately charged to the County Road Fund. However, due to the limited monies available in this fund it is evident that the road fund cannot be counted on for a large contribution toward improving the drainage.

E. POTENTIAL COST SAVINGS

Many of the proposed drainage projects, namely those involving drainage channel construction or widening would lend themselves well to a long term maintenance program at substantial cost savings over the estimated competitive bid costs. Most projects are not pressing and need not be developed to full potential immediately. Once the drainage easements are obtained the channels could be widened and deepened as required to prevent flooding from occuring. The existing and proposed channels should be maintained annually, at a minimum, keeping them clear. During this maintenance work they could be improved as development warrants.

Another potential cost savings would be the use of volunteer labor such as the National Guard to maintain and widen channels. There are two companies stationed in the Eureka area. They have, in the past, helped in community projects including drainage maintenance. They have equipment available and generally lend assistance on weekends. When a need arises a letter requesting aid should be sent to both companies.

TABLE VI-2 - NORTON CREEK DRAINAGE COST SUMMARY

a) 54-inch RCP crossing Norton Road

Construction	$ 4,900
10% Contingency	500
Total Construction Costs	$ 5,400
Engineering (15%)	800
Administration (5%)	300
Drainage Easement	-0-
TOTAL	$ 6,500[1]

[1]County Road Fund

b) Drainage Ditch east side of Central Avenue

Construction	$19,800
10% Contingency	2,000
Total Construction Costs	$21,800
Engineering (15%)	3,300
Administration (5%)	1,100
Drainage Easement	-0-
TOTAL	$26,200

c) Upsize Central Avenue crossing

This cost is given in Table VI for the North Fork of Widow White Creek crossing of Central Avenue at Big Foot Gas Station.

d) Maintain Existing Drainage Ditch on west side of Central Avenue

No major costs are required for this item. Regular maintenance and clearing of the existing ditch should be done.

e) Old Norton Creek Channel east of Halfway Avenue

Construction	$35,100
10% Contingency	3,500
Total Construction Cost	$38,600
Engineering (15%)	5,800
Administration (5%)	2,000
Drainage Easement	16,500
TOTAL	$62,900

f) 54-inch RCP crossing Meyers Road

Construction	$ 4,900
10% Contingency	500
Total Construction Cost	$ 5,400
Engineering (15%)	800
Administration (5%)	300
Drainage Easement	6,900
TOTAL	$13,400

g) Airport Complex flows to Halfway Avenue. No major costs are required for this item. Maintenance crew should direct the flows to the field to the north of Halfway Avenue.

h) 24-inch RCP on Halfway Avenue north of the old Norton Creek crossing.

Construction	$ 99,400
10% Contingency	10,000
Total Construction Cost	$109,400
Engineering (15%)	16,400
Administration (5%0	5,500
Drainage Easement	-0-
TOTAL	$131,300

TOTAL COSTS FOR NORTON CREEK DRAINAGE	$240,300
County Road Fund Share	$ 6,500
Local Share	$233,800

TABLE VI-3 - WIDOW WHITE CREEK DRAINAGE COST SUMMARY

a) Dual 66-inch RCP crossing Central Avenue for North Fork Widow White Creek.[1]

Construction Costs	$ 14,400
10% Contingency	1,500
Total Construction Costs	$ 15,900
Engineering (15%)	2,400
Administration (5%)	800
Drainage Easement	-0-
TOTAL	$ 19,100[2]

[1] Dual 66-inch RCP required with Norton Creek flow. Otherwise dual 54-inch - 60-inch RCP should be used. Cost difference is $3,700.

[2] County Road Fund

b) 24-inch RCP crossing on First Street

Construction Costs	$ 5,700
10% Contingency	600
Total Construction Costs	$ 6,300
Engineering (15%)	1,000
Administration (5%)	300
Drainage Easement	-0-
TOTAL	$ 7,600[1]

[1] County Road Fund Share $ 4,600
Local Share $ 3,000

c) Ditch and Culvert south and north of Pickett Road.

Construction Costs	$ 10,300
10% Contingency	1,100
Total Construction Costs	$ 11,400
Engineering (15%)	1,700
Administration (5%)	600
Drainage Easement	10,000
TOTAL	$ 23,700[1]

[1] County Road Fund Share $ 2,500
Local Share $21,200

d) Martin Road East Drainage.

Construction Costs	$ 14,400
10% Contingency	1,500
Total Construction Costs	$ 15,900
Engineering (15%)	2,400
Administration (5%)	800
Drainage Easement	9,300
TOTAL	$ 28,400

e) Martin Road West Drainage.

Construction Costs	$ 10,200
10% Contingency	1,000
Total Construction Costs	$ 11,200
Engineering (15%)	1,700
Administration (5%)	600
Drainage Easement	6,500
TOTAL	$ 20,000

f) Widow White Creek east of Central Avenue

Construction Costs	$ 47,400
10% Contingency	4,800
Total Construction Costs	$ 52,200
Engineering (15%)	7,900
Administration (5%)	2,600
Drainage Easement	25,300
TOTAL	$ 88,700

g) Widow White Creek crossing Central Avenue.

Construction Costs	$ 11,000
10% Contingency	1,100
Total Construction Costs	$ 12,100
Engineering (15%)	1,800
Administration (5%)	600
Drainage Easement	-0-
TOTAL	$ 14,500[1]

[1]County Road Funds

h) Widow White Creek west of Central Avenue.

Construction Costs	$191,200
10% Contingency	19,100
Total Construction Costs	$210,300
Engineering (15%)	31,500
Administration (5%)	10,500
Drainage Easement	72,300
TOTAL	$324,600

i) Drainage between McKinleyville Avenue and Central Avenue north of Railroad Avenue.

Construction Costs	$157,400
10% Contingency	15,800
Total Construction Costs	$173,200
Engineering (15%)	26,000
Administration (5%)	8,700
Drainage Easement	7,700
TOTAL	$215,600

j) Improve Ditches along east side of Central Avenue.

Construction Costs	$ 11,000
10% Contingency	1,100
Total Construction Costs	$ 12,100
Engineering (15%)	1,900
Administration (5%)	600
Drainage Easement	-0-
TOTAL	$ 14,500

k) Babler Road drainage.

Construction Costs	$ 8,900
10% Contingency	900
Total Construction Costs	$ 9,800
Engineering (15%)	1,500
Administration (5%)	500
Drainage Easement	4,800
TOTAL	$ 16,600

l) 100 foot drainage easement on north fork Widow White Creek between Central Avenue and Halfway Avenue.

Drainage Easement	$ 59,700

m) Obtain a 30-foot wide drainage easement from Second Road ro Widow White Creek in the Calville area.

Drainage Easement		$ 15,800
TOTAL COSTS FOR WIDOW WHITE CREEK DRAINAGE		$848,800
County Road Fund Share	$ 40,700	
Local Share	$808,100	

TABLE VI-4 - CENTRAL MCKINLEYVILLE DRAINAGE COST SUMMARY

a) 24-inch RCP - School Road to Worth Avenue.

Construction Costs	$ 10,600
10% Contingency	1,100
Total Construction Costs	$ 11,700
Engineering (15%)	1,800
Administration (5%)	600
Drainage Easement	900
TOTAL	$ 15,000

b) Combination 36-inch; 48-inch RCP from Worth Avenue to McKinleyville Avenue.

Construction Costs	$101,100
10% Contingency	10,100
Total Construction Costs	$111,100
Engineering (15%)	16,700
Administration (5%)	5,600
Drainage Easement	-0-
TOTAL	$133,400[1]

[1]County Road Funds

c) Drainage Ditch between McKinleyville Avenue and Hiller Road and Culvert Crossing at Hiller.

Construction Costs	$ 23,900
10% Contingency	2,400
Total Construction Costs	$ 26,300
Engineering (15%)	4,000
Administration (5%)	1,300
Drainage Easement	11,400
TOTAL	$ 43,000

d) Drainage Ditch along south side of Hiller Road.

Construction Costs	$ 9,000
10% Contingency	900
Total Construction Costs	$ 9,900
Engineering (15%)	1,500
Administration (5%)	500
Drainage Easement	7,000
TOTAL	$ 18,900[1]

[1]County Road Fund Share $ 3,400
Local Share $15,500

e) 27-inch RCP across McKinleyville and Hiller Road.

Construction Costs	$ 9,800
10% Contingency	1,000
Total Construction Costs	$ 10,800
Engineering (15%)	1,600
Administration (5%)	600
Drainage Easement	-0-
TOTAL	$ 13,000[1]

[1]County Road Fund

f) Dual 42-inch; 48-inch RCP along McKinleyville Avenue to Railroad Avenue.

Construction Costs	$160,400
10% Contingency	16,100
Total Construction Costs	$176,500
Engineering (15%)	26,500
Administration (5%)	8,800
Drainage Easement	-0-
TOTAL	$211,800

g) Railroad Avenue - McKinleyville Avenue to U.S. 101.

Alternate 1 - 3 separate routings -
42-inch Midfield Court; 48-inch Railroad; and Vukonich easement.

Construction Costs	$281,000
10% Contingency	28,000
Total Construction Costs	$309,100
Engineering (15%)	46,400
Administration (5%)	15,500
Drainage Easement	18,000
TOTAL	$389,900[1]

[1]County Road Fund Share $ 70,500
Local Share $319,400

Alternate 2 - Midfield Court 42-inch;
Railroad Avenue - dual 48-inch.

Construction Costs	$228,700
10% Contingency	22,900
Total Construction Costs	$251,600
Engineering (15%)	37,800
Administration (5%)	12,600
Drainage Easement	14,300
TOTAL	$316,300[1]

[1]County Road Fund Share $105,700
Local share $210,600

Alternate 3 - Flows north on McKinleyville to Vukonich easement.

Construction Costs	$421,900
10% Contingency	42,200
Total Construction Costs	$464,100
Engineering (15%)	69,600
Administration (5%)	23,200
Drainage Easement	10,400
TOTAL	$567,300[1]

[1] County Road Fund $ 6,000
Local Share 561,300

h) Drainage Ditch east side of U.S. 101 south of Widow White Creek.

Construction Costs	$ 23,300
10% Contingency	2,300
Total Construction Costs	$ 25,600
Engineering (15%)	3,900
Administration (5%)	1,300
Drainage Easement	13,800
TOTAL	$ 44,600

TOTAL COSTS FOR CENTRAL MCKINLEYVILLE DRAINAGE[1] $796,000

County Road Fund Share $255,500
Local Share $540,500

[1] Assumes Alternate 2 cost for g).

TABLE VI-5 - MILL CREEK DRAINAGE COST SUMMARY

a)	**Mill Creek Drainage**	
	Construction Costs	$238,700
	10% Contingency	23,900
	Total Construction Costs	$262,600
	Engineering (15%)	39,400
	Administration (5%)	13,100
	Drainage Easements	128,600
	TOTAL	$443,700
b)	**East Cochran Drainage to Mill Creek**	
	Construction Costs	$ 30,200
	10% Contingency	3,000
	Total Construction Costs	$ 33,200
	Engineering (15%)	5,000
	Administration (5%)	1,700
	Drainage Easement	13,800
	TOTAL	$ 53,700[1]

[1] County Road Fund Share $ 6,400
Local Share $47,300

c)	**Cochran Road Drainage**	
	Construction	$ 66,300
	10% Contingency	6,700
	Total Construction Costs	$ 73,000
	Engineering (15%)	11,000
	Administration (5%)	3,700
	Drainage Easement	-0-
	TOTAL	$ 87,700[1]

[1] County Road Fund Share $ 5,300
Local Share $82,400

d)	**Central Cochran Drainage to Mill Creek**	
	Construction Costs	$ 15,200
	10% Contingency	1,500
	Total Construction Costs	$ 16,700
	Engineering (15%)	2,500
	Administration (5%)	800
	Drainage Easement	11,000
	TOTAL	$ 31,000

e) West Cochran Drainage to Mill Creek

Construction Costs	$ 17,600
10% Contingency	1,800
Total Construction Costs	$ 19,400
Engineering (15%)	2,900
Administration (5%)	1,000
Drainage Easement	13,800
TOTAL	$ 37,100

f) Sutter Road near Azalea

Construction Costs	$ 18,400
10% Contingency	1,800
Total Construction Costs	$ 20,200
Engineering (15%)	3,000
Administration (5%)	1,000
Drainage Easement	13,800
TOTAL	$ 38,000[1]

[1] County Road Fund Share $ 3,400
Local Share $34,600

g) Sutter Road near Church

Construction Costs	$ 14,500
10% Contingency	1,500
Total Construction Costs	$ 16,000
Engineering (15%)	2,400
Administration (5%)	800
Drainage Easement	7,600
TOTAL	$ 26,800[1]

[1] County Road Fund Share $ 3,300
Local Share $23,500

h) North Fork Mill Creek

Construction Costs	$ 29,600
10% Contingency	3,000
Total Construction Costs	$ 32,600
Engineering (15%)	4,900
Administration (5%)	1,600
Drainage Easement	20,000
TOTAL	$ 59,100[1]

[1] County Road Fund Share $ 4,700
Local Share $54,400

i) Bartow Road Crossing

Construction Costs	$ 10,700
10% Contingency	1,100
Total Construction Costs	$ 11,800
Engineering (15%)	1,800
Administration (5%)	600
Drainage Easement	-0-
TOTAL	$ 14,200[1]

[1] County Road Fund

j) Combination 24-inch; 36-inch RCP on School, Vine and Anderson to U.S. 101. (This includes costs to drain the School-Fischer intersection)

Construction Costs	$ 84,000
10% Contingency	8,400
Total Construction Costs	$ 92,400
Engineering (15%)	13,900
Administration (5%)	4,600
Drainage Easement	-0-
TOTAL	$ 110,900

TOTAL COST FOR MILL CREEK DRAINAGE		$902,200
County Road Fund Share	$ 37,300	
Local Share	$864,900	

TABLE VI-6 MAD RIVER DRAINAGE COST SUMMARY

a) Combination 24-inch; 36-inch RCP on Fischer and School Roads with Drainage Ditch to Mad River.

Construction Cost	$148,600
10% Contingency	14,300
Total Construction Cost	$163,500
Engineering (15%)	24,500
Administration (5%)	8,200
Drainage Easement	22,000
TOTAL	$218,200

b) Combination 24-inch; 30-inch; 36-inch; 48-inch RCP on School, Bird and Ocean Roads.

Construction Costs	$198,200
10% Contingency	19,800
Total Construction Cost	$217,400
Engineering (15%)	32,600
Administration (5%)	10,900
Drainage Easement	-0-
TOTAL	$260,900

c) Combination 30-inch; 36-inch RCP tying to Ocean Side Subdivision Unit 4.

Construction Cost	$135,600
10% Contingency	13,600
Total Construction Cost	$149,200
Engineering (15%)	22,400
Administration (5%)	7,500
Drainage Easement	-0-
TOTAL	$179,100

d) Eucalyptus and Bolier Avenues Crossings and Channel Improvements.

Construction Cost	$ 18,900
10% Contingency	1,900
Total Construction Cost	$ 20,800
Engineering (15%)	3,100
Administration (5%)	1,000
Drainage Easement	11,000
TOTAL	$ 35,900

TOTAL COST FOR MAD RIVER DRAINAGE	$694,000
County Road Fund Share	$0
Local Share	$694,000

TABLE VI-7. PROJECT AREA COST SUMMARY

NORTON CREEK DRAINAGE		
Total Estimated Cost		$240,300
County Road Fund Share	$6,500	
Local Share	$233,800	
WIDOWN WHITE CREEK DRAINAGE		
Total Estimated Cost		$848,800
County Road Fund Share	$40,700	
Local Share	$808,100	
CENTRAL MCKINLEYVILLE DRAINAGE		
Total Estimated Cost		$796,000
County Road Fund Share	$255,500	
Local Share	$540,500	
MILL CREEK DRAINAGE		
Total Estimated Cost		$902,200
County Road Fund Share	$37,300	
Local Share	$864,900	
MAD RIVER DRAINAGE		
Total Estimated Cost		$694,000
County Road Fund Share	0	
Local Share	$694,000	
TOTAL ESTIMATED COST		$3,481,300
County Road Fund Share	$340,000	
Local Share	$3,141,300	

Legend

Drainage Study

Creek Drainage

Easement

Norton Creek Drainage

Widow White Creek Drainage

Central McKinleyville Drainage

Mill Creek Drainage

Mad River Drainage

PROPOSED PROJECTS

N

ARCATA COUNTY AIRPORT

DOWS PRAIRIE SCHOOL

GRANGE HALL

DOWS PRAIRIE

EXTREMELY DENSE TREE COVER

AIRPORT SCHOOL

PACIFIC OCEAN

Existing 30'' CMP

Existing 24'' CMPs

Existing 5' x 4' RCB

Existing 138'' CMP

Existing 60'' RCP

Existing 4' x 3' RCB

Existing 8' x 7' RCB

A

B

C

D

E

F

G

H

L

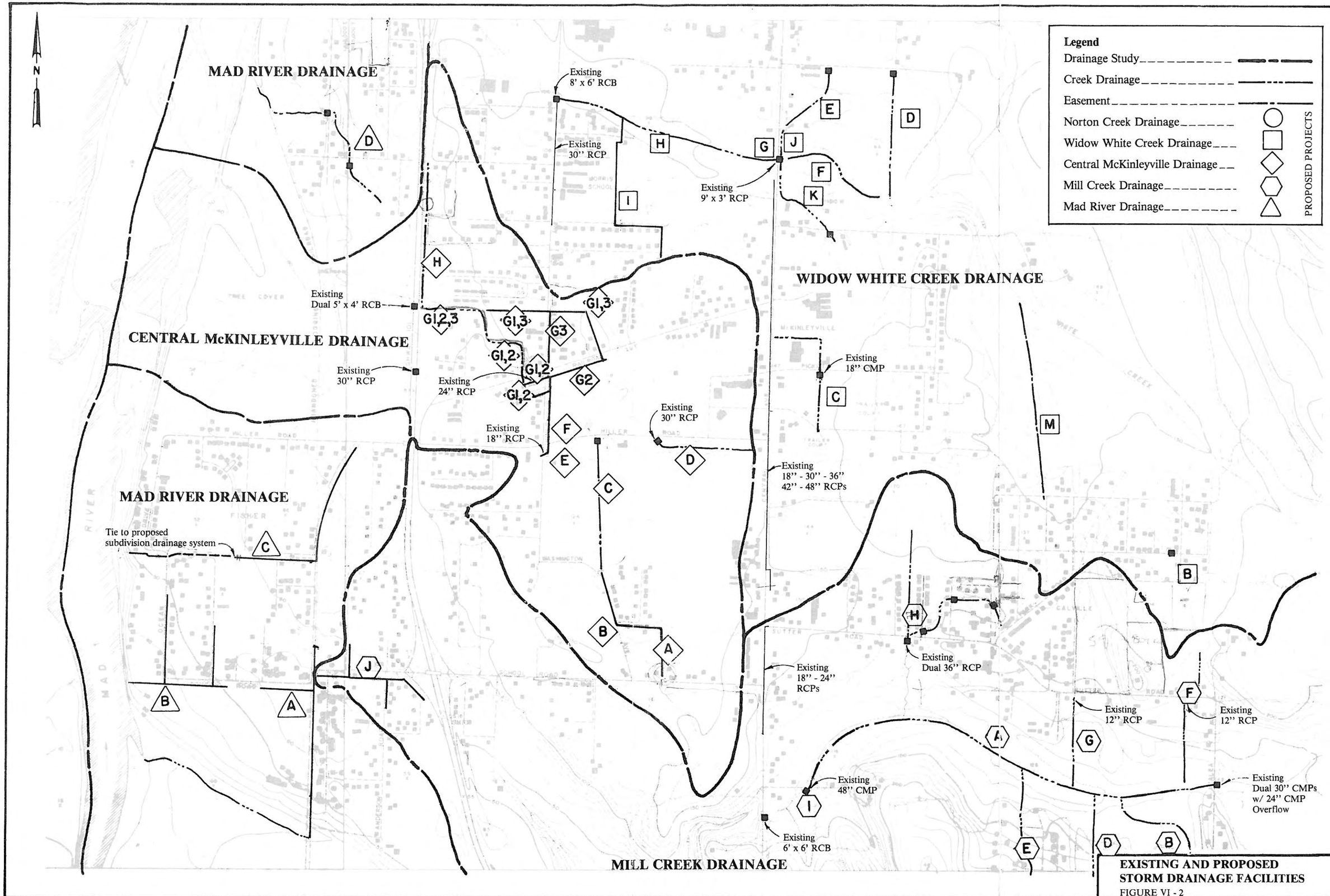
NORTON CREEK DRAINAGE

MAD RIVER DRAINAGE

WIDOW WHITE CREEK DRAINAGE

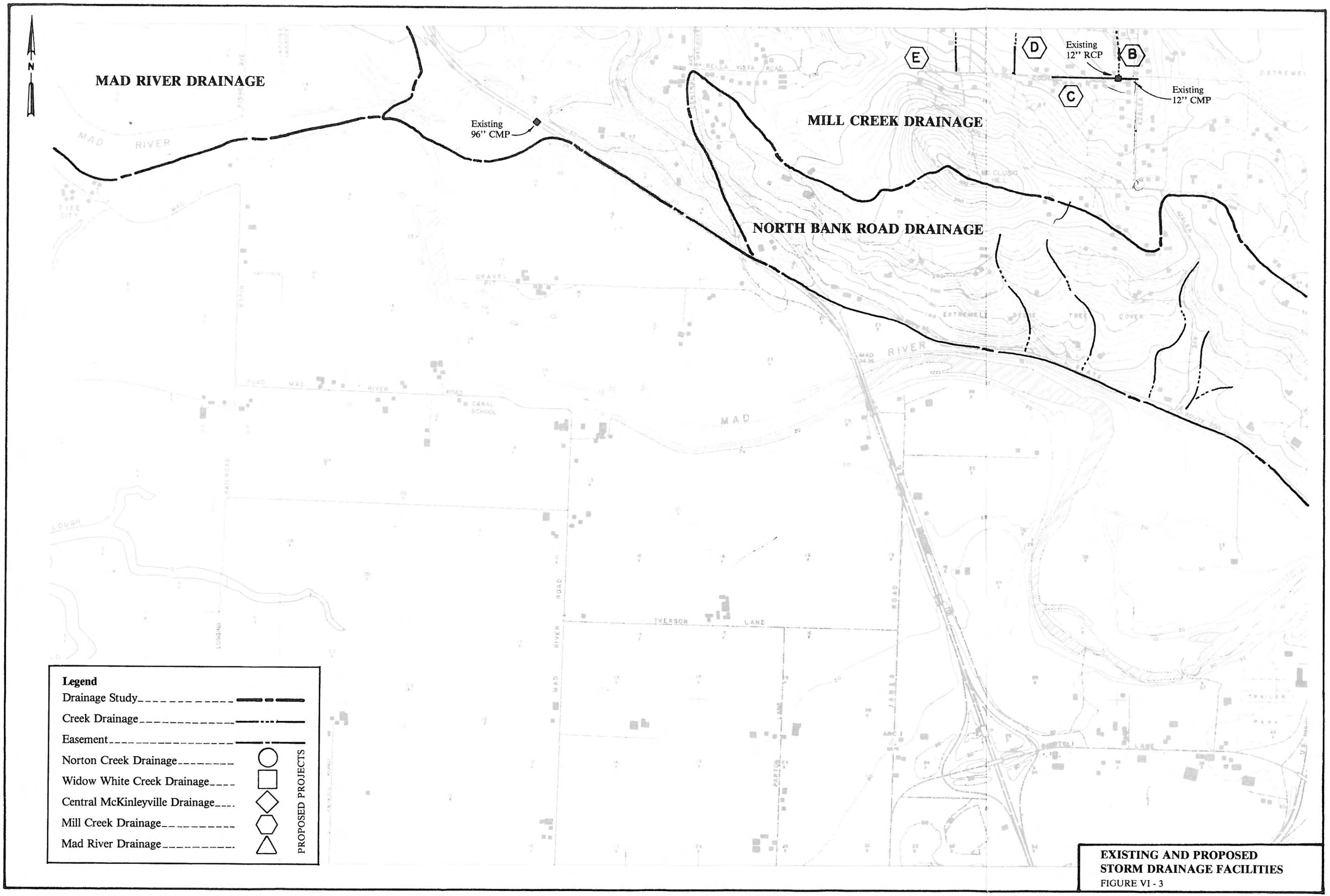
EXISTING AND PROPOSED STORM DRAINAGE FACILITIES

FIGURE VI - 1



EXISTING AND PROPOSED STORM DRAINAGE FACILITIES

FIGURE VI - 2



EXISTING AND PROPOSED STORM DRAINAGE FACILITIES

FIGURE VI - 3

CHAPTER VII. PRIORITIES, FINANCING AND ADMINISTRATION

A. General

The purpose of this chapter is to set forth the priorities for construction of the proposed projects described in Chapter VI, and explore various methods of financing these proposed projects.

Various means of administering the implementation of the drainage plan are examined including Humboldt County, McKinleyville Community Services District, or some type of co-operative agreement. In determining the most suitable administration system, various key points are examined including existing responsibilities and authority, financing mechanisms available, borrowing capacity and costs to the different agencies.

A draft drainage ordinance is developed tailored for the specific needs of the McKinleyville area. It addresses minimum requirements for storm water improvements, and methods for securing drainage fees.

B. Priority of Improvements

In determining priority of improvements, three major factors were considered:

- Existing Serious Flooding
- Preclusion of Development
- Cost Effectiveness

Areas where serious flooding occurs on a regular basis must receive top priority. Areas that have not been allowed to develop due to a lack of an area wide master drainage plan that will allow them to add to the runoff should receive second priority. In all cases the cost effectiveness of the project must be considered. A project that will allow a major subdivision to develop will be more cost effective than a similar project that will allow a lot split to occur.

Based on numerous criteria priority projects from the projects proposed in the previous chapter are listed. This listing is not intended to be a recommendation for order of implementation. Availability of funds will most likely determine which projects are completed first. There are eleven projects that are considered as priority projects.

1. The most notable flooding problem in the study area occurs at the intersection of McKinleyville Avenue and Railroad Avenue (Central McKinleyville Drainage, Project g.)

In addition, one or two proposed subdivisions have not been allowed to proceed until this flooding problem is resolved. Two problems contribute to the flooding. First, the road culverts in the area transporting flows west from the intersection to the existing ditch are undersized for existing flows. Second, the ditch itself is too small and overgrown to accommodate the flows. The area is relatively flat and the ditch is poorly graded causing flows to stagnate. A new single 48-inch RCP paralleling the existing pipe will accommodate existing flows. The ditch, once the easement is obtained, can be cleaned out and widened slightly and properly graded to handle existing flows. As development warrants additional pipe culverts can be installed and the ditch could be widened and deepened gradually as an ongoing maintenance program which would significantly reduce costs. The 48-inch pipe will be a County Road Fund project. Estimated costs for this project are $113,700 including $14,300 for drainage easement acquisition assuming the ditch is widened to maximum capacity at the time the pipe is installed as a single project. Of this cost, $40,500 can be budgeted and funded in the County Road Fund.

2. Upsize the culvert crossing on Bartow Road (Mill Creek Drainage project i). A new residential development is located at the end of Bartow Road. Houses have not yet been constructed, but the streets are complete and lots are available. This road is the only access to this subdivision and the road has flooded during periods of heavy rain. It is virtually impassible for short periods of time. Due to the potential lack of access for emergency traffic this project must receive high priority. This will be a County Road Fund project. Estimated costs for the project are $14,200.

3. Relocate the existing 24-inch RCP on First Street in the Calville area (Widow White Creek Drainage, Project b). There is a possibility that this culvert is blocked as the area floods regularly. The pipe can be relocated so it does not run underneath the existing house at the head of the drainage channel. Estimated costs for this project are $7,600 of which $4,700 can be funded by the County Road Fund.

4. Obtain a 30-foot wide easement and widen the existing north fork of Mill Creek. (Mill Creek Drainage project h). This project includes widening a channel from the east and installing an

additional culvert across Sutter as well as the improvements to the north fork. The additional improvements beyond widening the north fork of Mill Creek can be deferred at this time. The north fork presently floods into yards during periods of heavy rain. A portion of the new Eckland Ranch Subdivision will flow from the north to this drainage. This project is listed as a priority project especially if these additional flows create an increased flooding hazard to the area. Estimated costs are $24,400 (including $11,000 for the drainage easement acquisition.)

These estimated costs could be reduced if the work was done by maintenance personnel.

5. Obtain the 30-foot wide west drainage easement from Martin Road southwest to Central Avenue and improve the existing ditch as well as improve the ditches along Central Avenue (Widow White Creek Drainage projects e and g). The ditch along the east side of Central Avenue north of Widow White Creek is undersized. A drainage channel from the east enters just to the north of McKinleyville Tire and Muffler and is also undersized. Flows from this ditch have topped their bank and flooded the yards just north of the shop coming close to an existing mobilehome as well as flooding a portion of the parking lot of McKinleyville Tire and Muffler.

   The entire project does not have to be completed at once. The ditch upstream of the existing improvements need not be widened until future growth requires. A large portion of this work can be handled as a regular maintenance program.

   The costs for the two projects are $34,500 if done by competitive bid. This is a high cost for the benefit received. There is only one mobilehome seriously threatened, and it is likely that due to the downstream restriction on Widow White Creek west of Central Avenue and perhaps at the culvert crossing, this problem will not be totally alleviated. Thus it is not recommended that this work be done by competitive bid but only as an ongoing maintenance project.

   Due to the marshy conditions along Widow White Creek downstream of Central Avenue costs of widening will be high which will make the above project even less cost effective. However, due to the recent clearing of a stretch of Widow White

Creek downstream of Central Avenue, this stretch should not present any immediate problems.

An option would be to dike the low area along the channel by the mobile home and McKinleyville Tire and Muffler, perhaps with the aid of the National Guard.

6. Install a 54-inch culvert crossing of Meyers Road and obtain the required easement to the old Norton Creek channel west of Halfway Avenue (Norton Creek Drainage project f.). The estimated cost of the project is $13,400 including $6,900 for drainage easement acquisition. This project opens the way for development of approximately 50 acres of land between Halfway Avenue and Airport Road. This cost of $270 per acre can be borne by the developer.

7. Install a pipeline between Railroad Avenue and Widow White Creek (Widow White Creek Drainage project i). There is an area immediately north of McKinleyville, the Rector Subdivision, that cannot develop until the drainage problem in this area is resolved. One option is to drain down Railroad although the grades are not favorable and the flows would only exacerbate the existing problem at McKinleyville and Railroad. An alternate line north to Widow White Creek will not only serve this subdivision, but open up a large area to the east for possible development. However, the estimated cost of this project is high at $215,000. There are approximately 66 acres available for development that will be served. Thus the cost per acre for just this pipeline is approximately $3,300 which is perhaps not cost effective. These costs can be borne by the developer as currently there is not a serious problem.

8. Install the combination 36-inch; 48-inch pipe on Worth and Washington (Central McKinleyville project b) only if future development requires. A storage basin was constructed in this area as part of the Wallis Subdivision. It is not functioning properly and an 18-inch pipe is being installed on Worth Avenue across Washington. A ditch is to be constructed on the west side of Washington and a culvert will carry flows across Washington to the fields to the north. This is a temporary measure and it is unfortunate that a larger pipe is not to be installed at this time. The proposed pipe is

considered inadequate, but the County estimates it will still drain the area, although flooding will occur, for relatively short durations. This solution will be acceptable until such time as more intensive development occurs. The cost of the proposed solution is approximately $133,400. There are approximately 38 developable acres on the east and west sides of Washington that will benefit from this project. The cost per acre is approximately $3,500.

9. Obtain a 30-foot wide easement and improve the channel along the old Norton Creek drainage (Norton Creek Drainage project e) if required due to development. There is a sizable parcel of land to the southeast that at one time was proposed for development as a mobilehome park. It is unclear at this time if this development will proceed. It may, in fact, develop as single-family structures. There is a concern that the land is in the aircraft flight path which may restrict development. This area can drain either to the north fork of Widow White or to the old Norton Creek drainage. If it develops and drainage flows to Norton Creek, this channel should be improved. It can be scheduled as a maintenance item as there is currently little threat downstream of serious flooding. The area to the northeast of the channel is also a prime area for development. Both sections are classified as medium density. The estimated cost for development is $62,900 and as no existing flooding problem is occurring these costs can be borne by the developer.

10. Tie to the new Ocean Side Subdivision Unit 4 with a combination 30-inch; 36-inch RCP when development commences to the east (Mad River Drainage project c). The estimated cost of the project is $179,100 and it will benefit a relatively small area to the east of the old railroad grade. This area, approximately 24 acres in size, has been subdivided into lots. The cost per acre for drainage, $7,500, appears prohibitive to induce development. This can be borne by the developer and is listed as a priority project if development is to continue in the area.

11. Install the pipe system on School Road to drain Vine and Anderson east to U.S. 101 (Mill Creek Drainage, Project j). It appears advisable to extend a line west to the intersection of School and Fischer to drain this area also. This project

will do little to help with future development, but there is an existing flooding problem mainly of the streets. The cost for the work is approximately $135,700. It may not be cost effective to solve a problem that solely involves street flooding. However, the intersection of Fischer and School floods frequently and creates a traffic hazard on the corner. This area is a school bus stop and a number of children are served during the school year. During heavy rains the entire intersection is innundated and vehicular traffic is generally restricted to one lane. Because of the potential traffic hazard to the children it is recommended that this project be completed.

The remaining proposed drainage projects are not urgent and can be implemented when and if future growth supports construction. The county has a policy of maintaining a 200 foot wide green belt with no development along the main creeks in the area. No improvements to the creek channels are warranted until a substantial increase of flows is generated by the additional growth as there is essentially a 200-foot wide flood plain available to accommodate excess flows.

Widow White Creek will be the first creek needing improvements. Opening additional areas upstream will exacerbate the problem downstream. The proposed channel improvements are expensive. Once begun it may be required to improve a good deal of the existing length. Flows from the Grace Park Subdivision will increase as new lots are improved. These flows will cross Babler to Widow White Creek. Presently flooding occurs downstream at Glens Auto yard and in the fields to the west of the drainage channel along Goldfinch Lane. When volume increases it may be necessary to improve the creek channel downstream requiring upsizing of the Central Avenue crossing and widening the channel west of Central. It may be possible to construct some type of detention basin on the east side of Babler to restrict flows downstream, as the County presently has drainage easements in this area. Another potential detention basin site would be upstream of existing development on Widow White Creek and downstream of the Widow White Creek crossing of Babler Road.

A priority list is not presented for the remaining projects. These projects relate to where development will occur. In general, projects in areas classified as medium density will receive priority over projects in light density areas. The benefits per acre are greater in a medium density zone. Costs of the projects can alter this priority rating. If costs per acre are much higher in a medium

density area than in a light density area, it will be possible to consider the project in the low density area as higher priority.

Another priority that should be considered is safety. This is especially true where ditches parallel major traffic routes. These ditches (Central McKinelyville Draiange Project f, in particular) should have pipes installed when funds become available due to the hazards to both auto and foot traffic.

The proposed easements for all the projects should be obtained as soon as feasible. This would allow a maintenance program to be started and the various channels could be improved over a period of time as funding permits rather than the work being done all at once.

C. Methods of Financing

This section explores the various methods of storm water financing. Money is needed up front to do the priority projects listed above. The total capital cost of the eleven projects listed in section B is $934,500. Of this amount, $192,800 could be funded through the County Road Fund leaving $741,700 to be funded by local dollars. The estimated capital cost to complete the entire master drainage plan is $3,481,300. The County Road Fund share is $340,000. Recent discussion with County staff indicate that the road fund will probably not be available to any extent which would place the entire costs on the community.

There are several methods of funding potential storm water facilities. These are summarized below.

1. Grants

Grants and/or loans are available through various government agencies including the U.S. Department of Housing and Urban Development, U.S. Department of Agriculture Farmers Home Administration, Soil Conservation Service, Economic Development Administration and the U.S. Army Corps of Engineers.

The Department of Housing and Urban Development under Public Law 93-383, as amended, has two Community Development Block Grant Programs offering grant funds. However, these funds are mainly available for urban areas and generally they must benefit low income persons and aid in prevention or elimination of blight or meet urgent needs such as health or safety. The County will have to be the lead agency to apply for funds. The estimated funding available for 1982 throughout California is $23,000,000 and the average grant has historically been between $100,000 and

$500,000. Nationwide available funds for 1982 are $2,645,000,000 and estiamted funds for fiscal 1983 are $2,405,905,000.

Both the Farmers Home Administration and Soil Conservation Service are branches of the Department of Agriculture. The Farmers Home Administration provides grant and loan monies through three separate programs. The main program available is the Water and Waste Disposal Systems for Rural Communities. Although water and sewer projects have priority, some monies are made available for storm water projects. The estimated total available funding for California in 1982 and again in 1983 is $3,500,000 for grants and $11,000,000 for loans. Average grants and loans range between $300,000 and $600,000. Two other programs under FmHA are the Irrigation, Drainage and other Soil and Water Conservation loans and the Watershed Protection and Flood Prevention Loans. These programs have little available monies in California and are not considered promising sources for funding. In addition any loan with FmHA must be secured by duly authorized bonds. Current terms and conditions include repayment over a period not to exceed 40 years at 11 5/8 percent interest.

The Soil Conservation Service has two programs, only one of which is promising. It is the Watershed Protection and Flood Prevention Program. Storm water pipe systems are not eligible for these funds, only stream or channel improvements. Other local costs would be land easements, relocation of utilities and culverts and any required safety fencing. In order to qualify two sponsors are required, one being a Resource Conservation District which does not now exist in Humboldt County. Past attempts to set up such a district have failed. The second sponsor would be the Humboldt County Flood Control District.

An estimated $215,594,000 is available for grants in 1982, but this is expected to be cut to $116,873,000 in 1983. The average grant amount is $1,800,000. The second program is the Resource Conservation and Development Program which has very limited funds available and is not considered a viable source of funds. There is considerable competition for these funds and the process takes considerable time. It is expected that actual construction of a project would be five to six years in the future.

The Department of Commerce, Economic Development Administration provides funding through the Economic Development - Grant and Loans for Public Works and Development Facilities Program. This program is generally used to promote long-term economic growth and may be used to install facilities to improve opportunities for

establishment of industrial or commercial facilities. However, their funds have been cut back and little money is available at this time.

The U.S. Army Corps of Engineers administers the "Flood Control Projects" or "Small Flood Control Projects" program. Grants and loans as such are not available through the Corps. Rather the project is submitted to the Corps and they determine if it is a feasible or viable project complete within itself. If so, the Corps will actually take over the project from design through construction. Land easements required would be a separate cost borne by the local community.

2. Assessment District

An assessment district is an area within a public agency's corporate boundaries, parcels within which will receive a special benefit from the construction of specific facilities, such as a storm water system. It has no legal life of its own and cannot act by itself. Its instrumentality is the governing body of the local sponsoring agency which has responsibility for the type of facilities to be constructed.

An assessment district can come into being either as a result of a petition by the owners of the property which would be benefited or by a unilateral action of the governing body and as such does not require a vote of the people.

There are two procedural acts which can be used to set up an assessment district: the Improvement Act of 1911 and the Municipal Improvement Act of 1913. In either case, sale of bonds secured by special assessment liens would be required unless all property owners elect to pay their assessments in cash. In conjunction with either of the two acts above, there are two acts which provide for the machinery for the sale of bonds. These are the Improvement Act of 1911 and the Improvement Bond Act of 1915.

The procedural part of the Improvement Act of 1911 operates in the following manner. The governing body first orders the preparation of plans and specifications. After these are prepared, the governing body adopts a resolution of intention. Notice is given and a hearing is held. If there is not a protest by the owners of a majority of the assessable property, and the governing body decides to go ahead with the work, the construction work is ordered and a contract awarded. Upon completion of the construction, the engineer allocates the costs among the beneficiaries in the form of an assessment and prepares an assessment diagram. Notice of the proposed assessments are given to the property

owners and a hearing is held. After the hearing, the governing board confirms the assessment, with or without modifications. The assessment roll, assessment diagram and a document called a warrant are delivered to the contractor, or more normally, the contractor's assignee. The assessment, warrant and diagram constitute a negotiable instrument and is the contractor's payment for the work of construction.

The Municipal Improvement Act of 1913 operates in the following manner. The general procedure is for an assessment and assessment diagram to be prepared at the outset, before any construction is done or acquisitions made. The amount of the assessment levied against each property is based upon an engineer's report of the estimated cost of the acquisitions and construction. Notice is given and a hearing is held upon both the project and the amount of the proposed assessment. Frequently the governing body receives construction bids before or at the date of the hearing so that the assessments may be adjusted to reflect the actual construction bids. At the end of the hearing the legislative body confirms the assessment, with or without modifications.

The 1913 Act differs from the 1911 Act in that under the 1913 Act there is only a single hearing. This hearing has to do with both the project itself and the allocation of project costs. A local public district cannot use the 1913 Act, however, without the consent of the legislative body of the county or any city within which the special assessment district is situated.

Bonds issued under the Improvement Act of 1911 have the following characteristics. Each bond represents an unpaid lien on a specific parcel of property in the total amount of the lien. Each bond is secured solely by the parcel of property upon which the lien exists. The issuing agency is not liable for any payment and there can be no deficiency judgement. The bonds are payable in equal principal installments with the principal payable once each year in January and the interest payable twice each year, in July and January. The property owner pays the installments separately from the property taxes at the office of the treasurer of the sponsoring agency. The property owner must make the payments one month before the interest coupons are due - June 1st and December 1st. The 1911 Act is typically used for new subdivisions or improvement districts with limited number of ownerships, large future parcel divisions or historical high tax delinquencies. Currently the 1911 Act issues are structured to have equal principal payments maturing over a 10 year period. Currently these issues are being sold at 10 to 20 percent discount with 12 percent interest coupons.

Bonds issued under the Municipal Bond Act of 1915 are typically structured to mature annually to result in equal annual principal and interest payments. They are of even denominations, usually in amounts of $1,000 dollars each. Each and every bond is secured by all the unpaid assessments in the district. Property owners pay the amount to mature each year with their property taxes as part of their tax bill. The 1915 Act issues are structured to include provisions for reserve funds and fast foreclosure procedures to reduce liability of sponsoring agency if delinquencies occur. Current market for 1915 Act Bonds includes issues maturing over 15 years at 5 to 10 percent discount and 12 percent interest coupons.

An assessment district does not have to incorporate the entire study area. Any property owner can petition for an assessment district. This is a promising means of funding drinage facilities by individual developers although the bonds would need to be backed by Humboldt County.

3. Benefit Assessments

The levying of a benefit assessment for flood control services is authorized by Assembly Bill 549 signed into law on July 16, 1979. This act authorizes the board of directors of a flood control district to levy an assessment on each parcel of real property within the district, or any zone thereof, on the basis of estimated benefit sufficient to cover the cost not otherwise offset by other available revenue of providing flood control services within the district or any zone thereof.

Prior to levying an assessment, the board must first prepare a report which contains a description of each parcel and the amount of the assessment of each parcel. Once the report is complete a public hearing is set where all protests are received. The board then makes any modifications to the assessments it deems necessary and confirms the assessments by resolution.

The question of whether the district shall be authorized to levy these assessments must then be voted on by the voters of the district or zone within a year of passage by the board. The approval of the voters may be secured by a district-wide election or by a special ballot mailed to each property owner or registered voter of the district or zone.

This is a promising method of financing that is being used by a number of communities in California. The political acceptance may require exploring due to the required election.

Current Assesmbly Bill 630 proposes repealing Section 60.400 of the Government Code authorizing Flood Control District Benefit Assessments. The Bill provides new provisions similar in substance which would modify voting and hearing procedures more closely to existing benefit assessment procedures. Our interpretation is that the bill is currently not going anywhere, but bears monitoring.

4. Subdivision Drainage Fees

The Subdivision Map Act of the State of California authorized cities and counties to adopt an ordinance requiring the payment of fees as a condition of approval of a subdivision map. This ordinance must meet the following criteria:

- be passed and in effect for a minimum of 30 days before it can be administered:
- refer to "...a drainage ... plan adopted for a particular drainage ... area which contains an estimate of the total costs of constructing the local drainage... facilities required by the plan, and a map of such area showing its boundaries and the location of such facilities";
- state that the drainage plan conforms by resolution to the County drainage master plan;
- base costs upon legislative determinations which are fairly apportioned on the need for such facilities as created by development of these and other properties in the specified area;
- not set a fee which exceeds a pro rata share of drainage facility costs, that is, the gross facility costs for each zone divided by the total gross acres in each zone.

A developer may not be charged for construction of facilities that are required to cure an existing problem in an already developed area. However, if a problem is existing it would be reasonable to expect a developer to pay for any upsizing requirements due to estimated impact of his proposed development.

5. Building Permit Fees

There are many parcels in the McKinleyville area that have proceeded past the subdivision stage. They have already been subdivided, but improvements have not commenced. It appears appropriate that these parcels pay a fair share of future drainage improvement costs. It is,

therefore, proposed that a building permit fee drainage surcharge be levied on parcels at the time a building permit is issued. This system is proposed to be used for existing lots that are ready to develop whereas, subdivision drainage fees can be levied on all future development.

6. User Charges

Various public agencies have power and have passed ordinances that allow a user charge to be levied for storm drainage facilities similar to a water and sewer charge. This could be paid along with sewer and water charges if administered by the district or it could be paid along with taxes which would perhaps be more appropriate if administered by the county. This charge could be based on lot size and number of dwellings with separate rate structures for residential and commercial sites.

It should be noted that although several agencies have passed such ordinances, none are known to be in effect in California. There has been considerable public protest in areas where attempts have been made in the past to implement similar types of charges.

7. Developer Financed Projects

The developer of new subdivisions can be held responsible for costs of required storm water facilities both on and off site. This can include the requirement to connect to the nearest existing storm water facility that is adequately sized to handle the increased flow. This may require that off-site storm water facilities be upsized for a distance downstream.

If additional upsizing is required above the sizing for the new development due to potential downstream development it may be appropriate to consider constructing a larger system. The added cost can be borne by the developer who can execute an agreement to be reimbursed as other developments tie to the system. A second option would be for a public agency to advance the additional costs of upsizing drainage systems for potential future growth from a revolving fund. They can then be reimbursed as development occurs. However, indications are that public agencies have no surplus funds and may be unwilling or unable to take on this responsibility.

8. Humboldt County Road Fund

Monies have been available in the past through a County Road Fund to upsize inadequate culverts crossing county roads. Several proposed projects reference this fund

as a source of funds. However, recent discussions with County staff indicate that these funds will probably not be available to any extent.

There are various methods of distributing benefit costs and assessing drainage fees, benefit assessments and assessment districts. It must be based upon benefits received. Many agencies levy a fixed amount per acre regardless of the type of development. However, to allow for a more equitable spread of costs, several agencies have adopted fee schedules based on the amount of runoff generated from a particular development. One method is to relate benefit to the runoff coefficient "c" in the rational formula that varies depending on land use classiification of each parcel. The coefficient increases with increased development.

Contra Costa County Flood Control District utilizes a formula based on average impervious area for a particular type of development. Their initial study randomly selected parcels from the major land use categories: single and multi-family residences, commercial, industrial, and office. These parcels were photographed from the air and careful measurements of impervious surface areas were derived. This data provided the basis for the development fee schedule.

There are approximately 4260 acres of classified land in the study area. (Essentially Agricultural, Rural, Low Density, Medium Density, Community Core, Industrial and Tourist as delineated in Table VII-1.) If the local share of $741,700 for the eleven priority projects is to be funded by the land owners this cost computes to $175 per acre.

The estimated costs for all projects is $3,481,300. Of this amount, $3,141,300 will be funded by local funds. If financed by land owners the cost for all the improvements will be $740 per acre.

However, from the public participation it is apparent that there is strong opposition to any method of funding by the existing residents. Rather it appears that any costs must be borne by the developers and the County. Table VII-2 sets forth the approximate developable land by drainage area. If the entire $3,141,300 is borne by the developers the costs equate to $1,325 per acre.

Table VII-3 shows estimated costs per acre if costs are set proportional to benefit received computed using the runoff coefficient "C" as the benefit ratio. It is recommended that land designated as agricultural (20 acre minimum) not be assessed a fee. The lack of a fee would act as incentive to keep these areas in agriculture thus maintaining the rural setting of the community.

In addition, rural acreage (5 acre minimum) should only be charged a fee for one acre of development. Any additional acreage in the parcel should not be charged an acreage fee.

The costs per acre in Table VII-3 were developed by calculating a base acreage fee and multiplying this base fee by the runoff coefficient for the individual land use designation. The base fee is calculated by dividing the total project local costs by the sum of the individual land use acreages in Table VII-2, each multiplied by its runoff coefficient. In the case of rural acreage only one-fifth of the total acreage is assumed chargeable.

In addition a cost savings is possible if development does not reach the maximum allowable for both low density (RL) and medium density (RM) designations. 60 percent of the acreage fee shall be charged for the land itself with the remaining 40 percent divided up equally among the number of possible units. Thus, for example, an acre of low density land has a maximum capacity of two units per acre. Each unit or dwelling shall be charged 20 percent of the acreage fee. Thus a developer will see a 20 percent savings in acreage fees by developing to one acre minimums instead of half acre minimums.

For medium density designation (8 units per acre maximum) each unit or dwelling shall be charged 5 percent of the acreage fee.

D. Methods of Administration

There are essentially two separate entities that exist for administering the implementation of the proposed drainage plan. They are the McKinleyville Community Services District and Humboldt County. If Humboldt County were to administer the project it would be handled by the Department of Public Works or the Humboldt County Flood Control District which is essentially the Department of Public Works under a separate title.

Humboldt County Public Works is presently responsible for the storm water drainage in the area where it crosses County roads. It appears appropriate for them to continue in this capacity as Humboldt County personnel are available to support the required administration including required maintenance. It would be more difficult for McKinleyville Community Services District to expand and mobilize staff to support these functions. They do not have a large staff and are presently taking care of water and sewer needs of the area. However, they have administered the Sewer Assessment for the District and thus, such a process would not be new to them. On the other hand, Humboldt County is perhaps better able to sell bonds if required for an assessment district and may be able to obtain a better rate.

The Humboldt County Flood Control District, perhaps with an amendment to the Act, has the capability of setting up a Benefit Assessment District as is stated in A.B. 549.

A joint effort between the County and McKinleyville Community Services District would be cumbersome and expensive and does not appear to be a feasible alternative. It appears that Humboldt County Flood Control District has the most options available for funding and Humboldt County Public Works has the required maintenance personnel. Thus, the County should become the administrator for the master drainage plan implementation.

TABLE VII-1. LAND USE CLASSIFICATION BY DRAINAGE AREA

Norton Creek Drainage

A - Agricultural	=	118
R - Rural	=	115
RL - Light Density	=	102
RM - Medium Density	=	241
T - Tourist	=	11
Total		587 acres

Widow White Creek Drainage

R - Rural	=	177
RM - Medium Density	=	685
T - Tourist	=	5
I - Industrial	=	129
C - Community Core	=	61
Total		1057 acres

Central McKinleyville Drainage

RL - Light Density	=	129
RM - Medium Density	=	329
C - Community Core	=	47
Total		505 acres

Mill Creek Drainage

A - Agricultural	=	163
RL - Light Density	=	457
RM - Medium Density	=	421
T - Tourist	=	28
C - Community Core	=	46
Total		1115 acres

Mad River Drainage

A - Agricultural	=	224
RL - Light Density	=	410
Total		634 acres

North Bank Road Drainage

RL - Light Density	=	312
T - Tourist	=	9
RP - Parks	=	40
Total		361 acres

TOTALS

A - Agricultural	=	505
R - Rural	=	292
RL - Light Density	=	1410
RM - Medium Density	=	1676
T - Tourist	=	53
I - Industrial	=	129
C - Community Core	=	154
RP - Parks	=	40
Total		4259 acres

TABLE VII-2. APPROXIMATE DEVELOPABLE LAND BY DRAINAGE AREA

Norton Creek Drainage

A - Agricultural	=	118
R - Rural	=	115
RL - Light Density	=	27
RM - Medium Density	=	98
T - Tourist	=	11
Total		369 acres

Widow White Creek Drainage

R - Rural	=	177
RM - Medium Density	=	253
T - Tourist	=	5
I - Industrial	=	98
C - Community Core	=	12
Total		545 acres

Central McKinleyville Drainage

RL - Light Density	=	46
RM - Medium Density	=	162
C - Community Core	=	19
Total		227

Mill Creek Drainage

A - Agricultural	=	163
RL - Light Density	=	288
RM - Medium Density	=	192
T - Tourist	=	31
C - Community Core	=	8
Total		682 acres

Mad River Draiange

A - Agricultural	=	224
RL - Light Density	=	117
Total		341 acres

North Bank Road Drainage

RL - Light Density	=	208

TOTAL

A - Agricultural	=	505
R - Rural	=	292
RL - Light Density	=	686
RM - Medium Density	=	705
T - Tourist	=	47
I - Industrial	=	98
C - Community Core	=	39
Total		2372 acres

TABLE VII-3. ESTIMATED COSTS PER ACRE[1]

Land Use	Cost/Acre (with County Road Fund	Cost/Acre (without County Road Fund
A	$ 0	$ 0
R	1130	1250
RL	1500	1665
RM	2065	2290
T	3195	3540
I	3195	3540
C	3195	3540

[1] Calculation based on the following formula:

$$\text{Base Acreage Fee} = \frac{\text{Total Project Local Cost}}{(0.30)(0.20)R + 0.40RL + 0.55RM + 0.85T + 0.85I + 0.85C}$$

Where:

Cost/Acre

A - Agricultural	=	$0
R - Rural	=	(0.30) (Base Fee) (Acreage)
RL - Light Density	=	(0.40) (Base Fee) (Acreage)
RM - Medium Density	=	(0.55) (Base Fee) (Acreage)
T - Tourist	=	(0.85) (Base Fee) (Acreage)
I - Industrial	=	(0.85) (Base Fee) (Acreage)
C - Community Core	=	(0.85) (Base Fee) (Acreage)

APPENDIX A

ORDINANCE NO. _____

ORDINANCE GOVERNING DRAINAGE
FACILITY IMPROVEMENTS AND DRAINAGE
FEES FOR THE MCKINLEYVILLE AREA OF HUMBOLDT
COUNTY FLOOD CONTROL ZONE _____.

The Board of Supervisors of the County of Humboldt, State of California, do ordain as follows:

Section I. DEFINITIONS

1. "Channel" is defined as an elongated open depression in the contour of land in which storm water may or does flow.

2. "Conduit" is defined as a general term for any artificial or natural channel intended for the conveyance of storm water, whether open or closed, or any structure through which water flows.

3. "Culvert" is defined as a closed conduit for the free passage of surface drainage water under a highway, railroad, canal or other embankment.

4. "Ditch" is defined as a trench for drainage or irrigation artificially made by digging.

5. "Drainage" is defined as:

   a. The process of removing surplus ground or surface water by artificial means;

   b. The manner in which the waters of an area are removed;

   c. The area from which waters are drained; a drainage basin.

6. "Stream" is defined as any course of running water flowing on the earth.

7. "Ponding Area" is defined as a pond used for storage of storm water. It shall always contain some water and will have storage capacity in addition to its normal low flow level.

8. "Storage Basin" is defined as a holding basin for storage of storm water. Under normal circumstances it is dry but has storage capacity when flows exceed the capacity of the storm water drainage system.

9. "Major Drainage Channels" are the main stream tributaries that are the final discharge points for individual drainage areas.

10. "Secondary Drainage Channel" is defined as a channel or conduit tying directly to the major channels.

11. "Minor Drainage Channels" are defined as a channel or conduit that ties to the secondary drainage channels.

12. "Dwelling Unit" is a building or portion thereof designed exclusively for residential occupancy by one family for living purposes and having only one kitchen.

13. "Subdivider" means a person, firm, corporation, partnership or association who proposes to divide, divides or causes to be divided real property into a subdivision for himself or for others except that employees and consultants of such persons or entities, acting in such capacity, are not "subdividers."

14. "Subdivision" means the division by any subdivider, of any unit or units of improved or unimproved land, or any portion thereof, shown on the latest equalized county assessment roll as a unit or as contiguous units, for the purpose of sale, lease or financing, whether immediate or future except for leases of agricultural land for agricultural purposes. Property shall be considered as contiguous units, even if it is separated by roads, streets, utility easement or railroad rights-of-way. Any conveyance of land to a governmental agency, public entity or public utility shall not be considered a division of land for purposes of computing the number of parcels. As used in this paragraph, "agricultural purposes" means the cultivation of food or fiber or the grazing or pasturing of livestock.

15. "Subdivision Map Act" Title 7, Division 2 of the Government Code of the State of California, as amended.

Section II. MINIMUM REQUIREMENTS

1. Runoff Design. Storm water runoff from a subdivision shall be collected and conveyed by a storm drain system approved by the Director of Public Works. Maximum runoff shall be computed using the Rational Method. The Rainfall Intensity - Duration Curve, for Eureka, and "C" values approved by the Director of Public Works shall be used in the computation. Runoff design shall accommodate the full and anticipated future development within the drainage area. In cases where the drainage areas are undeveloped, fully improved conditions shall be determined by the designation of the area on the General Plan or the zoning classification of the area. The storm drain system shall provide for the protection of the abutting properties that would be adversely affected by any increase in runoff attributed to the development, for which offsite storm drain improvements may be required.

2. Protection from Surface Waters. All portions of a subdivision shall be protected from flood hazard, inundation, sheet overflow and ponding of storm waters, springs and all other surface waters. All finished floors shall be a minimum of one foot above the water surface of a 100-year frequency storm runoff.

3. Adequate Storm Drainage Facilities.

a. The design of all improvements within a subdivision shall be such that all surface waters occurring within the subdivision, as well as all surface waters flowing onto and/or through the subdivision, shall be conveyed through the subdivision without damage to any improvement, building site, or dwelling which may be constructed within the subdivision. Storm drainage facilities within a subdivision shall be designed to adequately convey the storm water runoff from the ultimate development of the drainage basin or watershed.

b. Site development is to be accomplished wherever possible in a manner that will maximize percolation and infiltration of precipitation into the ground and will minimize direct surface runoff into adjoining streets, water courses, or properties.

c. Site development is to be accomplished wherever possible in a manner to maximize use of natural drainage features.

4. Surface Water Flowing from a Subdivision. Surface water flowing from a subdivision in any form or manner shall be conveyed without damage to any improvement, building, or dwelling both within and downstream of the subdivision to a natural watercourse having a definable bed and banks, or to an existing adequate storm drainage facility. Storm drainage facilities to be constructed outside of the subdivision shall be designed to adequately convey the storm water runoff from the ultimate development of the drainage basin or watershed lying within and above the subdivision. Any surface waters detained or ponded on adjacent property(s) as the result of improvements constructed by the subdivider, shall not cause any damage to said property.

5. Storm Water Disposal Restriction. Storm water flowing from a subdivision in any form or manner shall not be permitted to flow into any sanitary sewer or any other facility not specifically intended for storm water runoff.

6. Capacity of Channels and Conduits. Drainage channels and conduits shall have the following minimum capacities.

a. Major Drainage Channels. Major drainage channels and conduits shall have sufficient capacity to contain a 100-year frequency of occurrence runoff.

b. Secondary Drainage Channels. Secondary drainage channels and conduits shall have sufficient capacity to contain a ten-year frequency of occurrence runoff.

c. Minor Drainage Channels. Minor drainage channels, conduits, and appurtenant facilities shall have sufficient capacity to contain a ten-year frequency of occurrence runoff.

7. Facilities Design Criteria. The ten-year frequency storm water shall be placed in conduits when the gutter flow comes within an inch of the top of the curb or when the flow encroaches on the travelled portion of a street. Open flow shall not be allowed across a street. Storm water shall be placed in closed conduits or lined channels, except that the Director of Public Works may recommend that an existing natural or unlined artificial water course, endowed with significant natural beauty or other scenic attractions, or a natural or unlined artificial water course that does not pose a safety hazard, be utilized for drainage with such improvements as may be designated. Drainage facilities shall meet the following minimum design requirements:

a. Closed Conduit. The minimum conduit size shall be 12 inches under driveway crossings and 18 inches across streets. In general, all storm drain conduit shall be standard strength reinforced concrete pipe. All storm sewers shall have a minimum invert grade not less than that which will provide a minimum velocity of 2-1/2 feet per second for the design flow. Radii of curves in conduit must be approved by the Director of Public Works and shall not be less than those recommended by the pipe manufacturer.

b. Inlet Structures. Standard inlet structures shall be constructed at each pickup point in the system. Inlets shall be of a design approved by the Director of Public Works and shall not be flooded with a ten-year frequency of occurance runoff.

c. Closed Conduits - Minimum Flow Line. Minimum flow line gradients for closed conduits shall be not less than three one-thousandth foot per foot.

d. Closed Conduits or Lined Channels - Outlet Velocity. Where the outlet velocity from a closed conduit or lined channel exceeds the maximum allowable velocity for the earth channels receiving the flow, suitable protective works such as riprap or a stilling basin shall be provided.

e. Earth Channels - Maximum Design Velocities. Maximum design velocities for natural or artificial earth channels shall be those specified by a registered civil engineer and approved by the Director of Public Works.

f. Earth Channels - Minimum Velocities. Minimum velocities at design capacity for earth channels shall be three feet per second.

g. Earth Channels - Side Slopes. Side slopes for improved earth channels shall be those specified by a registered civil engineer and approved by the Director of Public Works, but in no instance shall side slopes be steeper than one horizontal to one vertical.

h. Lined Channels - Side Slopes. Side slopes for lined channels shall be those specified by a registered civil engineer.

i. Ponding Areas and Storage Basins when Permitted. Storage of storm water drainage by means of ponding areas or storage basins may be permitted only with the approval of the Director of the Public Works Department, after study of the proposed disposal basin topography and soil characteristics.

j. Subdrainage - Where Required. Subdrain facilities shall be provided where specified by the soil engineer controlling the work and other areas where deemed necessary by the county to prevent sliding or settlement of the earth surface. Facilities will be required to convey the subdrainage to an approved point of discharge.

8A. Easements. Drainage easements and access easements shall be required. Easements shall generally be for the purpose of maintenance only, except that multiple use easements for public access may be required to be consistant with the Conservation and Open Space element of the McKinleyville General Plan.

8B. Easements. Drainage easements and access easements shall be required. Easements shall be for the purpose of maintenance.

a. Closed Conduits - Minimum Widths of Easements. Minimum widths of drainage easements for closed conduits shall be equal to the outside diameter or width of the conduit plus three feet on each side, but in no location less than ten feet. Drainage easements shall not be divided longitudinally by lot lines.

b. Improved Channels - Width of Easements. The width of drainage easements for excavated earth channels and channels greater than three feet in width that are lined with concrete or other materials, shall contain the full outside top width of channel, including lining and the required adjacent access easements. For lined channels having a top width less than three feet the minimum width of drainage easement shall be ten feet.

c. Improved Channels - Access Easements.

1) For excavated earth channels access easements shall be provided along the banks as follows:

Channel Top Width (Feet)	Access Easements (Minimum Width-Feet)
0-10	12 one side, 3 other side
10-30	15 one side, 3 other side
30-40	18 one side, 3 other side
40-50	21 one side, 3 other side
50-60	15 each side
60-70	18 each side
80 and above	21 each side

2) For lined channels, access easements shall be provided along the banks as follows:

Channel Lining Top Width (Feet)	Access Easements Minimum Width (Feet)
3-10	3 one side, 12 other side
10-15	6 one side, 12 other side
15-30	6 one side, 15 other side
30-40	6 one side, 18 other side
40-50	6 one side, 21 other side
50 and above	same as earth channels

3) Access easements shall be graded in a manner so as to be suitable by vehicular maintenance equipment but need not be surfaced. Minimum radius of centerline of access easements shall be forty feet. All access easements along channels shall be provided with ingress easements from a public way and be usable by vehicular maintenance equipment. The minimum width of the ingress easements shall be twelve feet. Where trees on and adjacent to channel banks are to remain, adequate additional vehicular access easement width shall be dedicated.

d. Unimproved Channels - Width of Easements. The width of drainage easements for unimproved channels with side slopes steeper than 2:1 (2-horizontal to 1-vertical) shall be determined by a line measured from the toe of slope a distance of twice the channel depth plus the appropriate top of bank setback as follows:

Channel Depth (Feet)	Top of Bank Set-Back (Minimum Width-Feet)
0-6	12 each side
6-12	15 each side
12-18	18 each side
18 and above	21 each side

The width of drainage easements for unimproved channels with side slopes flatter than 2:1 (2-horizontal to 1-vertical) shall be the channel top width plus the appropriate top of bank setback.

e. Structures and Landscaping within Easements. No permanent structures of any kind other than drainage structures may be constructed within or over any drainage or access easement. Landscaping including trees and shrubs may be accomplished within easements upon approval by the Director of the Public Works.

Section III. DRAINAGE FEES

1. The drainage plan and map entitled "McKinleyville Drainage Study," dated July, 1982, on file with the Clerk of this Board, is hereby adopted pursuant to Sections 66483 and 66487 of the State of California Government Code.

2. The Humboldt County official having jurisdiction, shall not issue a building permit for construction resulting in a 100 square foot or more increase in ground coverage, within McKinleyville Service Area until the fees set forth in this ordinance have been paid. The official having jurisdiction may accept cash, or other consideration (in the form of actual construction of a part of drainage facilities by the applicant or his principal) in lieu of the fee when authorized to do so by the Director of Public Works. This fee shall not be required if the requested permit is to perform one of the following:

a. To replace a structure destroyed or damaged by fire, flood, wind or acts of God. This exception is only to the extent that the resultant structure has the same or less ground floor square footage as the original structure; if the ground floor square footage is increased, the square footage of the additional ground floor area shall be used to determine if the fee is due.

b. To construct a swimming pool, patio, patio cover, or driveway.

c. To construct facilities (including dwellings) on lots greater than twenty acres in area, provided less than ten percent of the lot area is covered by impervious surfaces.

d. To construct, enlarge or modify concrete or asphalt concrete surfaces incidental to land uses other than single family residential. This exemption is only to the extent that the increase in impervious area is less than 1,500 square feet.

e. If the subdivision is for the conveyance of land to a government agency, public entity, public utility, or abutting property owner where a new building lot or site is not created as a result of the conveyance.

3. In the case of a new subdivision, the subdivider shall pay sixty percent of the drainage fees prior to recordation of the final or parcel map. The fees may be paid on the entire proposed subdivision or on each individual unit for which a final or parcel map is filed. The remaining forty percent shall be collected at the time of the issuance of individual building permits. In the case of existing subdivisions that have not yet filed for building permits, the entire drainage fee shall be collected at the time of issuance of the individual building permits.

4. The Base Fee, used to determine Drainage Fees, shall be on a per acre basis and shall be set by resolution.

a. Agricultural Land (20 acre minimum) shall not be assessed an acreage fee.

b. Rural Land (5 acre minimum) shall only be assessed an acreage fee for one acre in any parcel split. Additional acreage shall not be charged an acreage fee.

c. For individual existing strucures, costs of additions will be determined by multiplying the Base Fee per acre by the percentage increase and multiplying this product by the runoff coefficient "C" designated to this individual structure.

d. For individual lots the Drainage Fee shall be determined by multiplying the Base Fee per acre by the area of the lot, excluding the area falling within the public street right-of-way, calculated to the nearest hundredth of an acre, and multiplying this product by the runoff coefficient "C" designated to the lot.

e. For subdivisions the Drainage Fee shall be determined by multiplying the Base Fee per acre by the gross area of the subdivision excluding the area falling within the public street right of way prior to the land being subdivided, and multiplying this product by the runoff coefficient "C" designated to this subdivision.

f. The forty percent fee to be collected at the building permit stage shall be divided equally among the maximum number of dwelling for low density (RL) and medium density (RM) designated land. Thus each dwelling on RL designation (2 dwellings per acre) shall be charged twenty percent. Each dwelling on RM designation (8 dwellings per acre) shall be charged five percent. This allows a savings in drainage fees for areas not developed to maximum capacity.

g. Runoff coefficients shall be determined from the Land Use Designation Map of the McKinleyville General Plan or as actually zoned. The runoff coefficients (C values) for each of the various land use designations shall be as follows:

Land Use Designation	Coefficient of Runoff "C"
RM - Medium Density	0.55
RL - Low Density	0.40
R - Rural	0.30
C - Community/Core	0.85
I - Industrial	0.85
T - Tourist	0.85

5. No lot shall be subject to payment of the fee, under the terms of this ordinance, more than once.

6. With the filing of the improvement plans for the first unit of any subdivision, the subdivider or developer shall submit a master storm drainage plan for the entire area covered by the tentative map. In so doing, the subdivider or developer shall design the system to essentially conform to the McKinleyville Drainage Study plan. The subdivider shall construct and dedicate to the County, the necessary storm water drainage improvements.

Whenever permanent off-site storm drainage facilities are required by the County to be constructed and installed as a part of a subdivision, in connection with the development of such subdivision, an amount of money based on the cost of construction of such storm drainage facilities shall be credited against storm drainage fees chargeable to such owners as defined in Section III, provided such facilities are owned by the County at the time the owner pays such fees, or will be owned by the County upon acceptance thereof by the County, until the amount of such

credit is exhausted. In the event that the amount so credited under this section exceeds the storm drainage fees which are chargeable to such owner, the amount of such excess shall be reimbursed as determined by the Director of Public Works, based on the estimated cost of facilities at the time of original construction. The reimbursement will be based on the percentage of the area that other benefitted lands are in relation to the total benefit area. The subdivider will be reimbursed by the County from monies received from the benefitting lands pursuant to this ordinance. Reimbursements under this paragraph shall terminate ten years after acceptance by the County of the construction and installation of the facilities on which the reimbursement are based.

Section IV. ENACTMENT

This ordinance shall take effect thirty (30) days after its' passage and prior to the expiration of fifteen (15) days after the adoption hereof shall be published in a newspaper or general circulation within the County of Humboldt.

The foregoing ordinance was duly regularly passed and adopted by the Board of Supervisors of the County of Humboldt on the _____ day of _____, 1982 by the following vote, to wit:

AYES:

NOES:

ABSENT:

_____
Chairman of the Board of Supervisors
County of Humboldt, California

APPENDIX B

AGREEMENT
FOR
ENGINEERING SERVICES
FOR
McKinleyville Drainage Study

This agreement made and entered into this 19th day of January, 19 82 by the between County of Humboldt, State of California, c/o Department of Public Works, 1106 Second Street, Eureka, California, 95501, hereinafter referred to as the COUNTY, and Winzler and Kelly Consulting Engineers, a California corporation, 633 Third Street, Eureka, California, 95501, hereinafter referred to as the ENGINEER.

WITNESSETH

That, WHEREAS, the COUNTY requires a drainage study to be performed in the McKinleyville area;

and, WHEREAS, the ENGINEER is duly licensed as a registered Professional Engineer in the State of California and is qualified and experienced to provide such engineering services.

NOW, THEREFORE, the COUNTY and the ENGINEER, for the consideration hereinafter named, agree as follows:

ARTICLE I: ENGINEER'S SERVICES

The Engineer is to develop a comprehensive drainage plan for the McKinleyville area shown on Exhibit B. The plan, when completed, shall be a tool designed for immediate implementation and shall provide a guide for appropriate long-term solutions to drainage in McKinleyville. The plan shall, to the maximum extent possible, use the many natural water courses in McKinleyville. The plan will not be a detailed lot-by-lot review as this must be ultimately addressed during implementation.

The engineer will consider the McKinleyville area on a drainage area basis and report their findings and recommendations specific to each basin.

The plan will be prepared by accomplishing the tasks that are described as follows:

Task 1: Data Collection and Review

This task will be to obtain all the data available concerning the McKinleyville drainage area. This will include work done by the County Department of Public Works staff, previous work by Baruth & Yoder, a review of County Public Works slides of the McKinleyville area taken during the winter of 1975, a review of recent mapping completed by the Federal Emergency Management Agency, recent mapping completed by Koretsky

and King, data available from the U. S. Coast & Geodetic Survey, mapping from the U. S. Corps of Engineers, and personal knowledge of the area.

This task will also include the collection of various planning documents and utility location maps, including the McKinleyville General Plan, the open space and recreation element of the County General Plan, the Local Coastal Plan, the Humboldt County Trails Plan, and the mapping of the existing water and sanitary sewerage systems.

This task will also include field inspection of Mill Creek between Central and Azalea Avenues, Widow White Creek between Murray Road and Babler Road, and Norton Creek from Highway 101 to Dows Prairie Road.

Task 2: Establish Criteria for Plan Development

The County Public Works staff has generally defined the major drainage courses within the McKinleyville area and has compiled expected flow data for storm recurring events of 10 and 100 years. This work was based on ultimate buildout proposed by the General Plan. The Engineer shall use this data and supplement it in some of the smaller drainage areas where such calculations have not been completed. Under this task the Engineer will review the existing planning documents, define the capacities of the water and sewer systems, making overlays of the various plans and existing utilities to determine consistencies or non-consistencies in the documents. From this the Engineer will, in conjunction with the Drainage Committee, establish how to consider areas where the various plans do not coincide.

As part of this task, the Engineer will also solicit input from the District and County staffs, the Drainage Committee, and the community at large. Input from Fish and Game, the Coastal Commission, and other interested agencies will also be solicited.

Also as a part of this task a review of existing major drainage laws in the State will be made so that as the plan is developed, it will be consistent with existing regulations.

Task 3: Develop Proposals for Drainage Control

Using information from Tasks 1 and 2, a determination of ultimate capacity of the existing drainage features, including the major natural stream channels (Mill Creek, Widow White Creek, and Norton Creek), will be made and compared to maximum expected runoff. In conjunction with this task, alternate methods for routing and controlling storm water will be made and the limits of expected high water determined. From this information options for controlling flooding and routing of storm water in each basin will be established.

These initial proposals will be reviewed with the Citizens Advisory Committee and the District and County staffs.

Work from Task 3 will be further refined and detailed proposals for near-and long-term drainage planning established. This would include detailed mapping of the proposed improvements and outlining the boundaries

of the open areas required for future drainage use. This task would also reference documentation for multiple use of these areas.

Task 4: Develop Cost Estimates and Prepare Detailed Proposals

This task would set forth, by drainage area, the costs of the facilities, near- and long-term, that will be proposed as a part of this report. The cost estimates will be presented in tabular form by drainage basin and will be keyed to the improvement maps.

Task 5: Financial and Institutional Arrangements

The first order of work will be a review and analysis of current institution arrangements and alternate methods for storm drainage management and financing. This will include a thorough exploration of the following revenue sources.

Ad valorem taxes

Service charges/fees

State loans and grants

Special taxes/assessments

This analysis will consider current and proposed State and local regulations regarding drainage management. This review will also include the legal and enabling legislation which governs specific distribution of financial resources for drainage systems.

In conjunction with the financial study, a review and analysis will be made of the various means to administer implementation of the program. Options for administration include the McKinleyville Community Services District, the County of Humboldt, or some type of joint agreement.

Following completion of the above tasks an analysis of the following opportunities and restraints, as they relate to options for program administration, will be made.

Public agency versus responsibilities

Public agency versus powers/authority

Public agency versus financing mechanisms

Financing mechanisms versus cost

Public agency versus borrowing capacity

Public agency versus revenue sources

Financing mechanisms versus procedures

This analysis will also be summarized in matrix form.

This task will also develop the draft drainage ordinance required for program implementation. A proposed plan tailored to the specific needs of the McKinleyville area, will be developed with the Drainage Committee and Board staffs. In conjunction with establishing an optimum institutional arrangement, alternatives for enacting an enforceable ordinance will be explored.

Task 6: Community Involvement

The Engineer shall, in conjunction with all phases of the report preparation, involve the community at large to the maximum extent possible. This will be done initially by interaction with the Board staffs and the Drainage Committee, and will ultimately entail two public meetings, one when draft concepts are available, and a second public meeting when the final plan is nearly complete. This task shall include, besides the two public meetings, three meetings with the Drainage Committee, one study session with the McKinleyville Community Services District, and one study session with the Board of Supervisors. In addition, the Engineer shall also work closely on an ongoing basis with County and District staffs and be available to present the reports to the McKinleyville Community Services District and the Humboldt County Board of Supervisors.

Task 7: Final Report Preparation

The Engineer shall assemble all materials in a plan that will be easy to read and understand so that an ordinary person would be able to determine financial costs, locations of drainage improvements, easements, and diversions developed within the scope of this agreement. A program for implementation and administration of the plan shall also be included.

In addition, a copy of all calculations pertaining to pipe sizing and cost estimates shall be bound and delivered to the County.

The reproduction of the final report will be done by the County except for any sheets that are not a standard 8-1/2" x 11" size. The Engineer will reproduce the other size sheets, place them at the proper place in the reports, and cover and bind the reports. Fifty copies of the final report will be necessary.

The same reproduction procedure will be followed for any draft reports that are needed.