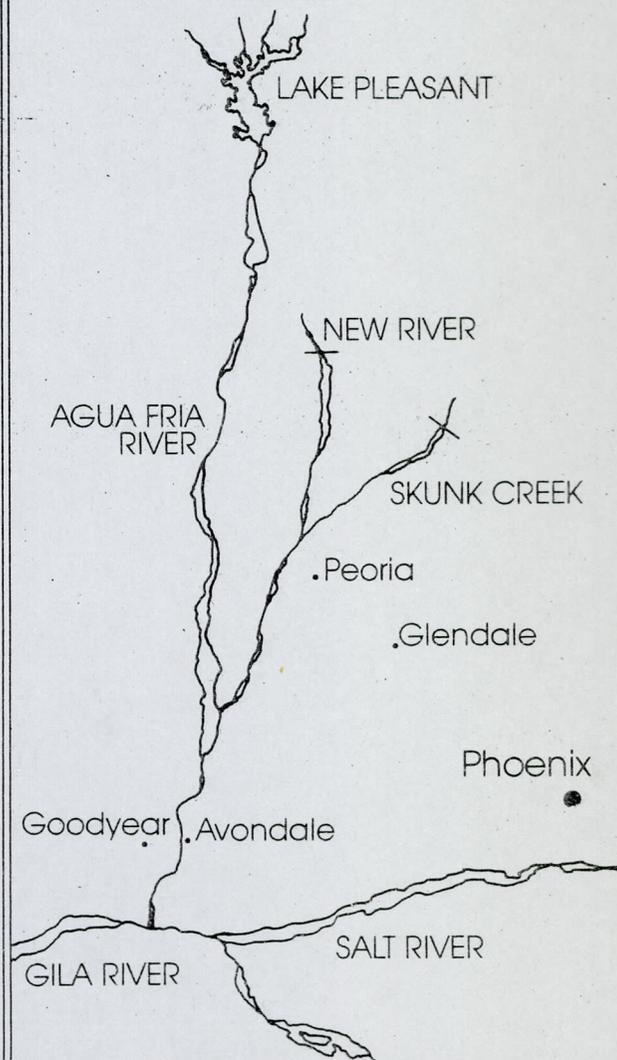


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NEW RIVER SKUNK CREEK AGUA FRIA RIVER FLOOD CONTROL PLAN

prepared for the
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WILLDAN ASSOCIATES
OCTOBER 1982



**New River/Skunk Creek/Agua Fria River
Conceptual Flood Control Plan**

Prepared by:

**Willdan Associates
1550 East Meadowbrook Avenue
Phoenix, Arizona 85014**

Prepared for the

**Flood Control District of Maricopa County
FCD Contract 81-12**



October 1982

PREFACE

In accordance with the Flood Control District of Maricopa County contract number FCD 81-12, Willdan Associates was retained to prepare a conceptual flood control plan for New River, Skunk Creek, and the Agua Fria River. The plan seeks feasible and environmentally sound solutions to the problems associated with the acquisition of large areas of developing urban lands for flowage easements. This conceptual floodplain study is based on the hydraulic parameters of these stream channels. This study also inventories the existing environmental conditions, existing and future land uses, land ownership, and incorporates the concept of open space preservation in the formulation of floodplain use alternatives.

ACKNOWLEDGEMENTS

The New River/Skunk Creek/Agua Fria River Flood Control Plan required the assistance and cooperation of many people. Municipal, county, and state representatives cooperated with the contractor in providing guidance and also aided in the search for land use and ownership information. The U.S. Army Corps of Engineers furnished data sources for flood control and open space planning, maps, and aerial photographs for the study area. Technical assistance and editorial review have been provided by the Flood Control District of Maricopa County.

New River/Skunk Creek/Agua Fria River
Flood Control Plan

<u>Contents</u>	<u>Page</u>
I. INTRODUCTION	1
The Study Area	1
Background	2
The Problem	3
Goals of the Plan	5
II. METHODOLOGY	6
Inventory and Mapping Procedure	6
Land Use Inventory	7
Proposed Changes in Existing Land Use	8
Land Ownership Inventory	8
Jurisdictional Boundaries	9
III. OPEN SPACE PLANNING	26
Wildlife Habitat Areas	29
Recreation Open Space	30
Buffer Areas	31
IV. PARTICIPANT INPUT	32
V. EXISTING ENVIRONMENTAL CONDITIONS	35
Topography	35
Geology	35
Soils	35
Surface Hydrology	36
Subsurface Hydrology	37
Water Quality	37
Vegetation	38
Wildlife	40
Archaeological and Historical Resources	42
Population and Land Use	42
Transportation	46
Economy	46
Open Space and Public Use Areas	47
Aesthetics	48
VI. EXISTING AND PROPOSED LAND USE DESCRIPTIONS	64
Reach 1	64
Reach 2	65
Reach 3	66
Reach 4	68

	<u>Page</u>
VII. FLOOD CONTROL ALTERNATIVES	85
Hydrology	85
Alternatives Development	87
VIII. ENVIRONMENTAL EFFECTS OF THE CHANNELIZATION ALTERNATIVES	89
Topography	89
Geology and Soils	89
Surface and Subsurface Hydrology	89
Water Quality	89
Vegetation	90
Wildlife	90
Archaeological and Historical Resources	90
Land Use	90
Population	91
Transportation	91
Economy	91
Open Space and Public Use Areas	92
Aesthetics	92
IX. RECOMMENDATIONS	93
Reach 1	93
Reach 2	94
Reach 3	94
Reach 4	95
X. CONCLUSIONS	122
XI. BIBLIOGRAPHY	123

Tables

Page

Table 1:	Participants' Input	34
Table 2:	Future Population Distribution for Communities Adjacent to New River, Skunk Creek, and Agua Fria River	45
Table 3:	New River/Skunk Creek/Agua Fria River Estimated Flow Rates	86

LIST OF MAPS

<u>Map</u>	<u>Page</u>
Land Ownership/Jurisdiction	
Key Map	11
Map 1	12
Map 2	13
Map 3	14
Map 4	15
Map 5	16
Map 6	17
Map 7	18
Map 8	19
Map 9	20
Map 10	21
Map 11	22
Map 12	23
Map 13	24
Map 14	25
Existing Land Use	
Key Map	49
Map 1	50
Map 2	51
Map 3	52
Map 4	53
Map 5	54
Map 6	55
Map 7	56
Map 8	57
Map 9	58
Map 10	59
Map 11	60
Map 12	61
Map 13	62
Map 14	63
Proposed Changes in Existing Land Use	
Key Map	70
Map 1	71
Map 2	72
Map 3	73
Map 4	74
Map 5	75
Map 6	76
Map 7	77
Map 8	78
Map 9	79
Map 10	80
Map 11	81
Map 12	82
Map 13	83
Map 14	84

LIST OF MAPS
(continued)

<u>Map</u>	<u>Page</u>
Flood Control Plan Alternatives	
Key Map	97
Map 1	98
Illustrative Typical Section A-A	99
Map 2	100
Illustrative Typical Section B-B	101
Plan View for Section B-B	102
Map 3	103
Map 4	104
Illustrative Typical Section C-C	105
Map 5	106
Illustrative Typical Section D-D	107
Map 6	108
Map 7	109
Illustrative Typical Section E-E	110
Map 8	111
Illustrative Typical Section F-F	112
Map 9	113
Map 10	114
Map 11	115
Illustrative Typical Section G-G	116
Map 12	117
Illustrative Typical Section H-H	118
Plan View for Section H-H	119
Map 13	120
Map 14	121

I. INTRODUCTION

The New River/Skunk Creek/Agua Fria River Conceptual Flood Control Plan was initiated by the Flood Control District of Maricopa County (FCD) in an effort to offer alternative conceptual floodplain designs to be used as a guide for local decision making and physical development along these stream channels. Located in central Maricopa County, Arizona, on the western edge of the Phoenix metropolitan area, these rivers cut across rapidly developing areas of the cities of Phoenix, Glendale, Peoria, Sun City, and Avondale. Each of these municipalities provided input for incorporation into the alternative plans. In concert with hydraulic constraints and environmental considerations, this information offers the basis for the planning alternatives.

The flood control plans consist of conceptual projects for specific locations, some or all of which may be combined with one another to permit flexibility in the final design. These alternatives will allow the FCD, municipalities, concerned agencies and organizations the opportunity to jointly define a comprehensive policy for flood control that is both environmentally sound and publicly acceptable. As support for development of a comprehensive policy and a solution to flooding problems, the New River/Skunk Creek/Agua Fria River Conceptual Flood Control Plan provides the framework on which to base final flood control decisions by these groups. This planning document describes the study approach, participant input, existing and future conditions, areas of concern, and, based on these findings, alternative methods for flood control, environmental impacts, and the recommendations and conclusions of the study.

The Study Area

The study area is approximately 30 miles (48 km) long and includes all lands within the 100-year floodplain. Also included are lands surrounding the floodplain to a distance of approximately 0.5 miles (0.8 km). The study area is divided into four reaches, with each reach then subdivided into map sections:

- o Reach 1 - Along New River, from New River Dam to Skunk Creek (maps 1 thru 3 and a portion of map 6);

- o Reach 2 - Along Skunk Creek, from Adobe Dam to New River (maps 3 thru 6);
- o Reach 3 - Along New River, from Skunk Creek to the Agua Fria River (maps 6 thru 9); and,
- o Reach 4 - Along the Agua Fria River, from New River to the Gila River (maps 10 thru 14).

Background

In two studies completed in 1976, the U.S. Army Corps of Engineers presented a Project Plan and Environmental Impact Statement (EIS) for the New River and Phoenix City Streams Project. The Corps studies recommend a combination of structural and non-structural measures be employed to protect existing structures and prevent further encroachment of the floodplain in the study area. In the Project Plan, Skunk Creek from Adobe Dam to the Arizona Canal Diversion Channel was found to have a non-damaging capacity discharge from Adobe Dam. In this case, local interests are required to manage and maintain a designated floodway and floodway fringe. The Project Plan recommended acquisition of flowage easements by the local sponsor (the FCD) from the Arizona Canal Diversion Channel to the New River confluence, and recommendations also included control measures such as flood proofing and removal of residences. New River, from the proposed New River Dam to Skunk Creek has a non-damaging capacity discharge from New River Dam; consequently, local interests are required to manage and maintain a designated floodway and floodway fringe along this reach also. From the New River/Skunk Creek confluence downstream along New River and the Agua Fria River to its confluence with the Gila River, the Project Plan proposed flood proofing, permanent evacuation of the floodplain, bank stabilization, levee construction, and some channelization and channel clearing, in addition to flowage easement acquisition requirements.

The Corps' proposed plan also addressed the elements of recreation and aesthetics along these stream channels. The acquisition of flowage easements would provide open space with an opportunity for this open space to be used for recreation purposes. Twenty miles (32 km) of hiking and riding trails, under a recreation easement, were recommended for development in conjunction with rest stops and staging areas that would be

acquired in fee title. Recreation facilities would be managed and maintained by local recreation agencies. The acquisition of flowage easements was reported as having a beneficial impact on aesthetics because it would preserve open space in an urbanizing area. According to the Corps plan, the recommended channels would not be highly visible because of the relatively level topography. In addition, suggested landscaping in the channel rights-of-way would serve to screen views.

Overall, the accomplishments of the Corps plan for the New River/Skunk Creek/Agua Fria River Study Area include:

- o flood damage reduction
- o maintenance of vegetation and wildlife values and fulfillment of some recreation needs in the county through open space preservation;
- o reduction in health and safety hazards resulting from floods;
- o in limited areas, the ability to develop lands for urban uses in accordance with local land use plans.

The Problem

In 1976, the rivers under study were largely located in vacant and agricultural areas; however, urban development has steadily converted these lands to residential, commercial, and industrial uses. In the past, encroachment of the floodplain occurred primarily due to farming, an occasional farm related building or extraction of sand and gravel. Today, the encroachment trend continues as these lands become urbanized. To be developed for urban uses, lands in private ownership must consider flood protection. To prevent the possibility of flood damages, many developers have undertaken or proposed flood control measures for the areas of the rivers directly affecting their property. This practice is condoned by the municipalities, and is also within the limits of county and municipal floodplain regulations; however, it results in a haphazard array of relatively inconsistent controls, and fails to contribute to an overall flood control system. Also, on the negative side, the Corps recommended plan does not provide flood protection for river crossings. Dip crossings and small capacity bridges are unusable

during floods, disrupting normal traffic flow. This disruption prevents emergency vehicles, school buses, essential services, and regular commuter traffic from easily crossing the rivers.

In 1976, the prospect of flowage easements along these rivers was compatible with the small communities and low-intensity uses occurring at that time. Open space, wildlife, and vegetation values were significant because the types and intensity of uses made these considerations possible. The costs of acquisition and maintenance of flowage easements were considered feasible and within the economic limitations of the local sponsoring agency. In the interim, these values have lost much of their appeal and public support for several reasons. Some of these change agents include:

- o Flooding in the recent past, allowable uses in the floodplain, such as sand and gravel extraction, and flood control measures have destroyed much of the vegetation that in 1976 provided viable wildlife habitat.
- o As the cities and towns in the study area have grown, general land use plans have been prepared and/or policy has been set that promotes residential, commercial, and industrial development based on community needs and the economic advantages these developments present to the community. The general land use plans allow for the development of appropriate flood control measures so that the 100-year floodplain may be developed for urban uses.
- o Revised hydrology may require that larger areas of flowage easements be acquired by the local sponsor.
- o Increased property assessments on the lands in the study area, escalating costs for maintenance, and the limited resources of the local sponsor make the concept of extensive flowage easement acquisition less desirable.

These change agents have made implementation of the Corps recommended plan less desirable in terms of the existing conditions and actual needs and resources available to the local communities and sponsor.

Goals of the Plan

The goal of the New River/Skunk Creek/Agua Fria River Conceptual Flood Control Plan is to develop alternatives to the Corps recommended Project Plan. As previously mentioned, changes in land use have occurred in the study area due to rapid growth and development on lands surrounding the 100-year floodplain, private land uses within the floodplain, and flood occurrences. Documenting these changes allows for comparisons and determinations to be made on the applicability of the Corps project plan with a more current perspective provided by this additional information. The intent of this plan is to renew coordination with local municipalities and promote the adoption of a cohesive flood control plan that is publicly acceptable and environmentally tenable. The environmental concerns of the Corps project plan included those of wildlife habitat, aesthetic quality, and open space uses. Therefore, the following goals for this conceptual flood control plan with respect to these issues have been formulated:

- o Avoid adverse environmental impacts through the loss or permanent alteration of significant wildlife habitat;
- o Preserve the aesthetic quality of the study area;
- o Preserve open space identified for conservation in local land use plans;
- o Coordinate municipal and county land use plans;
- o Reduce flowage easement acquisitions to a reasonable level.
- o Provide an alternative flood control program that achieves the goals listed above.

II. METHODOLOGY

Land use information was a part of the data collection effort because it provides guidance in the development of flood control alternatives. Toward this end, four inventory and mapping tasks were accomplished:

- o Existing Land Use Inventory - to determine the existing uses in the study area (Map Set 1).
- o Proposed Changes in Existing Land Use Inventory - to determine how projected land uses will affect change in the study area (Map Set 2).
- o Land Ownership Inventory - to provide baseline data on public and private ownership in the study area (Map Set 3).
- o Jurisdictional Boundaries - to show existing city limits and proposed annexations (shown on Map Set 3 with land ownership).

The procedures for collection of this information are described in detail in the following sections.

Inventory and Mapping Procedure

The initial area studied was the 100-year floodplain with Adobe Dam (now under construction) and the proposed New River Dam in place. In addition, the area paralleling the floodplain, for a distance of approximately 0.5 miles (0.8 km), was surveyed to provide information on adjacent uses of the floodplain. For inventory and

mapping purposes, the study area was divided into the four previously described reaches and mapping sections. All mapping was completed on aerial photographs at a scale of one inch (2.5 cm) to 1,000 feet (305 m).

Land Use Inventory

The purpose of the land use inventory was to identify the existing land uses located within the defined study area boundary. To aid in this survey, uses were generally mapped on aerial photographs and field checked. The following categories and definitions were used:

- o Residential - All residential land uses -- single family, multi-family, mobile home, nursing home.
- o Commercial - All lands used for retail, wholesale, or service oriented businesses as well as indoor private recreation.
- o Industrial - Lands used to support both heavy and light industry, warehouses, lands used for mining or the removal of materials from the ground, and landfills used for the disposal of solid waste.
- o Agriculture - Land used for cultivation and livestock as well as land used for structures and residences associated with agricultural use.
- o Recreation/Open Space - Lands used for public outdoor recreation such as parks.
- o Open Space - Generally defined as land with no infrastructure.

Proposed Changes in Existing Land Use

The purpose of the Proposed Changes in Existing Land Use mapping task is to enable comparisons to be made: how the existing land is proposed to be used and how these proposed land use changes may affect the development of alternatives. Mapping of the proposed changes in existing land use was done with the aid of current general land use plans and zoning information for the entities having jurisdiction within the study area. These include Maricopa County, Glendale, Avondale, Phoenix, Goodyear, and Peoria. Additional proposed land use information for mapping was obtained through personal contacts and/or telephone conversations with staff members from these agencies. Those categories used for mapping existing land uses (residential, agricultural, commercial, recreation/open space, industrial, open space) were used for mapping proposed land uses so that comparisons can be readily made. Only the changes in existing land uses have been mapped so that the proposed conversions are easily highlighted.

Land Ownership Inventory

A generalized investigation of land ownership within the New River/Skunk Creek/Agua Fria River Conceptual Flood Control Plan yielded six main ownership categories:

- o Maricopa County
- o City or Town
- o State of Arizona
- o Private
- o School District
- o Federal Government

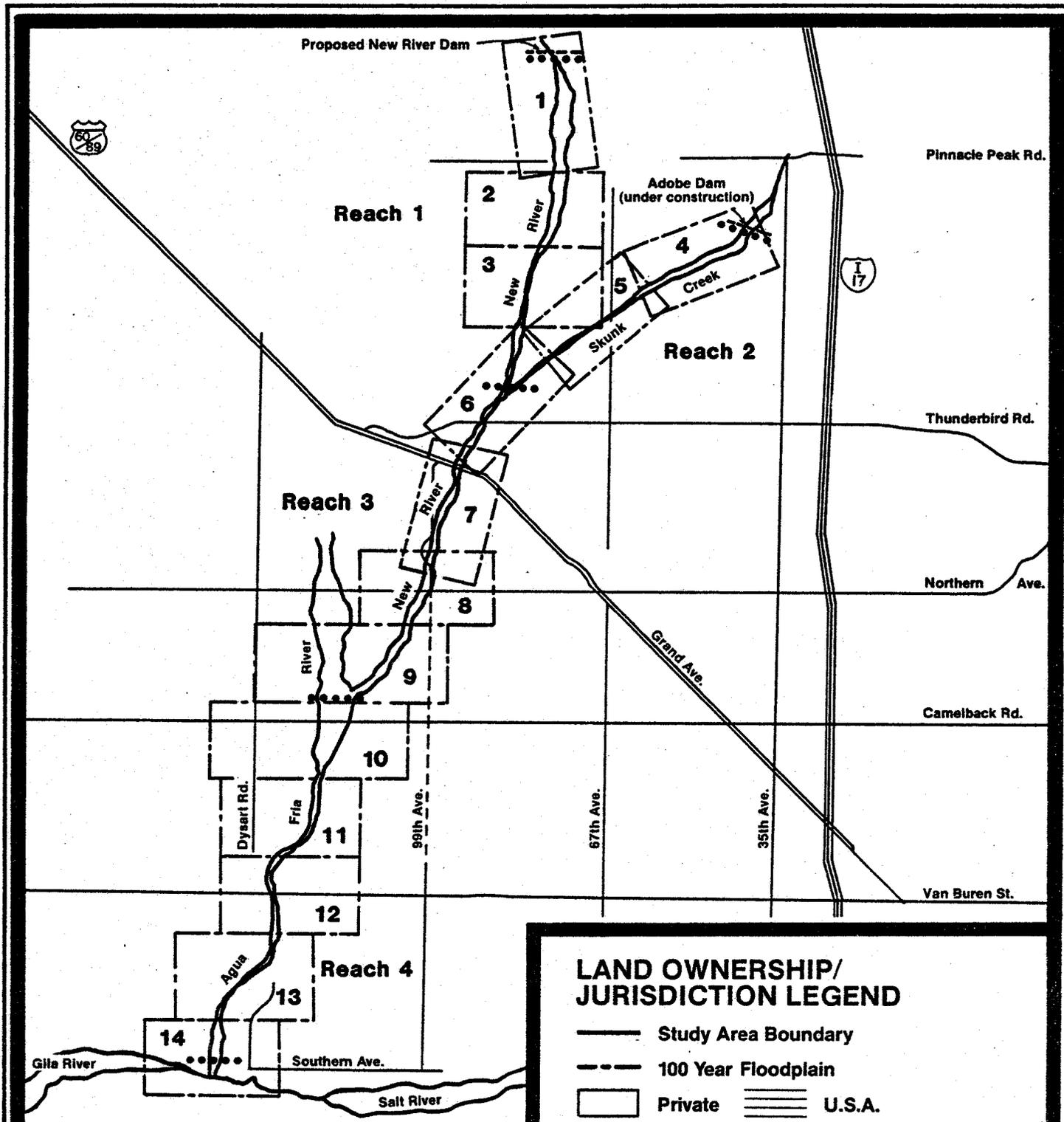
To begin the generalized land ownership investigation, copies of County Assessor's maps were obtained for the study area. These maps graphically display land parcel boundaries and each parcel is labeled with a Maricopa County Assessor's number. These numbers, representing the book, map, and parcel, correspond to Maricopa County land ownership information stored on microfiche. For this study, Assessor's numbers were used to obtain ownership data directly from the County Assessor's microfiche, or by obtaining copies of tax rolls of land ownership from St. Paul Title, Phoenix, Arizona. It should be noted that recent transfers of land ownership are not always evident on county microfiche or on title company tax rolls. Ownership information for this study is assumed to be current through December 1980.

The six categories of land ownership were displayed on aerial work maps, and then transferred to original aerial maps at a scale of one inch (2.5 cm) equals 1,000 feet (305 m). Due to graphic limitations of scale, small ownership areas were not mapped if either dimension was less than 200 feet (61 m).

Jurisdictional Boundaries

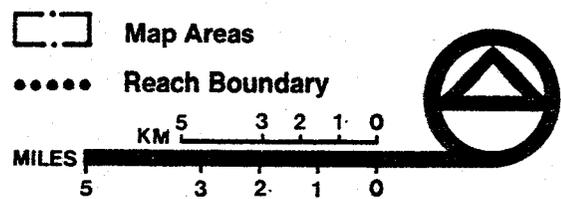
Jurisdictional information for the New River/Skunk Creek/Agua Fria River Conceptual Flood Control Plan will determine those agencies with jurisdiction over any portion of the river channels and/or 100-year floodplain. This process identifies the entities that may be involved in the planning and implementation of flood control alternatives. Because the study does not require a detailed investigation of jurisdictional boundaries, the Central Maricopa County jurisdictional map, prepared by the County Department of Planning and Development, was used as the one source. This map source is current through July 1981. The jurisdictions found to be located within the conceptual flood control plan study area are:

- o City of Avondale
- o City of Glendale
- o Maricopa County
- o City of Peoria
- o City of Phoenix
- o Sun City
- o City of Goodyear

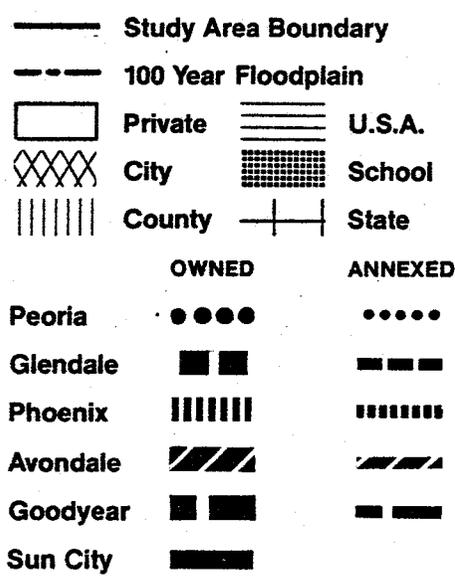


LAND OWNERSHIP/JURISDICTION • KEY MAP
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981

KEY MAP LEGEND

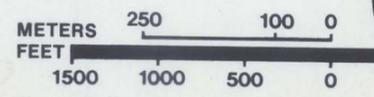


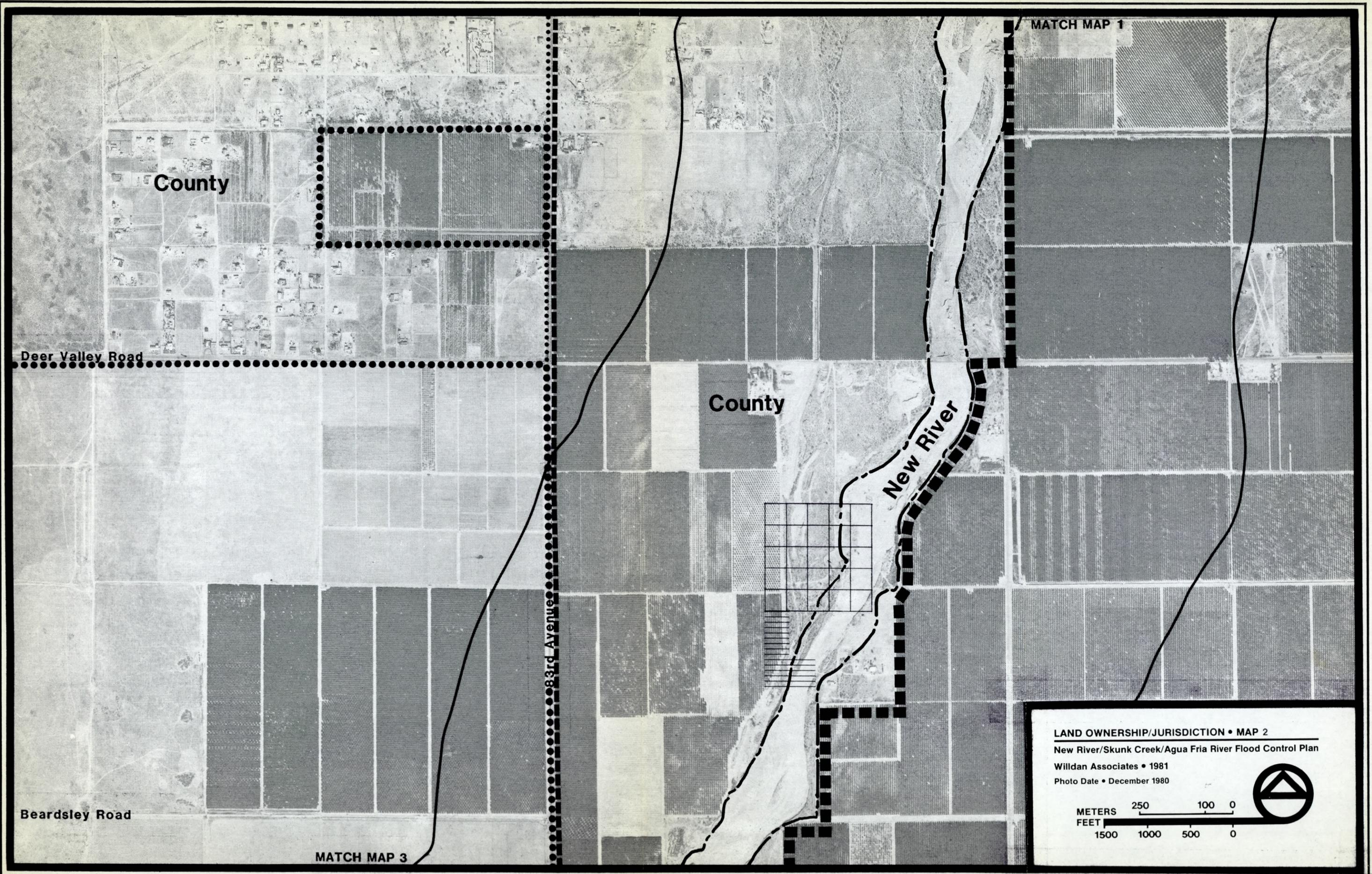
LAND OWNERSHIP/ JURISDICTION LEGEND





LAND OWNERSHIP/JURISDICTION • MAP 1
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981
 Photo Date • December 1980





MATCH MAP 2

83rd Avenue

New River

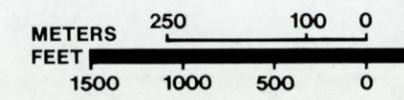
75th Avenue

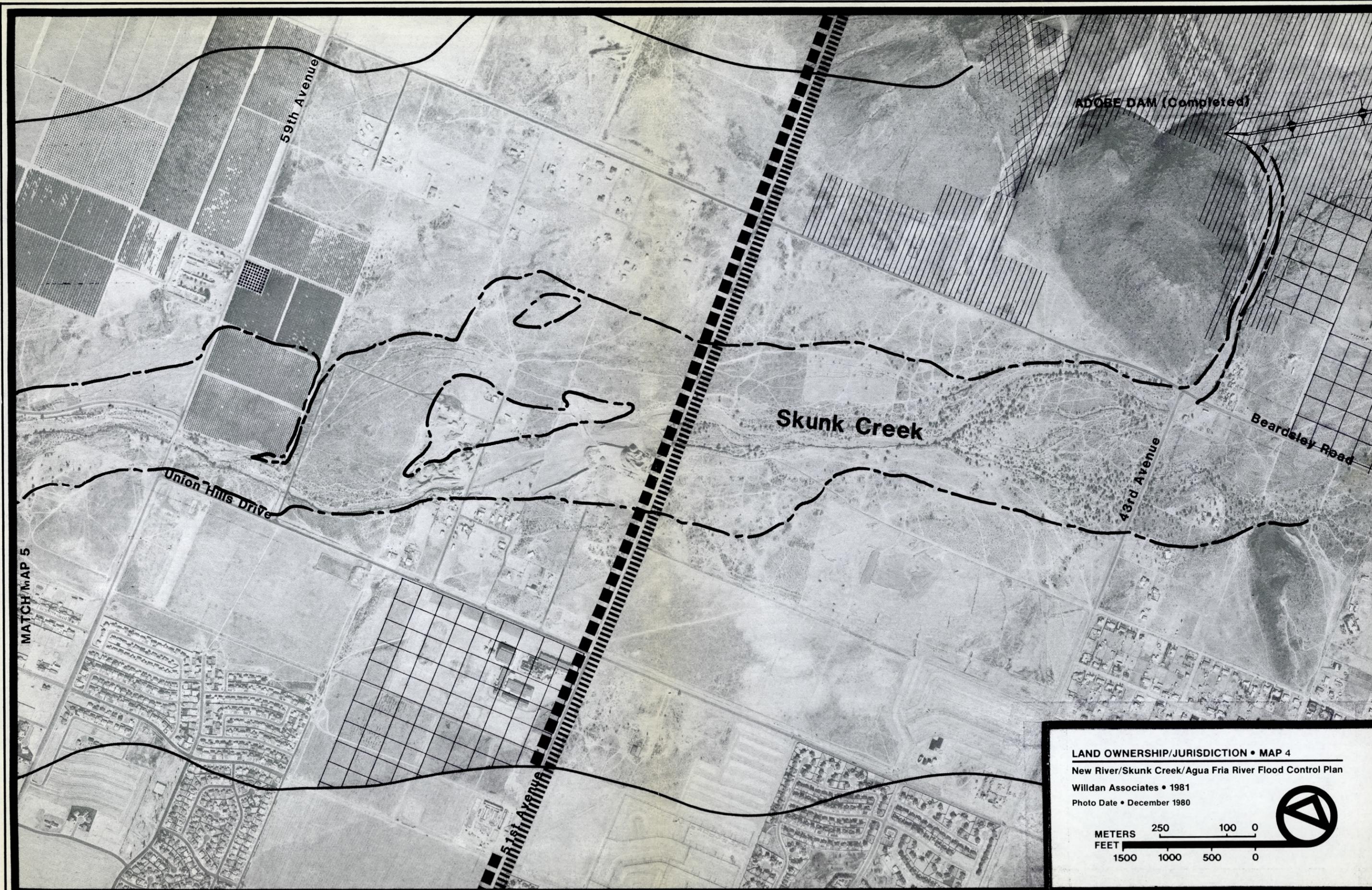
Union Hills Drive

91st Avenue

MATCH MAP 6

LAND OWNERSHIP/JURISDICTION • MAP 3
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981
 Photo Date • December 1980





MATCH MAP 5

59th Avenue

Union Hills Drive

51st Avenue

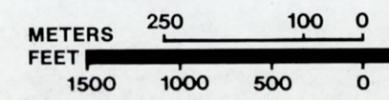
Skunk Creek

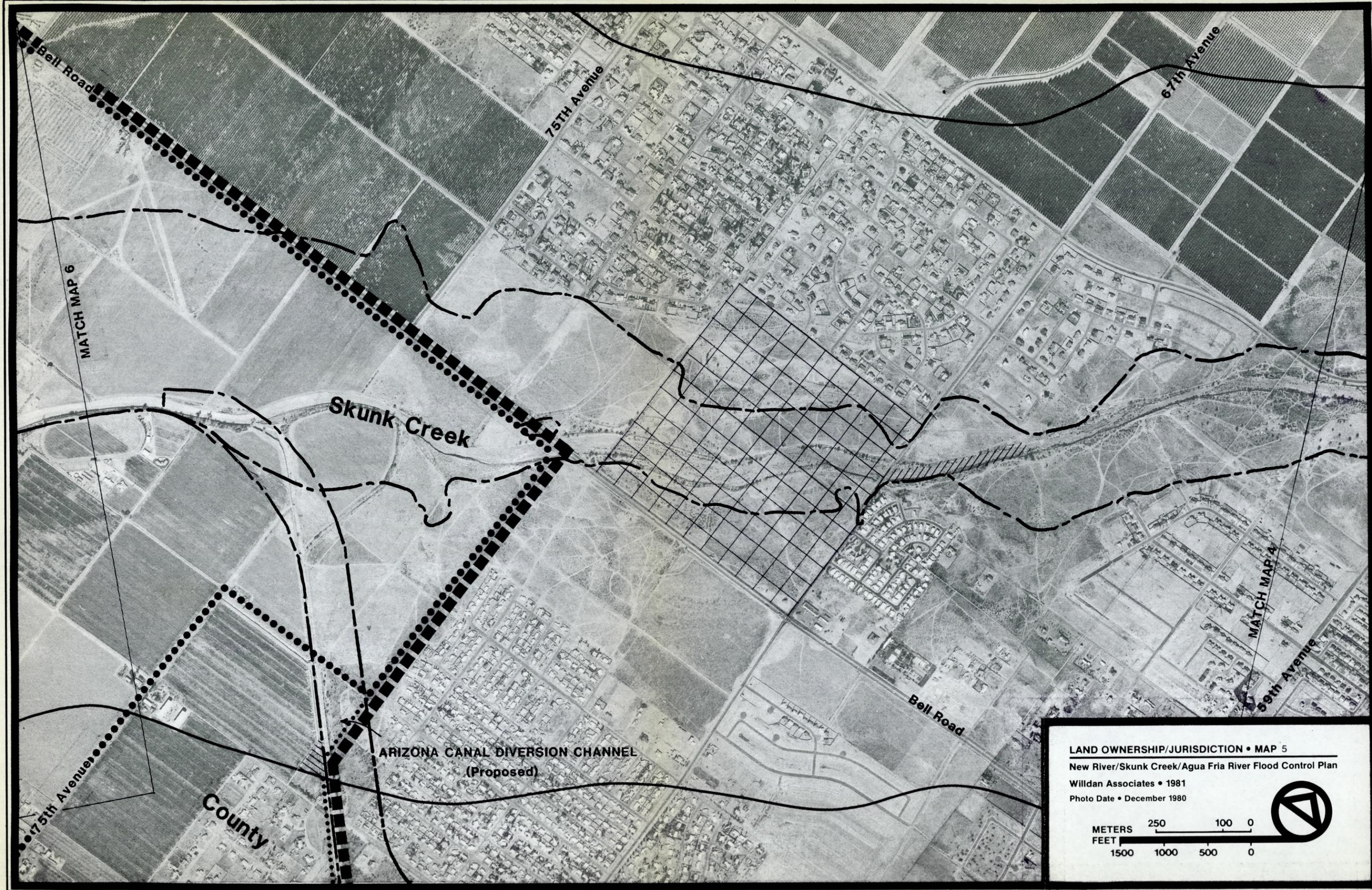
ADOBE DAM (Completed)

43rd Avenue

Beardsley Road

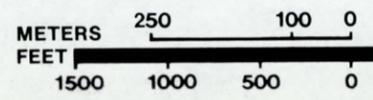
LAND OWNERSHIP/JURISDICTION • MAP 4
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980

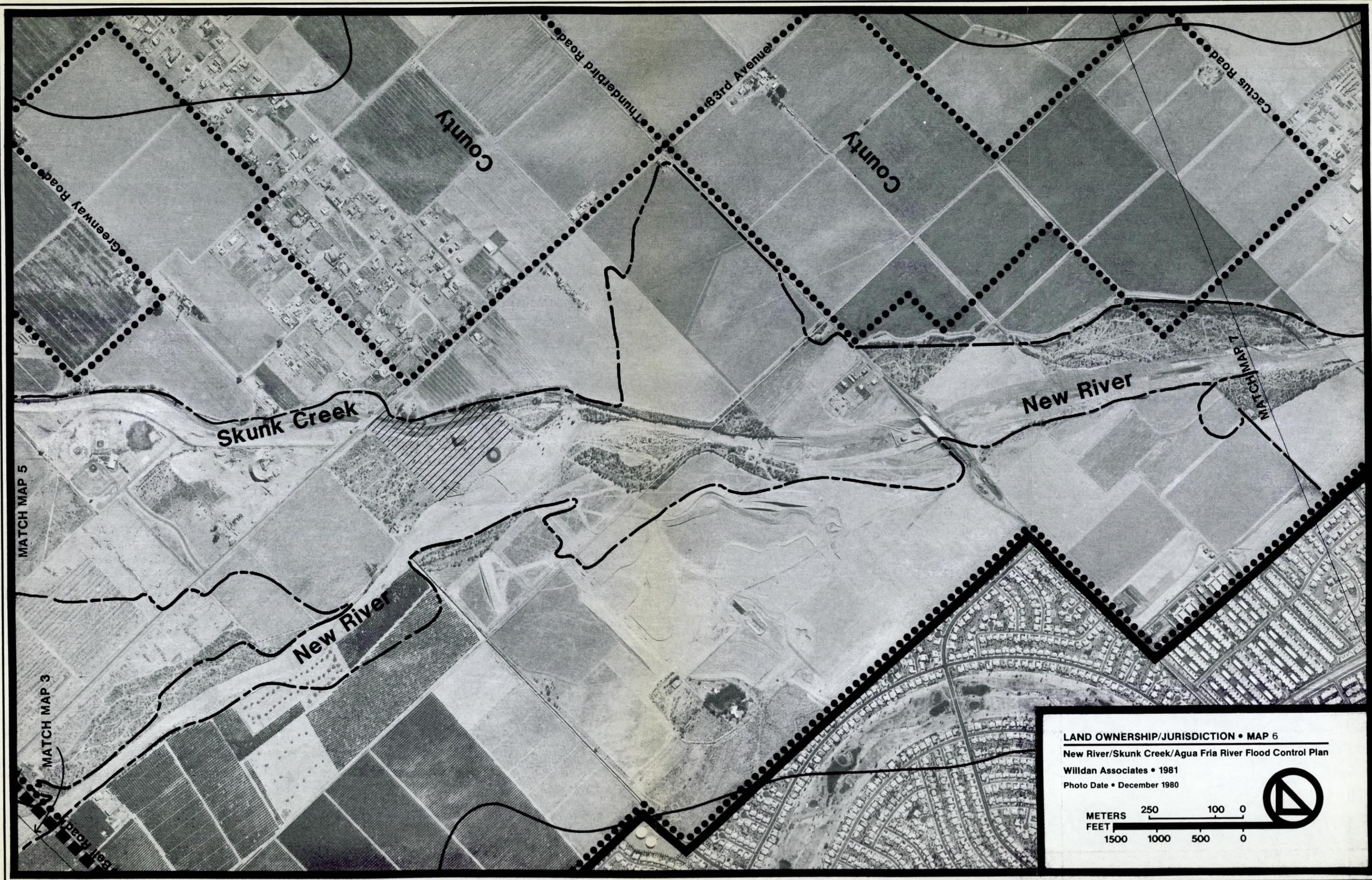




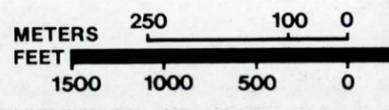
ARIZONA CANAL DIVERSION CHANNEL
(Proposed)

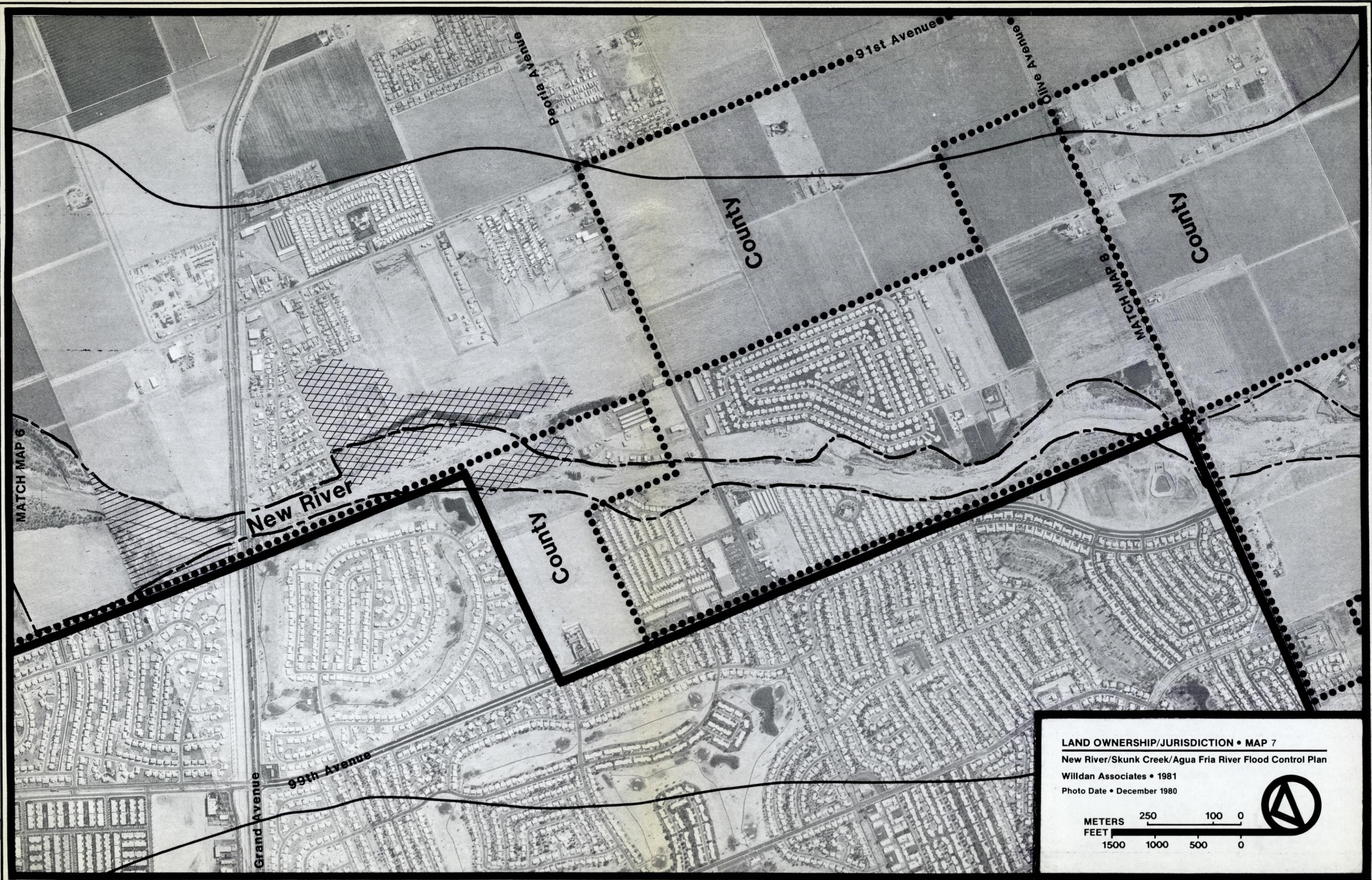
LAND OWNERSHIP/JURISDICTION • MAP 5
New River/Skunk Creek/Agua Fria River Flood Control Plan
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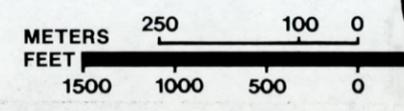


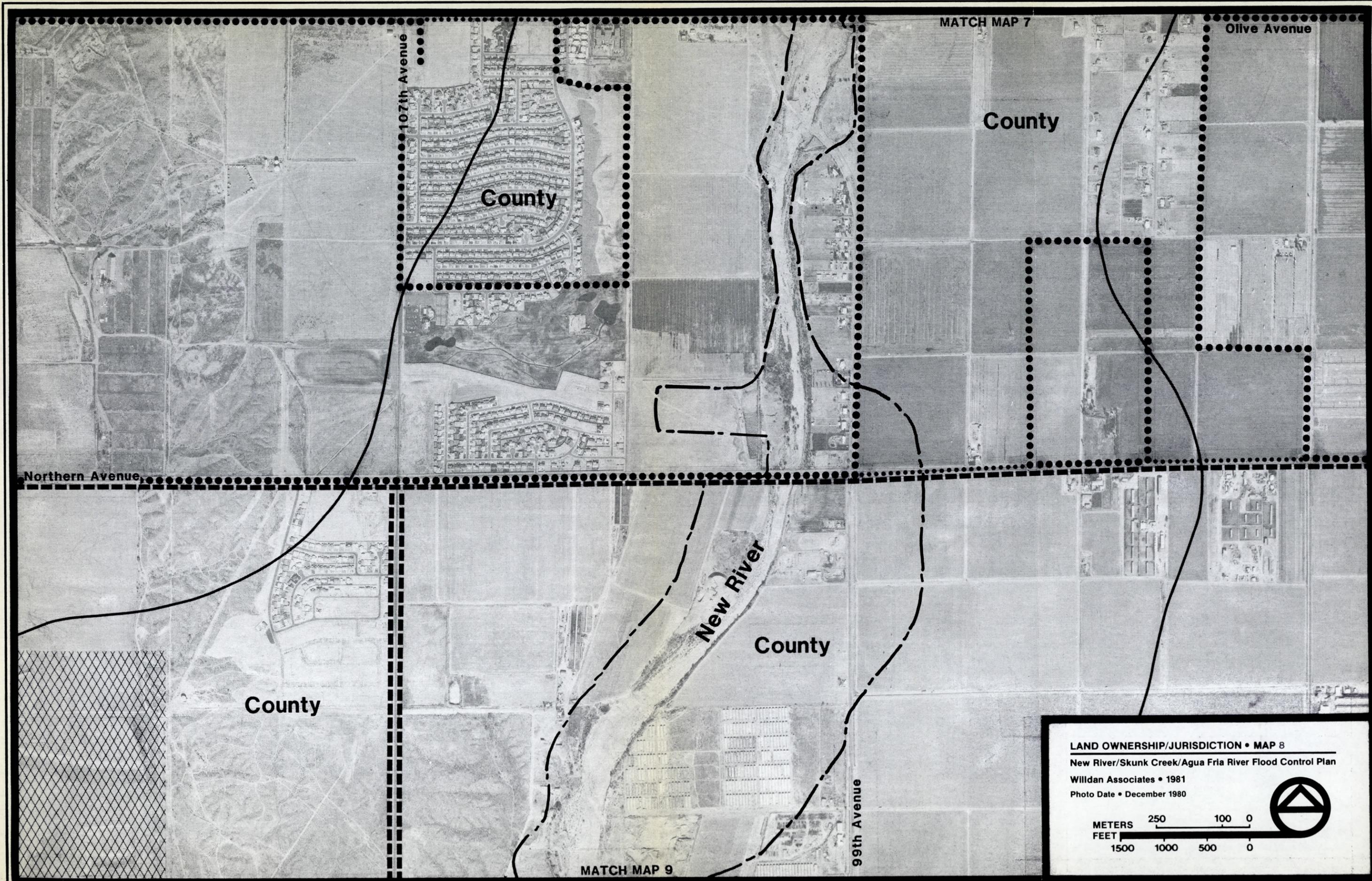
LAND OWNERSHIP/JURISDICTION • MAP 6
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981
 Photo Date • December 1980





LAND OWNERSHIP/JURISDICTION • MAP 7
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 7

Olive Avenue

107th Avenue

County

County

Northern Avenue

New River

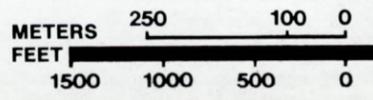
County

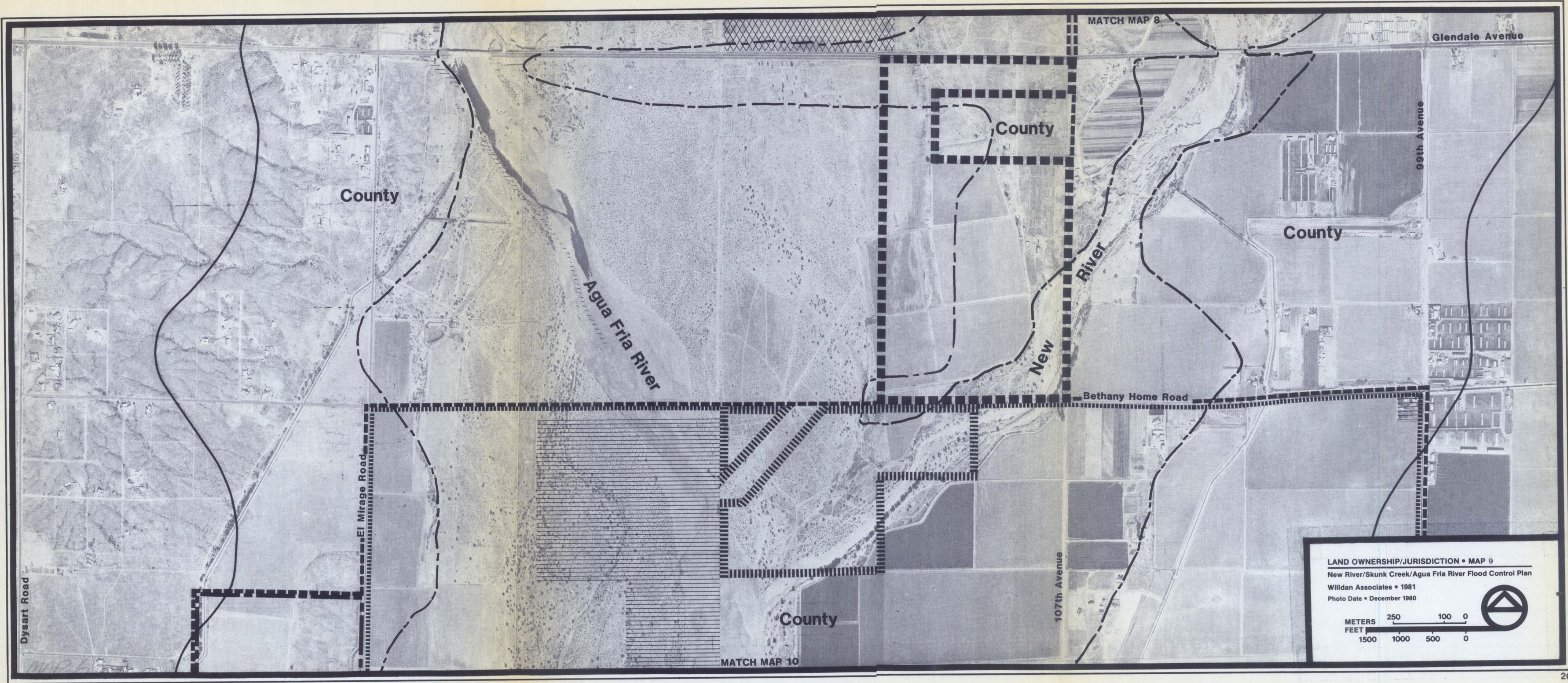
County

99th Avenue

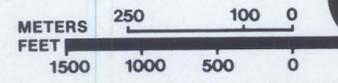
MATCH MAP 9

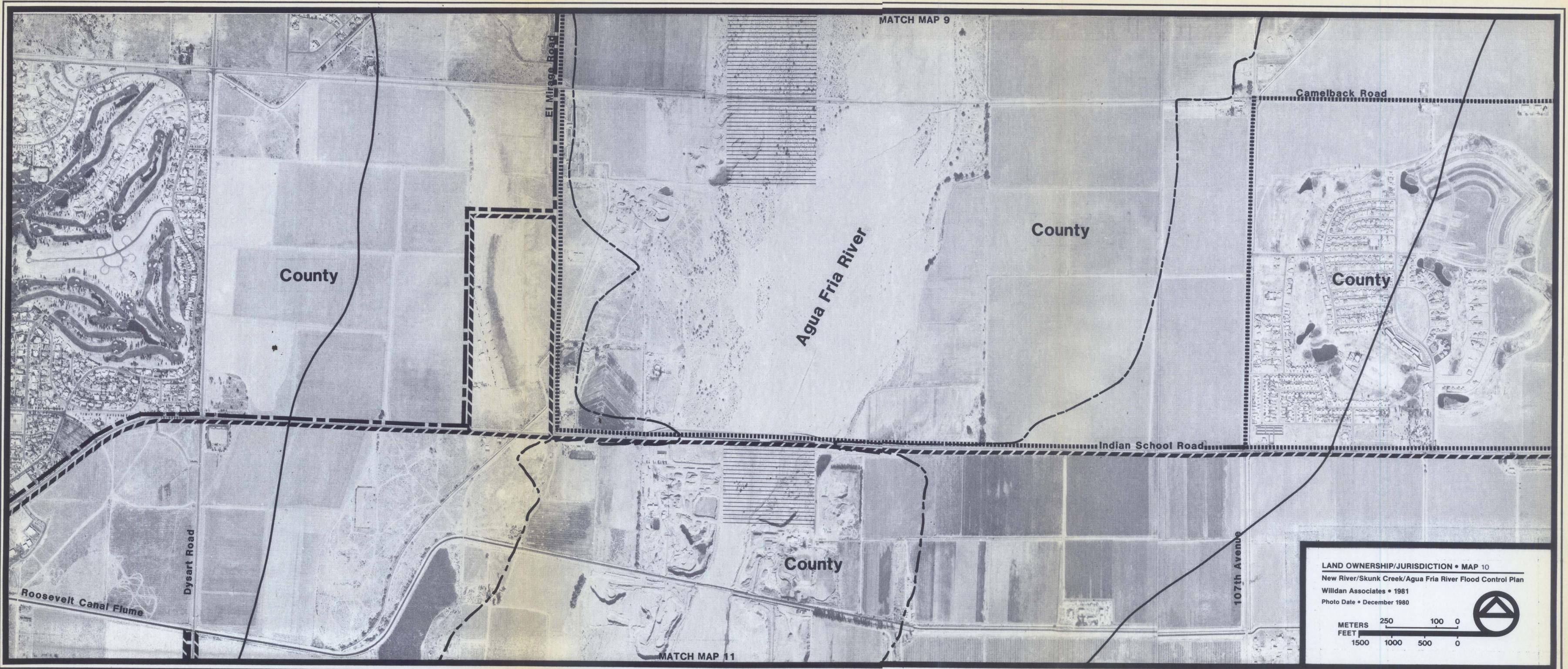
LAND OWNERSHIP/JURISDICTION • MAP 8
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





LAND OWNERSHIP/JURISDICTION • MAP 9
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 9

MATCH MAP 11

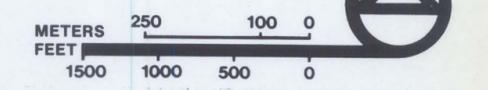
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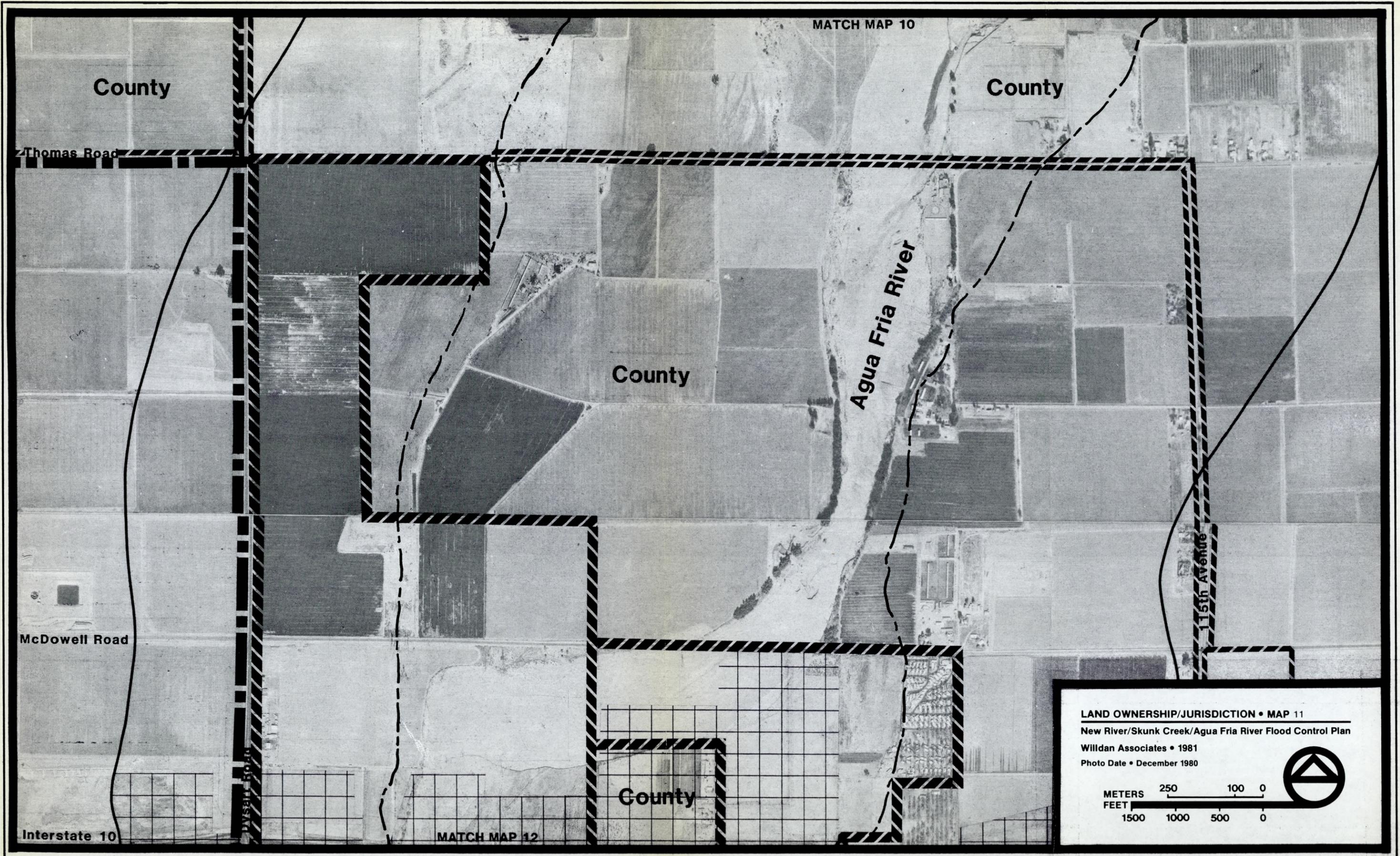
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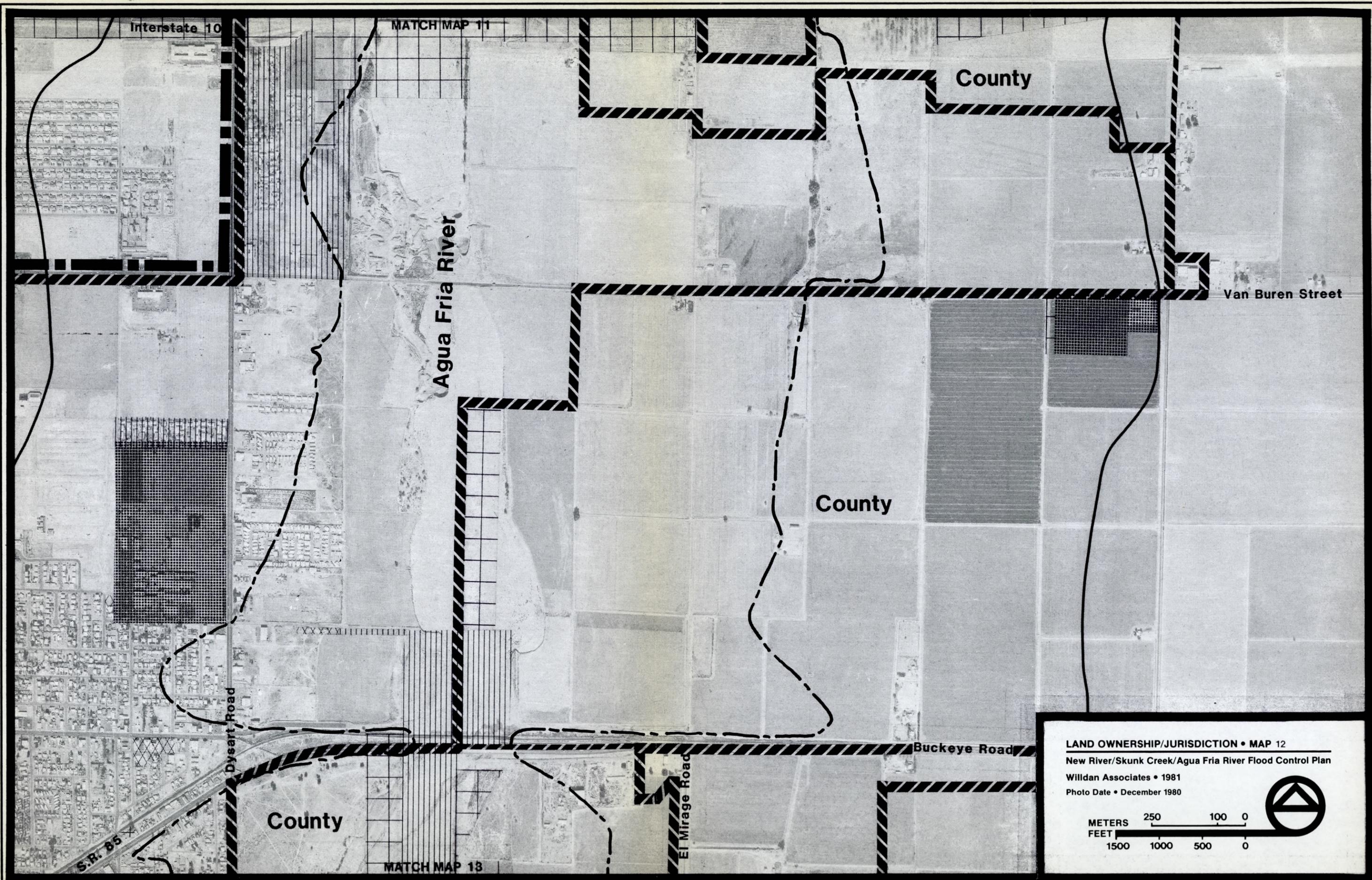
County

County

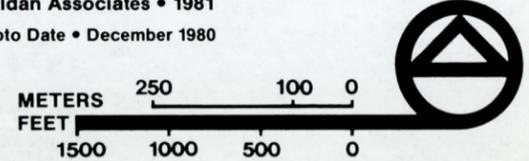
LAND OWNERSHIP/JURISDICTION • MAP 10
New River/Skunk Creek/Agua Fria River Flood Control Plan
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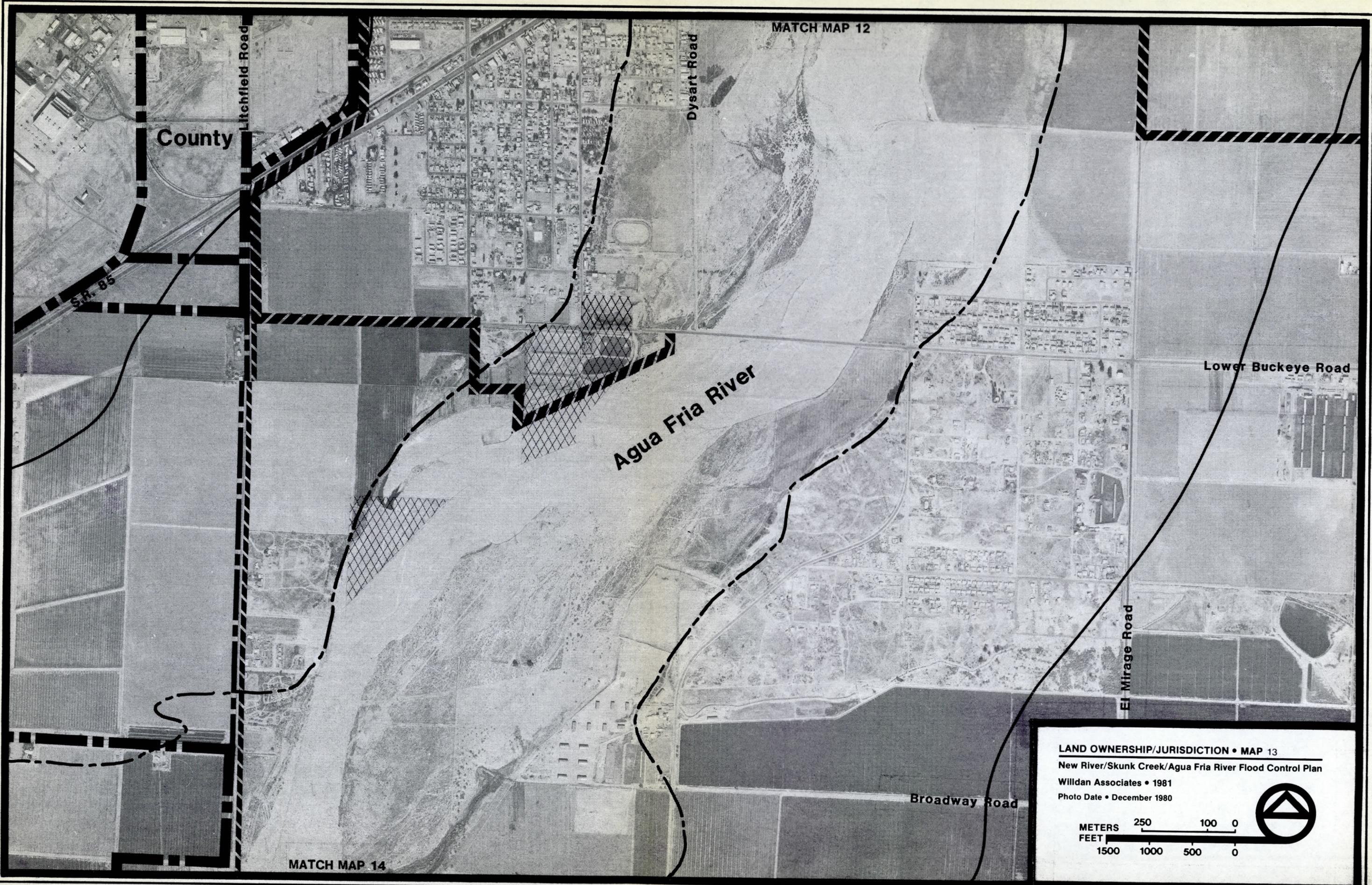






LAND OWNERSHIP/JURISDICTION • MAP 12
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 12

County

Litchfield Road

Dysart Road

Agua Fria River

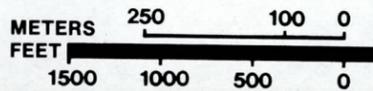
Lower Buckeye Road

El Mirage Road

Broadway Road

MATCH MAP 14

LAND OWNERSHIP/JURISDICTION • MAP 13
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980



MATCH MAP 13

Bullard Avenue

County

Agua Fria River

Dysart Road

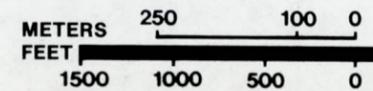
County

Southern Avenue

County

Gila River

LAND OWNERSHIP/JURISDICTION • MAP 14
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980



III. OPEN SPACE PLANNING

The New River/Skunk Creek/Agua Fria River Conceptual Flood Control Plan is intended to provide alternatives as guidance to be used in an overall inter-community flood control planning endeavor. An important consideration in this plan is the preservation of open space. The scope of open space considerations include:

- o Areas reserved for recreation uses;
- o Areas required for the conservation and preservation of unique natural environments;
- o The preservation of areas with cultural features;
- o Areas to be used as buffers for land uses;
- o Linear linkages for non-motorized transportation.

There is no generally agreed upon definition for "open space." The term can refer to all lands not altered by construction, or it can be limited to developed recreation spaces. Green areas devoted to purposes such as recreation, utility corridors, or cemeteries are sometimes considered as "open space." Charles Lowe, author of Arizona's Natural Environment, defines open spaces as:

"open and natural areas within built-up urban areas and countryside that have characteristics such that they are suitable to be permanently preserved in a natural state or used for various open space purposes, such as recreation" (Lowe, 1964).

While recognizing that all areas not built upon can be considered open space, the planning process employed here recommends the preservation of open space in a systematic and logical fashion with qualifying factors based on existing conditions and

proposed uses in the study area. Patterns of open space often occur randomly in an unsystematic fashion because open space is preserved, in many cases, on an incremental basis by any number of jurisdictions through purchase, dedication, donation or tax default without the benefit of a well-ordered plan. This flood control plan proposes that an open space plan be integrated with the conceptual and preliminary flood control planning, as well as existing land use plans of the affected jurisdictions. In this manner, open space considerations will become an integral part of the plan rather than an add-on.

The open space shown for preservation or conservation in this plan is not derived from a "standards approach." The "standards approach" applies a fixed relationship of people to facilities, but does not recognize the diversity of needs of communities or the diversity in quality of the environment. Instead, an open space plan that meets community needs, designed with a purpose in mind, is proposed as more useful because it functions in a beneficial manner for the local population, without overburdening local sponsors with undue operation costs. While it is recognized that any area not built upon can be considered open space, open space planning is defined as the systematic preservation of recreation, vegetation, cultural and wildlife areas as they function in a positive manner with other human considerations including social, economic, and environmental factors.

The Corps of Engineers' Project Plan's long term goals for the study area included the preservation of open space through local sponsor acquisition, maintenance, and management of flowage easements within the 100-year floodplain. Intervening circumstances, discussed earlier as change agents, have made this goal unrealistic. Private development pressures and current uses in the floodplain are such that comprehensive planning strategies in the study area need to be implemented to preserve natural areas and influence appropriate development and use strategies.

One of the dominant characteristics of open space located within the New River/Skunk Creek/Agua Fria River study area is the high degree of human disturbance. Sand and gravel operations, transmission lines, urban development, flood control structures and litter are commonplace. Only one segment of the study area (north of Happy Valley Road along New River) is pristine. In general, restoration and maintenance of existing natural areas is required. Blighted areas need to be cleaned, posted, and patrolled. The dumping of garbage and other discarded materials must be discouraged if an area is to be preserved with any value to the local population.

The overall community planning program for flood control and open space is designed to coordinate the concerns and activities of different agencies to form common objectives. In this case, the priorities preliminarily identified by concerned agencies at the outset of the study include:

- o Preservation of open space;
- o Implementation of flood control measures to protect development and allow for more intensive uses of the 100-year floodplain;
- o Consistency with the Environmental Impact Statement (EIS) prepared by the Corps in 1976 for the study area;
- o Conformance with existing general land use plans prepared by municipalities.

On the surface, the first two priorities appear to directly conflict with one another; to implement one strategy would preclude the other. One of the plan accomplishments identified in the EIS include the maintenance of open space for vegetation and wildlife values, and also to meet a need in the county for trail-based recreation. To avoid the exclusion of these priorities, this conceptual flood control plan has identified significant existing and proposed open space in the study area. The plan does not recommend a

maximum amount, i.e., the entire 100-year floodplain, be designated as open space because the local sponsor, the Flood Control District of Maricopa County, would be severely constrained to acquire and maintain this large area. In addition, the value previously placed on certain portions of the study area--because of environmental quality and the associated benefits to wildlife and humans--is not tenable. As an alternative, the New River/Skunk Creek/Agua Fria River Conceptual Flood Control Plan calls for the identification and mapping of three open space categories:

- o wildlife habitat areas
- o recreation open space
- o buffer areas

Although cultural resource preservation is a concern, no significant sites have been found in areas previously surveyed; hence, this consideration has not been further addressed in this study. If, in the future, significant cultural resources were identified in the area, plans for their preservation would need to be studied and perhaps incorporated into the flood control plan.

Wildlife Habitat Areas

When considering plant communities and wildlife, there are no outstanding or significant examples of native vegetation or wildlife forms present in the study area. Although a detailed inventory is lacking, most of the species that occur are typical lowland desert-dwelling forms. They are widespread and not of management significance. The disturbed condition of the wildlife habitat serves to reaffirm this conclusion (Arizona Natural Heritage Program, 1981).

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For the purposes of this study, potential wildlife habitat areas were identified and mapped based upon the existence of a wide variety and abundance of vegetation. It is assumed that if an area provides adequate and diverse plant life, wildlife will find it suitable for feeding, breeding, and resting cover. Other significant elements include the proximity, type, and density of existing urban developments. Evidence of use by wildlife with a concern for water availability was also taken into consideration.

The effects of urbanization on wildlife are usually negative because habitat essential to their continued existence is destroyed for development purposes. Considering wildlife and their habitat into the planning process will ensure that desirable populations of species are maintained. (For a more detailed discussion of wildlife planning and management in developing urban areas, see Planning for Wildlife in Cities and Suburbs, U.S. Fish and Wildlife Service, 1978.)

Recreation Open Space

The second classification, recreation open space, is defined as areas planned for recreation use in general land use plans. The Cities of Peoria, Avondale, and Glendale have each identified areas for conservation to be used for recreation.

In addition, rest nodes were located in conjunction with Maricopa County's proposed completion of the Sun Circle Trail. The trail is proposed to circle the metropolitan Phoenix area with an alignment crossing several jurisdictions. Completed portions of the system are currently used for jogging, hiking, bicycling, and horseback riding. Nodes provide access to the trail system by serving as a point of origin, they also furnish opportunities for rest and relaxation for those engaged in trail activities. The proposed trail system can become an integral part of any flood control alternative by

utilizing flowage easements for trail placement. In some cases, trail nodes might require the acquisition of additional property for their development. In each case, proposed recreation areas were incorporated in this study.

Buffer Areas

The third classification, buffer areas, is defined as open space that allows for natural vegetative growth and spatial relief. The primary function of a buffer is to shield potential wildlife habitat areas and recreation open space from a variety of conflicting and competitive adjacent land uses. The actual amount of buffer needed for habitat or recreation areas is a function of the interaction of the specific site with adjacent land uses, and would need to be determined on a case-by-case basis. For the purposes of this study, a width of 100 feet (30.5 m) is provided as buffer around habitat and recreation areas.¹

The buffer areas are included in the total area shown reserved for potential wildlife habitat and recreation sites. Trail alignments are not shown at this conceptual level of planning. Later stages of planning should coordinate trails development with the local recreation, flood control, and municipal agencies. The standard of 100 feet (30.5 m) of buffer is not required for trails. The buffer required for trails is much less than 100 feet (30.5 m) and should be determined by actual field conditions.

¹ Although the home range of many species found in the study area has been determined, little knowledge presently exists on how much area these same species would require in order to be retained within developed areas. One of the main factors influencing home range requirements with developed areas is the effect of human disturbance. To help ensure retention of wildlife species present within the study area, acreage greater than that required under natural conditions should be provided to allow adequate buffering of habitat areas.

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IV. PARTICIPANT INPUT

Agencies and municipalities affected by flood control planning in the New River/Skunk Creek/Agua Fria River study area were requested to provide information to help guide the development of this conceptual flood control plan. Table I lists those contacted and the information obtained. Following is a brief discussion of the major considerations outlined by the jurisdictions.

The City of Avondale has recently completed a comprehensive land use plan. This master plan calls for a recreation/open space area to be preserved on the Agua Fria River north of Buckeye Road; however, flood control through channelization of the river is a primary goal of the city because this would permit some development in the existing floodplain.

The City of Glendale has prepared a General Plan 1980-2005. This plan proposes a mixture of residential, commercial, and light industrial development along Skunk Creek. At the confluence of New River and the Agua Fria River the proposed Glendale Airport is sited; this would also require modifications to the channel. North of the airport site, a golf course is proposed for what is now a landfill. Initiation of this development is pending as studies are now being conducted on a potential problem associated with frequent watering on redeveloped landfill sites.

According to the Maricopa County Planning Department, extractive operations will continue in the channel of the Agua Fria River. The department requires that any proposals for future development must insure that the flooding potential would not increase. Much of the study area currently under jurisdiction of the county has been strip annexed by the municipalities. The Maricopa County Parks and Recreation

Department is interested in development of riding and hiking trails along the river corridor to complete the Sun Circle Trail as described in the open space planning section.

The City of Peoria provided guidance for mapping of future land uses and promotes channelization in approved areas to increase private development potential. For instance, channelization at Bell Road and 75th Avenue is required for complete development of the proposed Arrowhead Ranch. The city does not agree with the concept of acquisition of flowage easements, but does encourage limited dedications of land along the channel by private developers so that these areas may be used for open space and recreation purposes. While the fiscal resources for operation of recreation areas are limited, the city feels there is a community need for trails development.

The City of Phoenix Planning Department has not completed planning for the areas of concern; however, the parks department is considering a district park to be located adjacent to the New River in the Camelback Road area.

The Maricopa County Highway Department proposes the realignment of McDowell Road and is studying, with the Flood Control District of Maricopa County, the channelization of the Agua Fria River in this area.

Unincorporated Sun City is under the jurisdiction of Maricopa County. A Sun City master plan is on file with the county with development essentially completed. No additional plans have been made that would affect the study area.

The Town of Goodyear's comprehensive plan was incorporated into this study, as were the town's planning goals for the study area.

Table 1: Participants' Input

Agency	Information Obtained
City of Avondale	Avondale Comprehensive Plan Planning goals for the study area
City of Glendale	Glendale General Plan 1980-2005 Proposed park locations Proposed Glendale Airport Boundaries Planning goals for the study area
Town of Goodyear	Goodyear Comprehensive Plan Planning goals for the study area
Maricopa County Highway Department	Plans for roadways crossing the rivers.
Maricopa County Planning Department	Planning goals for the study area
Maricopa County Parks & Recreation Department	Sun Circle Trails Plan
City of Peoria	Community Land Use Plan Planning goals for the study area
City of Phoenix	Zoning Maps
Sun City	Sun City Master Plan
Flood Control District of Maricopa County	Plans for channelization of the Agua Fria River at selected locations
Arizona State Land Department	No development plans

V. EXISTING ENVIRONMENTAL CONDITIONS

Topography

The New River/Skunk Creek/Agua Fria River study area is located within the Sonoran Desert region of the Basin and Range physiographic province. The study area slopes gently from an elevation of approximately 1,400 feet (427 m) at the site of the proposed New River Dam to 925 feet (282 m) at the confluence of the Agua Fria and Gila Rivers.

Geology

The Basin and Range physiographic province is characterized by deeply dissected steep mountains and broad alluvium-filled valleys. The study area is located in one of these valleys. Extensive alluvial deposits have formed the valley floor, filling the basin and covering the foreslopes of the hills and mountains. Alluvia may extend to depths of over 1,000 feet (305 m) and consist of coarse, unconsolidated, and unsorted sands, gravels, and cobbles.

Soils

Soil types in the study area are derived from parent material characteristic of the physiographic province. In the study area river channels, soils are formed from recent alluvia. These include soil associations of nearly level loams and clay loams, and nearly level to gently sloping sandy loams and gravelly sandy loams. All three river channels have relatively shallow beds that consist of unconsolidated porous sands, gravels, and cobbles. The alluvia in the channel has little agricultural value.

Soils formed in old alluvia occupy the strips paralleling New River, Skunk Creek, and the Agua Fria River. These soils are generally well suited for crops requiring a light textured, yet fertile soil, producing crops such as alfalfa, cotton, and small grains. Additional and more detailed soil information for the study area may be found in the Soil Survey of Maricopa County, Arizona, Central Part (Soil Conservation Service, 1977).

Surface Hydrology

All three watercourses are ephemeral streams that generally have well-defined channels. With headwaters located 40 miles (64 km) north of Phoenix in the New River Mountains, New River is supported by a drainage area of approximately 340 square miles (88,060 ha) with a stream gradient in the study area ranging from 10 feet to 40 feet per mile (3.05 to 12.2 m/km). Skunk Creek has a drainage area of approximately 110 square miles (28,490 ha) and a stream gradient in the study area ranging from 15 to 35 feet per mile (4.5 to 10.6 m/km). Headwaters for Skunk Creek are located 35 miles (56 km) north of Phoenix in the New River Mountains. The Agua Fria River has a drainage area of 941 square miles (243,719 ha) below Lake Pleasant with a stream gradient, in the study area, of approximately 40 feet per mile (12.2 m/km).

Maximum discharge flows for these rivers under present conditions, before the construction of the proposed Arizona Canal Diversion Channel, have been recorded by U.S.G.S. stream gauges for the storm on February 20, 1980. The following peak discharges were recorded:

Agua Fria River at Grand Avenue	41,800 cfs
Agua Fria River at Buckeye Road	44,200 cfs
New River at Bell Road	9,400 cfs
Skunk Creek at Adobe Mountain	1,210 cfs

Source: U.S.G.S., 1981

Adobe Dam, now under construction on Skunk Creek at approximately Deer Valley Drive, will limit peak flows below Adobe Mountain to 1,890 cfs. A proposed dam on New River, approximately 4 miles (6.4 km) north of Deer Valley Drive, will limit peak discharges at this point to 2,665 cfs.

Subsurface Hydrology

Depth to ground water is estimated by the U.S.G.S. to vary from 100 to 500 feet (30.5 to 152.4 m) along New River, 300 to 500 feet (91.4 to 46.6 m) along Skunk Creek, and 100 to 200 feet (30.5 to 61 m) along the Agua Fria River.

Urbanization in the Phoenix metropolitan area is increasing the amount of impervious area adjacent to these streambeds, thus reducing the amount of percolation and increasing the amount of runoff. This, in combination with groundwater withdrawals, has increased groundwater depth.

Water Quality

Agricultural, municipal, and industrial waters used in the Phoenix metropolitan area come from a combination of two sources; 1) surface water from rivers originating outside the study area, and 2) ground water from wells. Surface water flows along the Agua Fria River and the New River meet the Arizona water quality standards for wildlife and agricultural uses (Arizona Department of Health Services, 1980). No surface water quality data are available for Skunk Creek.

Groundwater in the study area is a major source of water for public supply, irrigation, and industrial uses. The concentration of total dissolved solids (TDS) in groundwater is

mainly related to the presence and availability of soluble minerals in the deposits, and to the composition of the soil and rocks in the recharge area. Generally, water containing more than 1,000 mg/l of dissolved solids is not preferred for public supply without treatment, but water containing as much as 3,000 mg/l may be used for irrigation. TDS concentration for groundwater in the study area have been classified by the U.S.G.S. (1974) as follows:

- o less than 500 mg/l for Skunk Creek and New River to their confluence;
- o 500 mg/l to 1,000 mg/l, along New River from its confluence with Skunk Creek to the Agua Fria/New River confluence (parts of this stretch may contain areas with less than 500 mg/l); and,
- o less than 500 mg/l for the Agua Fria River from its confluence with New River to Indian School Road, 500 to 1,000 mg/l from Indian School Road to Buckeye Road, 1,000 to 3,000 mg/l from Buckeye Road to Broadway Road, and over 3,000 mg/l from Broadway Road to the Gila-Agua Fria Rivers confluence.

Vegetation

The two major biotic communities that occur within the project area are Sonoran Desertscrub (Arizona Upland Division and Lower Colorado Valley Division) and Sonoran Deciduous Riparian Scrub. The foothill paloverde-saguaro desertscrub association, usually occurring on hillslopes in the area, represents the Arizona Upland Division. The Lower Colorado Division is represented by creosotebush associations occurring on the alluvial flats that cover most of the study area. The Sonoran Deciduous Riparian Scrub community includes the vegetation along the watercourses in this region, and is represented by the saltcedar riparian scrub association.

Low shrubs, small trees, and cacti comprise the foothill paloverde-saguaro association. The study area is near the lower elevation limits of the association, thus the vegetation of this association is low in density and diversity. The common perennial plants include:

Foothill paloverde (Cercidium microphyllum)
Saguaro (Carnegiea gigantea)
Creosotebush (Larrea divaricata)
Brittlebush (Encelia farinosa)
Triangle leaf bursage (Ambrosia deltoidea)
Buckhorn cholla (Opuntia acanthocarpa)
Teddy-bear cholla (Opuntia bigelovii)
Prickly-pear (Opuntia phaeacantha)
Ironwood (Olneya tesota)
Catclaw acacia (Acacia greggii)
White-thorn acacia (Acacia constricta)
Barrel cactus (Ferocactus acanthodes)
Strawberry hedgehog (Echinocereus engelmannii)
Ocotillo (Fouquieria splendens)
Mesquite (Prosopis juliflora)

The creosotebush association in this area is dominated by creosotebush, occurring in monotypic stands. The several minor drainageways that dissect the study area are dominated by mesquite, blue paloverde, and white-thorn acacia. The foothill paloverde-saguaro association species, such as saguaro, brittlebush, and ironwood, often descend into the creosotebush dominated flats along these drainageways. Agricultural crops grown in the study area include citrus fruits, cotton, and milo among others.

The floodplains of New River, Skunk Creek, and the Agua Fria River support a distinctive but widespread vegetation type called the desert riparian association. Within this area, the following plants can be found:

Burrobrush (Hymenoclea monogyra)
Desertbroom (Baccharis sarothroides)
Ironwood (Olneya tesota)
Blue paloverde (Cercidium floridum)
Mesquite (Prosopis juliflora)

The Arizona Natural Heritage Program has gathered several thousand distributional records on more than 450 species of "sensitive" plants, including federal and state listed threatened and endangered species. There is no evidence and little probability that any of these plants occur within the New River/Skunk Creek/Agua Fria River study area (Arizona Natural Heritage Program, 1981).

Wildlife

The largest number and greatest diversity of desert fauna in the Phoenix area appear to occupy the desert wash and upland habitats north of Phoenix. This is due primarily to the abundance of wildlife plant foods in these habitats. Areas of significant urban development and agricultural activity usually have a limited wildlife diversity and abundance, although some bird species flourish around agricultural areas. Wildlife found in various habitats throughout the study area include: mammals such as bats, rodents, skunks, rabbits, and coyotes; amphibians and reptiles; and several species of birds. The Audobon Society's Christmas Bird Count area is located from Peoria Avenue to the confluence of the Agua Fria and Gila Rivers. In 1979, 84,947 birds were sighted in the bird count area including members from 131 species and 4 races (Audobon Society, 1981).

Although some reaches of the New River/Skunk Creek/Agua Fria River study area remain relatively natural, biological communities in much of the study area have been altered by sand and gravel mining, off-road vehicle activities, illegal trash disposal, urban development, and agricultural uses. Wildlife populations have, therefore, diminished over the years to the point that most species are lowland desert dwelling forms that are widespread and not of management significance.

Two federally endangered species have occurred near the study area in the past, while two other species could possibly occur. The Yuma Clapper Rail (*Rallus longirostris yumaensis*) is currently listed as federally endangered and was most recently sighted and verified in June, 1976. Two Yuma Clapper Rails were sighted along the Gila River near Bullard Avenue. Recent floods have destroyed or modified much of the habitat where this species once occurred. The Arizona Game and Fish Department reports that some pockets of potentially suitable habitat still remain in the general Phoenix area. If the Gila River is left undisturbed, shallow marsh habitat essential to the Yuma Clapper Rail is likely to recover (Arizona Natural Heritage Program, 1981).

Another federally endangered species, the Blackbellied Whistling Duck (*Dendrocygna autumnalis*) was recorded along an irrigation canal on Thunderbird Road, 2.5 miles (4 km) north and 0.5 mile (0.8 km) east of the City of Peoria, just outside of the study area. A pair was sighted breeding at this location in 1969; however, no previous or subsequent records in the area are known. It is unlikely that this species will return to the Phoenix metropolitan area regularly, even with habitat restoration.

The Gila Monster (*Heloderma suspectum*) and the Desert Tortoise (*Gopherus agassizi*) are two species studied by the Arizona Game and Fish Department whose status in Arizona may be in jeopardy in the foreseeable future. Both species are widespread in Arizona and could occur sporadically within the study area. Given the urban development surrounding much of the study area, it is unlikely that these species will persist (Arizona Natural Heritage Program, 1981).

Archaeological and Historical Resources

A survey of archaeological resources in the study area has been conducted by the Arizona State University, Department of Anthropology, under contracts with the U.S. Army Corps of Engineers (Arizona State University, 1976 and 1977). A survey of historical resources has also been conducted (Arizona State Historic Preservation Office, 1977). These reports have been utilized for the following discussion on the archaeological and historical resources in the study area.

Investigations along New River exposed two archaeological remains, neither of which is located within the 100-year floodplain. No evidence of prehistoric remains or historic sites has been found along the New River within the 100-year floodplain. An examination of the area along Skunk Creek and adjacent lands, and a review of literature for the area failed to identify the existence of prehistoric or historic resources, with the exception of a petroglyph area along the east side of Adobe Mountain. This area has been proposed for use as a cultural interpretation area. A cultural resources review of the Agua Fria River revealed one archaeological site that has not been considered for nomination to the National Register. Occupying an older alluvial terrace overlooking the Agua Fria River, this remnant is located outside of the 100-year floodplain (U.S. Army Corps of Engineers, 1976).

Population and Land Use

The metropolitan Phoenix area population has steadily grown for several decades and is expected to continue to grow. All of the communities within the study area are experiencing population growth, as reflected in Table 2. Factors contributing to this continued growth include both natural increase and net in-migration.

Of the communities located within the study area, Peoria and Avondale are affected the greatest by the waterways being studied. These communities average ten or more persons per acre (24 per hectare), with population densities for the rest of the study area generally lower except for Sun City which has a higher population density.

Land uses occurring in the study area have been indicated on the Existing Land Use Maps 1-14. Agriculture represents the most extensive land use in the study area, with open space accounting for a majority of the remaining area. Several sand and gravel operations occupy the floodplains as industrial uses. Avondale's municipal wastewater treatment plant is located within the 100-year floodplain, south of lower Buckeye Road on the west side of the channel. Residential uses also occur throughout the study area, most significantly in Peoria, Sun City, and Avondale.

Future land uses have also been indicated for the study area on the Proposed Changes in Existing Land Use Maps 1-14. These maps show only proposed changes from existing land uses, according to general plans prepared by the agencies within the study area, so that modifications to existing uses may be readily identified. Most agricultural land is expected to be phased out as urban development expands. Future development plans also show the filling in of areas outside of the 100-year floodplain currently indicated as open space with urban uses. Residential development is expected to replace most of the agricultural lands and open space in the study area, although industrial and commercial development will also be occurring as the Phoenix metropolitan area continues to expand. One of the major land use changes proposed in the study area is the development of a new Glendale Municipal Airport at the confluence of the New and Agua Fria River. (For more detailed discussion of land use in the study area, see the chapter entitled Existing and Proposed Land Use Descriptions.)

All communities within the study area are proposing some form of recreation/open space use in specified areas of the 100-year floodplain. Avondale has proposed a major park facility within the Agua Fria River 100-year floodplain south of Van Buren Street. Peoria is anticipating greenbelt areas to be developed along New River and Skunk Creek. These are to be dedicated by private developers. Glendale and Phoenix have no recreation/open space plans for the study area at this time other than preservation of the 100-year floodplain for future recreation/open space needs. Maricopa County Parks and Recreation Department is promoting trail development through the study area as part of their Sun Circle Trail System. The proposed trail would extend along the Agua Fria River north from the Gila River, up the New River to its confluence with Skunk Creek, and along Skunk Creek upstream of Adobe Dam.

**Table 2: Future Population Distribution for Communities Adjacent to
New River, Skunk Creek and Agua Fria River**

	1975	1980	1985	1990	1995	2000
Avondale	11,405	12,000	14,400	24,800	30,000	39,600
Glendale	71,292	92,000	105,900	123,900	139,500	170,700
Peoria	13,527	17,900	23,000	40,300	54,500	73,900
Phoenix	699,006	791,000	830,700	900,000	985,300	1,093,000
Sun City*		40,149*				
Goodyear	3,187	3,700	5,000	12,100	19,100	26,000

*Arizona Department of Economic Security, 1981.

Source: Maricopa Association of Governments, 1980.

Transportation

New River is crossed by nine east-west roads and two north-south roads. Six of these crossings are on bridges, the others are dip crossings. The Atchison-Topeka and Santa Fe Railroad crosses New River on a multispan bridge immediately north of Grand Avenue. Two east-west streets and four north-south streets cross Skunk Creek, three of which are bridge crossings. A private landing strip is located near the creek, 0.5 miles (0.8 km) north of Bell Road.

Seven major east-west roads cross the Agua Fria River with no north-south roads crossing the river. The Buckeye Road Bridge (Highway 85) and the Glendale Avenue Bridge are the only bridges currently crossing (Indian School Road Bridge was washed out in February, 1980). All other roads, including Indian School Road, cross the river as dip crossings. The Interstate-10 Bridge is expected to provide access across the Agua Fria River by 1983. A mainline of the Southern Pacific Railroad crosses the river immediately north of the Buckeye Road Bridge. The Phoenix-Litchfield Municipal Airport is located approximately 2 miles (3.2 km) west of the river and immediately north of Lower Buckeye Road. A private landing strip is located 1.5 miles (2.4 km) east of the river just below McDowell Road.

Economy

Currently, Maricopa County's economy is primarily based upon manufacturing of high technology products, agriculture, tourism, and government. Urban expansion in the area has occurred due to population growth, which is largely tied to migration to the Southwest, and to the growth of manufacturing industries. Manufacturing, led by the electronics industry, has increased steadily in the Phoenix metropolitan area. This

trend is expected to continue as urbanization expands. Maricopa County is also the largest producer of crops and livestock in the state; however, agriculture is declining in relative importance in terms of employment and production value. Tourism and travel in the county generate more than two billion dollars in annual expenditures (Valley National Bank, 1980). Growth in government, manufacturing, tourism, services and recreation activities will be experienced in the county in the future according to the Bureau of Business and Economics Research at Arizona State University.

The major economic activities in the study area are agriculture and land development. Varying from community to community, agriculture, wholesale-retail trade, construction, manufacturing, retirement, and government represent significant employment categories.

Open Space and Public Use Areas

Public facilities along the New River/Skunk Creek/Agua Fria River floodplains are minimal with the exception of Peoria's Greenway Sports Complex, which hosts the Milwaukee Brewer's spring training camp. This complex supports baseball, softball, and outdoor basketball and is adjacent to Skunk Creek, just northeast of the intersection of Greenway Road and 83rd Avenue.

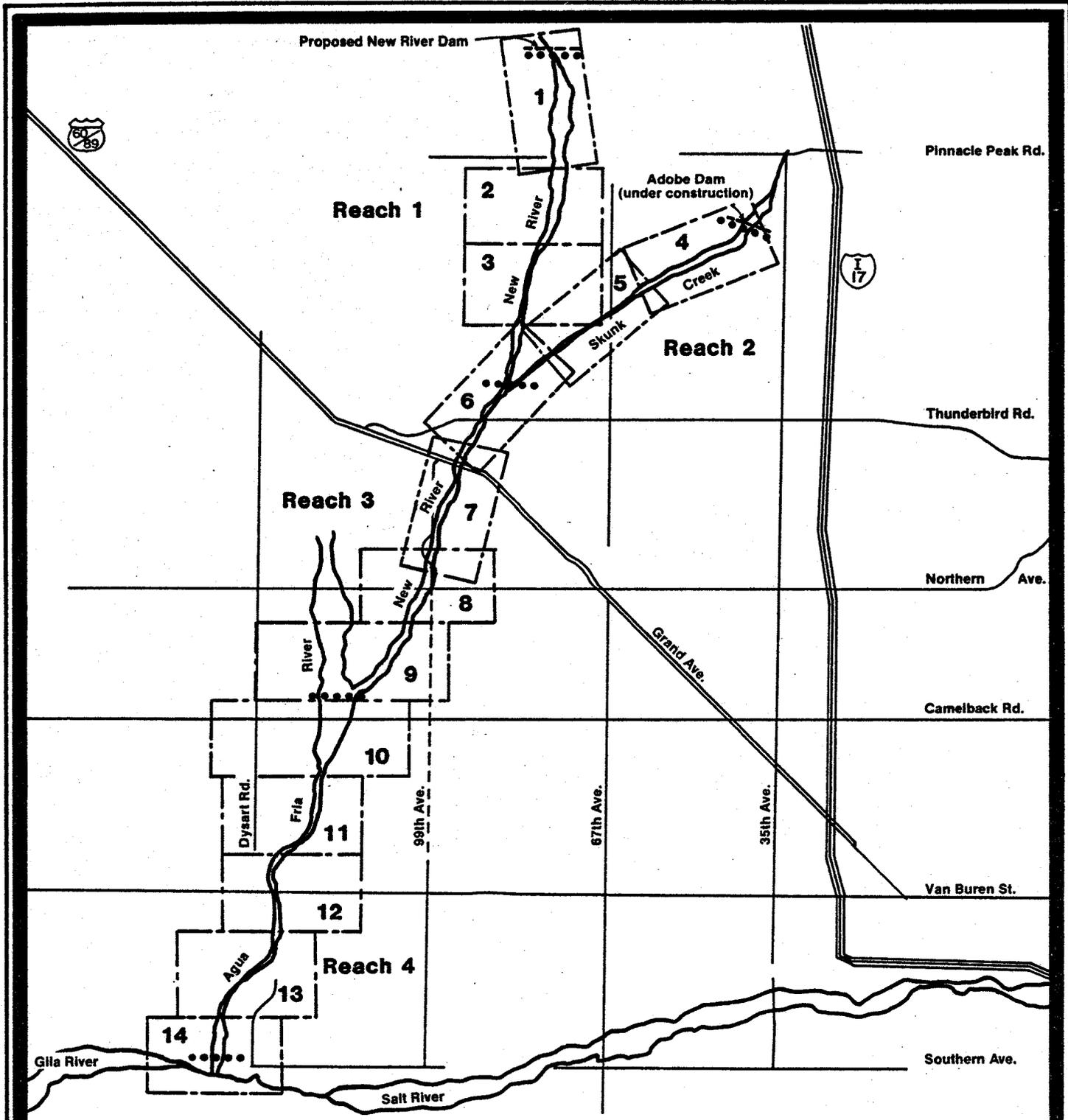
No other formal recreation facilities are provided along the study area, although these areas are used informally for riding, hiking, off-road vehicle driving, nature observation (National Audubon Society), and illegal hunting. The Proposed Changes in Existing Land Use Maps 1-14 illustrate how some of the municipalities have planned areas along the floodplains for recreation use. Peoria anticipates several greenbelt areas along New River and Skunk Creek which they hope to have dedicated by developers as urbanization

approaches the floodplain. Avondale proposes a large recreation sports area in the floodplain between Interstate 10 and Buckeye Road.

The Maricopa County Parks and Recreation Department is planning to extend the Sun Circle Trail along the Agua Fria River, New River and Skunk Creek in conjunction with flowage easement acquisition or the development of flood control measures along these rivers. Completion of this stretch of trail will provide an important link to the entire Sun Circle Trail System planned to encircle the Phoenix metropolitan area. Rest nodes have also been proposed along the trail system south of Lower Buckeye Road, Glendale Avenue, and at the junction of the Arizona Canal Diversion Channel and Skunk Creek. These are indicated on the Proposed Changes in Existing Land Use Maps.

Aesthetics

The study area lies on a flat, gently-sloping desert floor, with hills occurring in the northern part of the study area. Depending on the amount of annual rainfall and time of the year, this desert area can potentially provide an extensive amount of varying scenic quality due to the vegetation. River areas, however, have been abused for several years and are many times cluttered with litter. Urbanization over the past several years has replaced much of the natural desert beauty with a conglomeration of human-related development and disturbances.



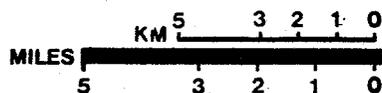
EXISTING LAND USE • KEY MAP

New River/Skunk Creek/Agua Fria River Flood Control Plan

Willdan Associates • 1981

KEY MAP LEGEND

-  Map Areas
-  Reach Boundary



EXISTING LAND USE LEGEND

-  Study Area Boundary
-  100 Year Floodplain
-  Residential
-  Commercial
-  Industrial
-  Agricultural
-  Recreation/Open Space
-  Open Space



NEW RIVER DAM (Proposed)

New River

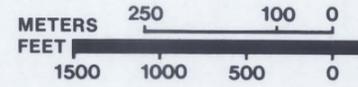
Pinnacle Peak Road

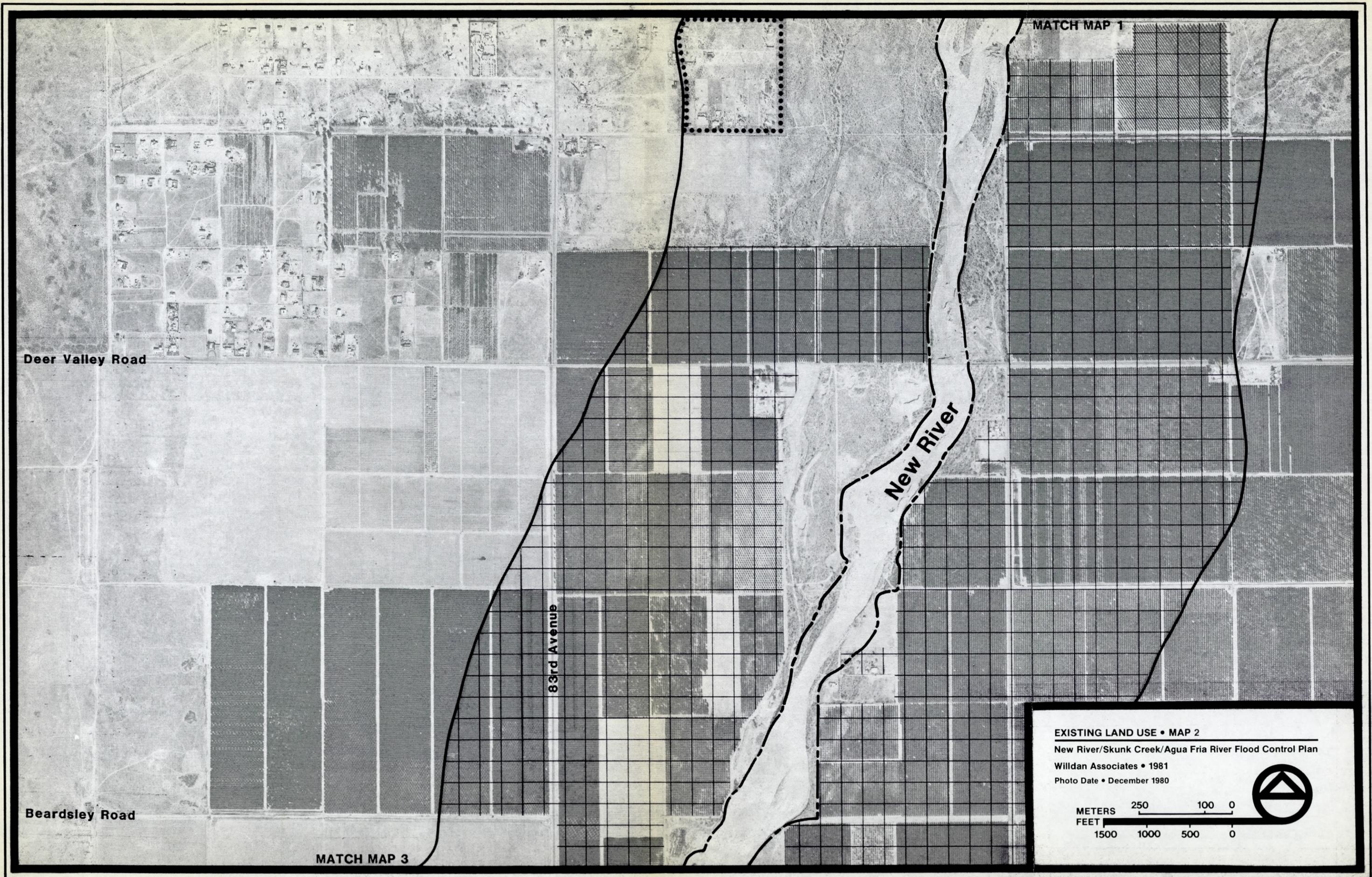
Happy Valley Road

83rd Avenue

MATCH MAP 2

EXISTING LAND USE • MAP 1
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 2

83rd Avenue

New River

75th Avenue

Union Hills Drive

91st Avenue

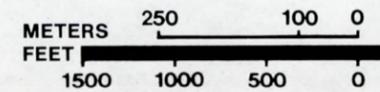
MATCH MAP 6

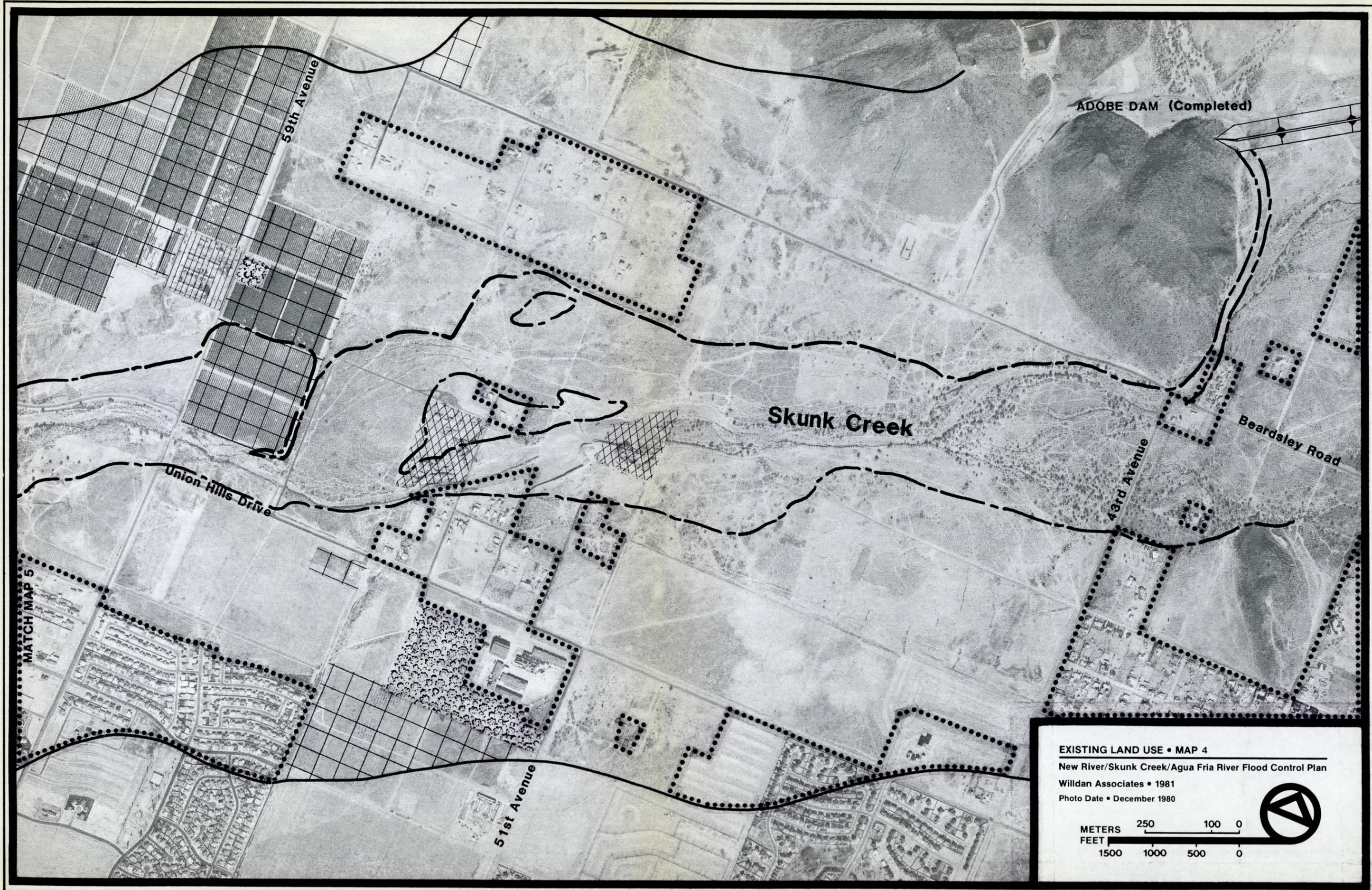
EXISTING LAND USE • MAP 3

New River/Skunk Creek/Agua Fria River Flood Control Plan

Willdan Associates • 1981

Photo Date • December 1980





ADOBE DAM (Completed)

Skunk Creek

59th Avenue

Union Hills Drive

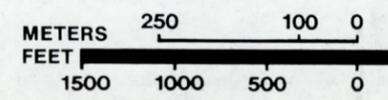
43rd Avenue

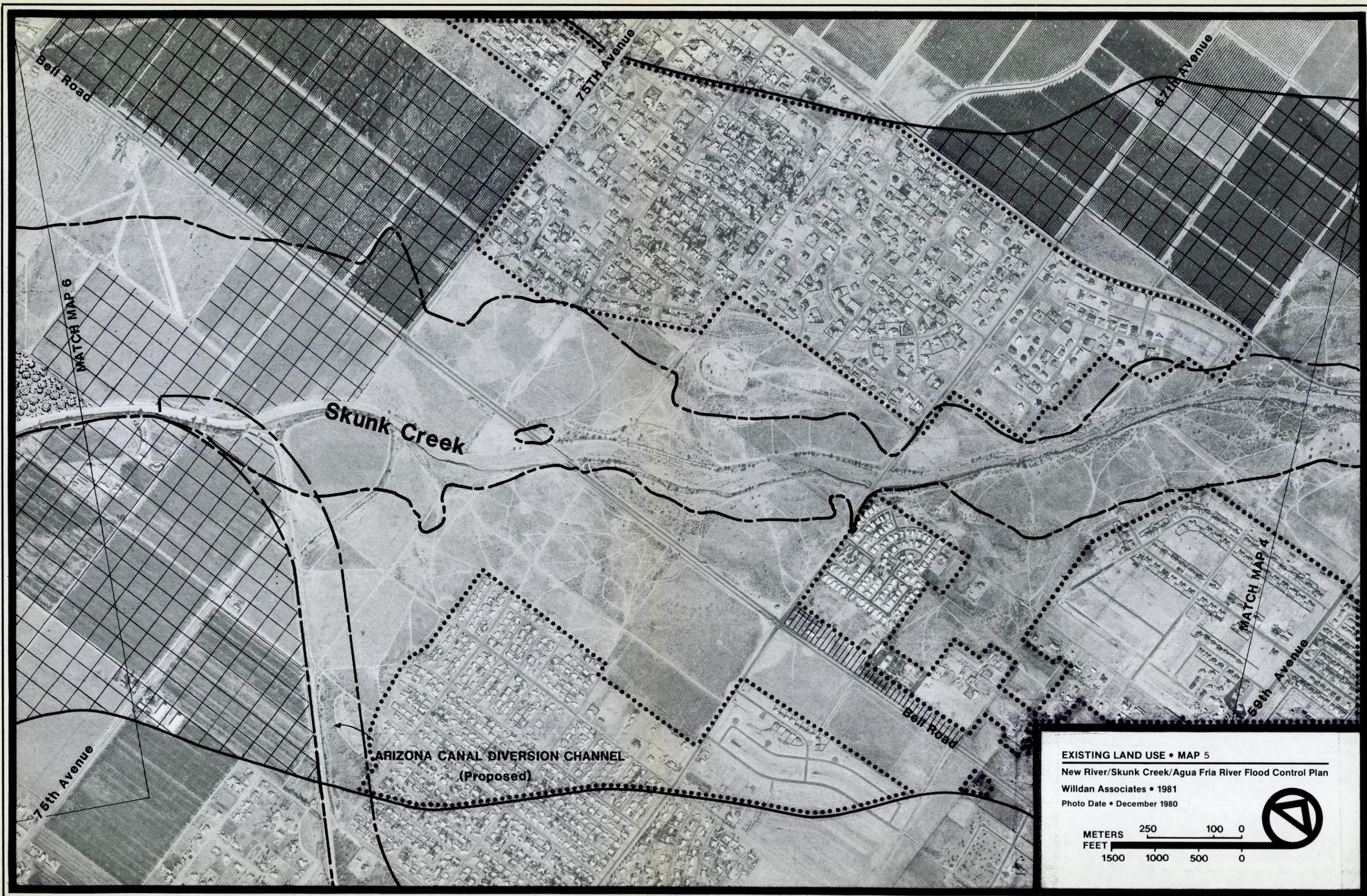
Beardsley Road

51st Avenue

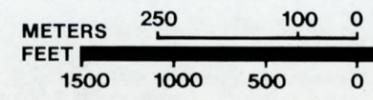
MATCH MAP 5

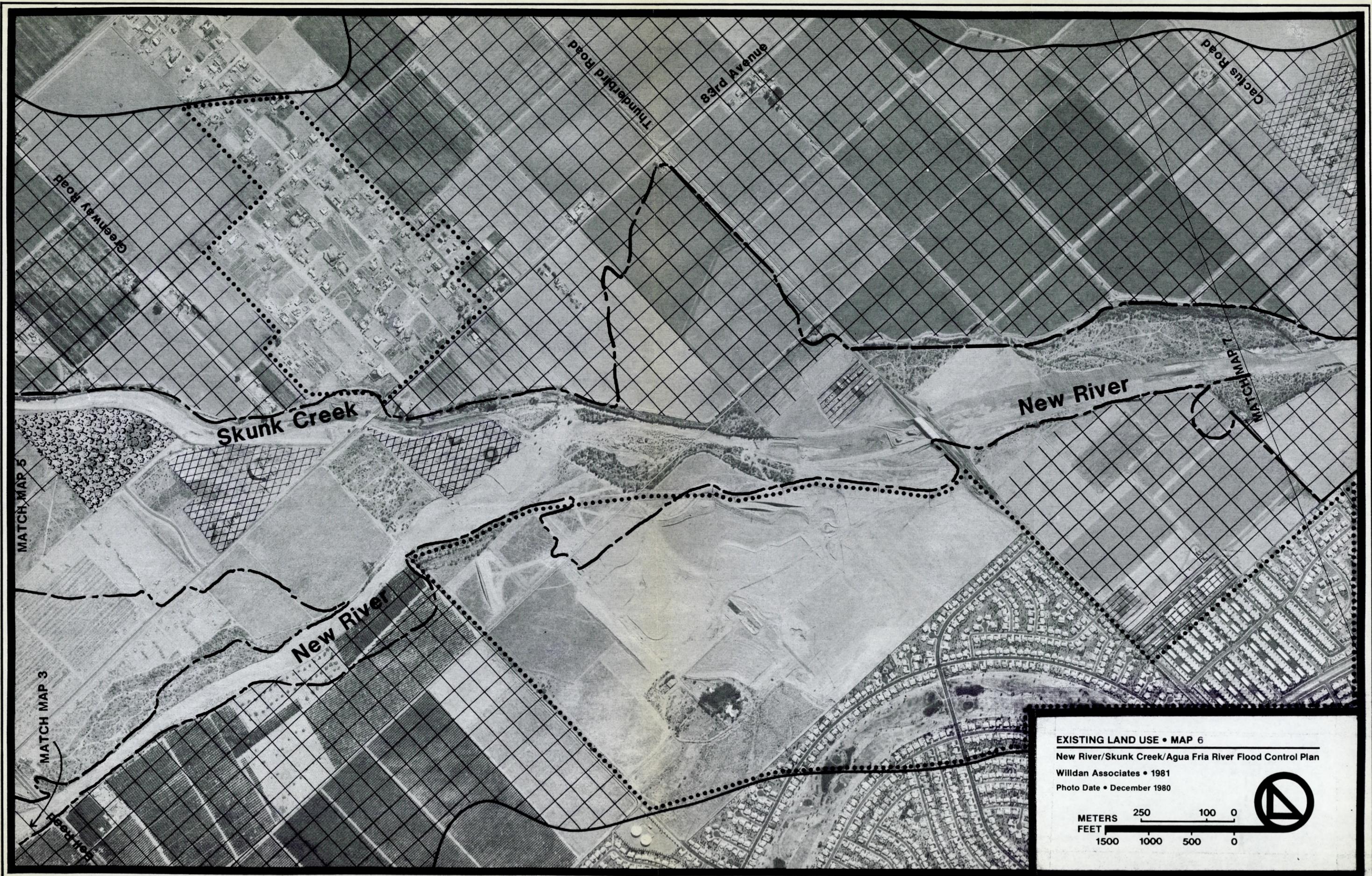
EXISTING LAND USE • MAP 4
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980



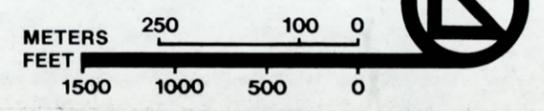


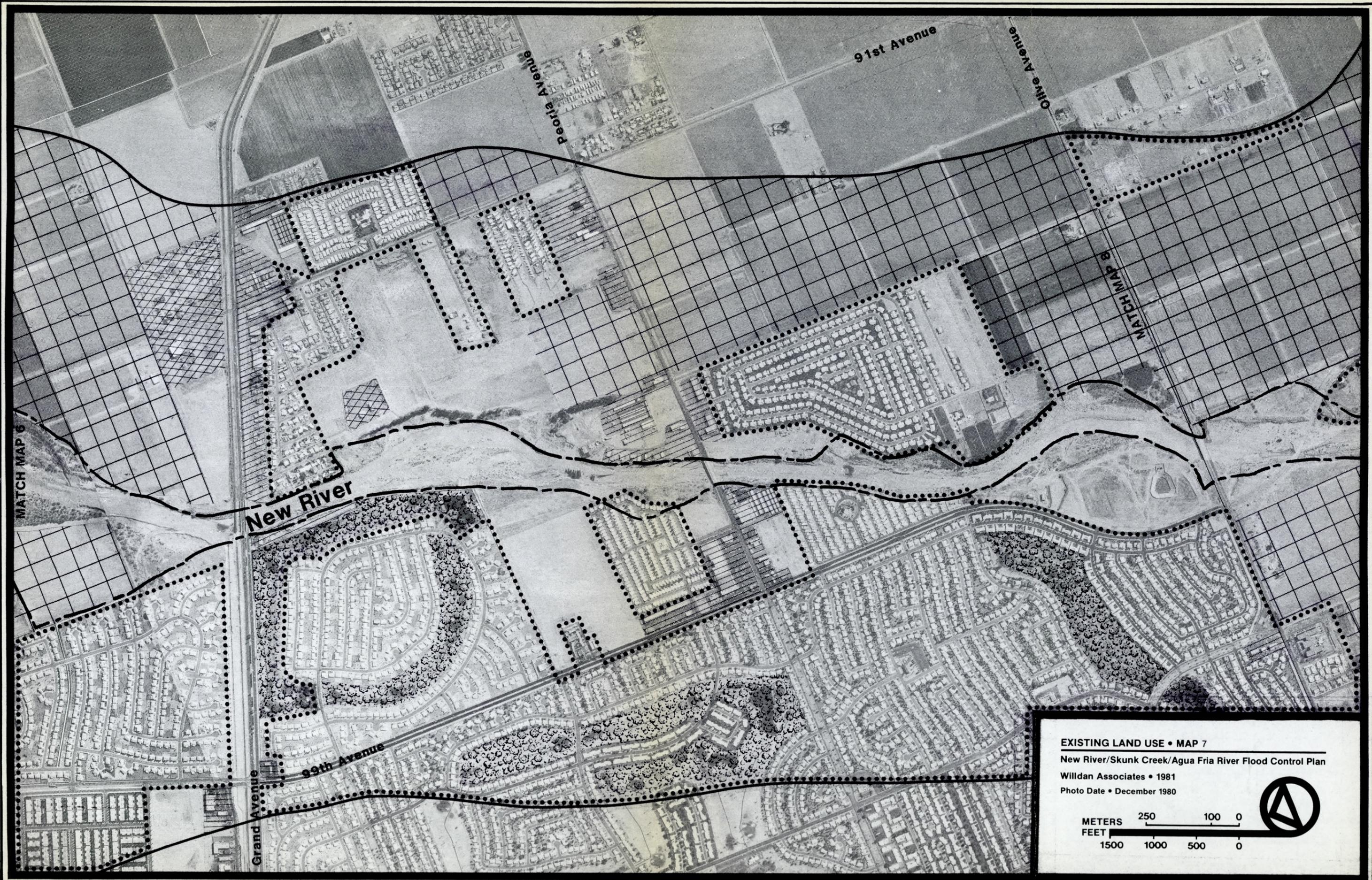
EXISTING LAND USE • MAP 5
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980



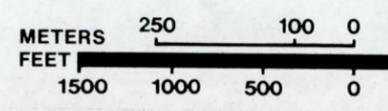


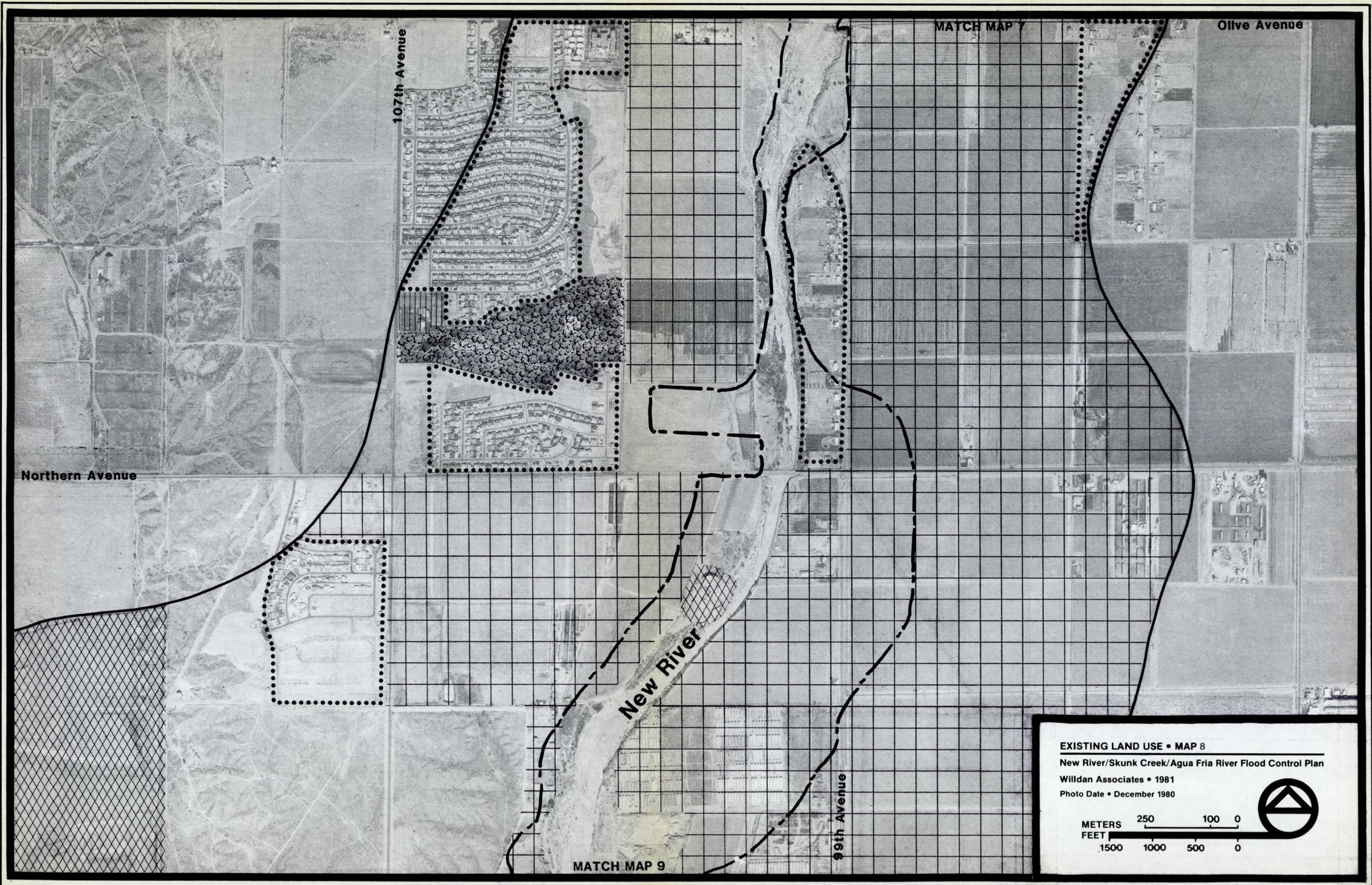
EXISTING LAND USE • MAP 6
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981
 Photo Date • December 1980



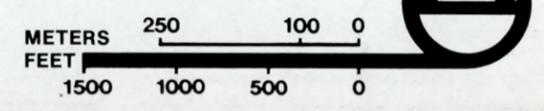


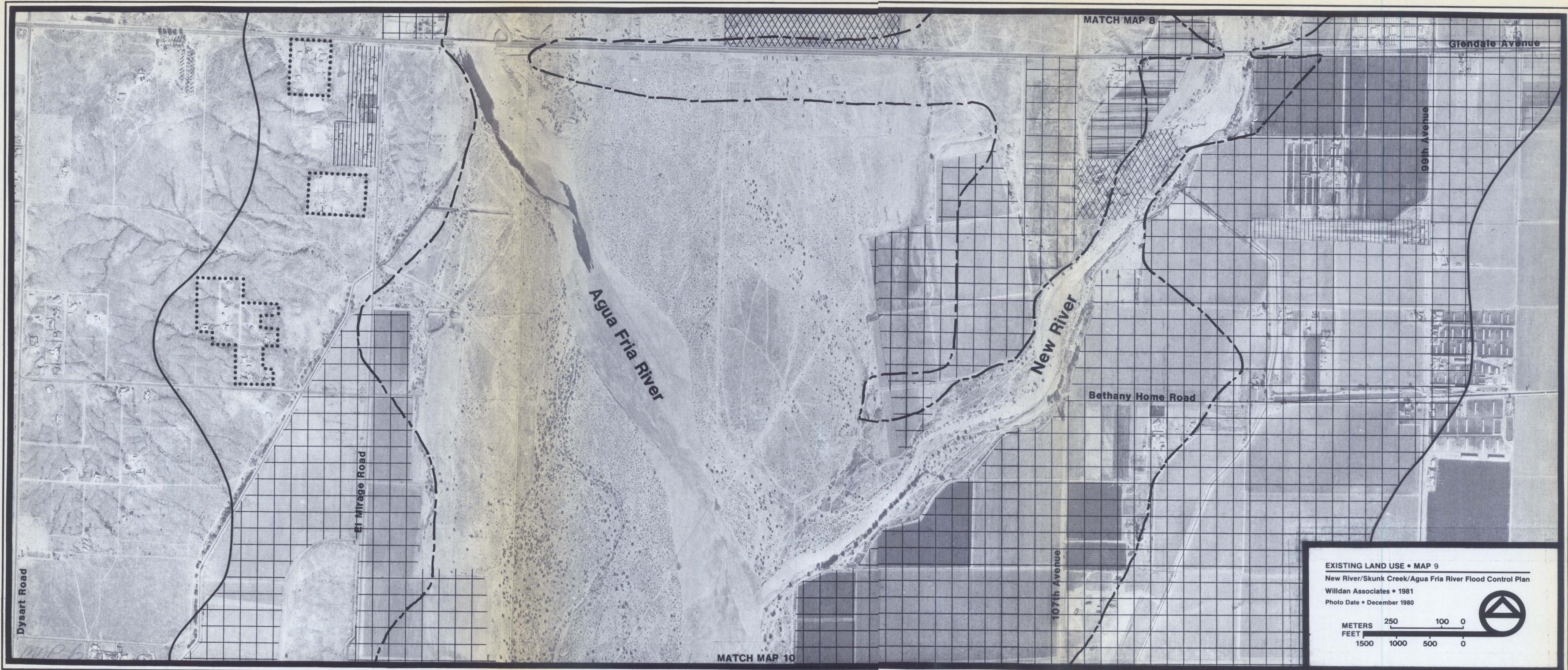
EXISTING LAND USE • MAP 7
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





EXISTING LAND USE • MAP 8
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 8

Glendale Avenue

99th Avenue

New River

Bethany Home Road

107th Avenue

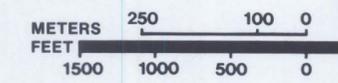
El Mirage Road

Dysart Road

Agua Fria River

MATCH MAP 10

EXISTING LAND USE • MAP 9
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 9

Agua Fria River

Camelback Road

Indian School Road

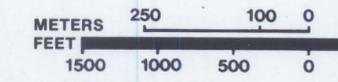
107th Avenue

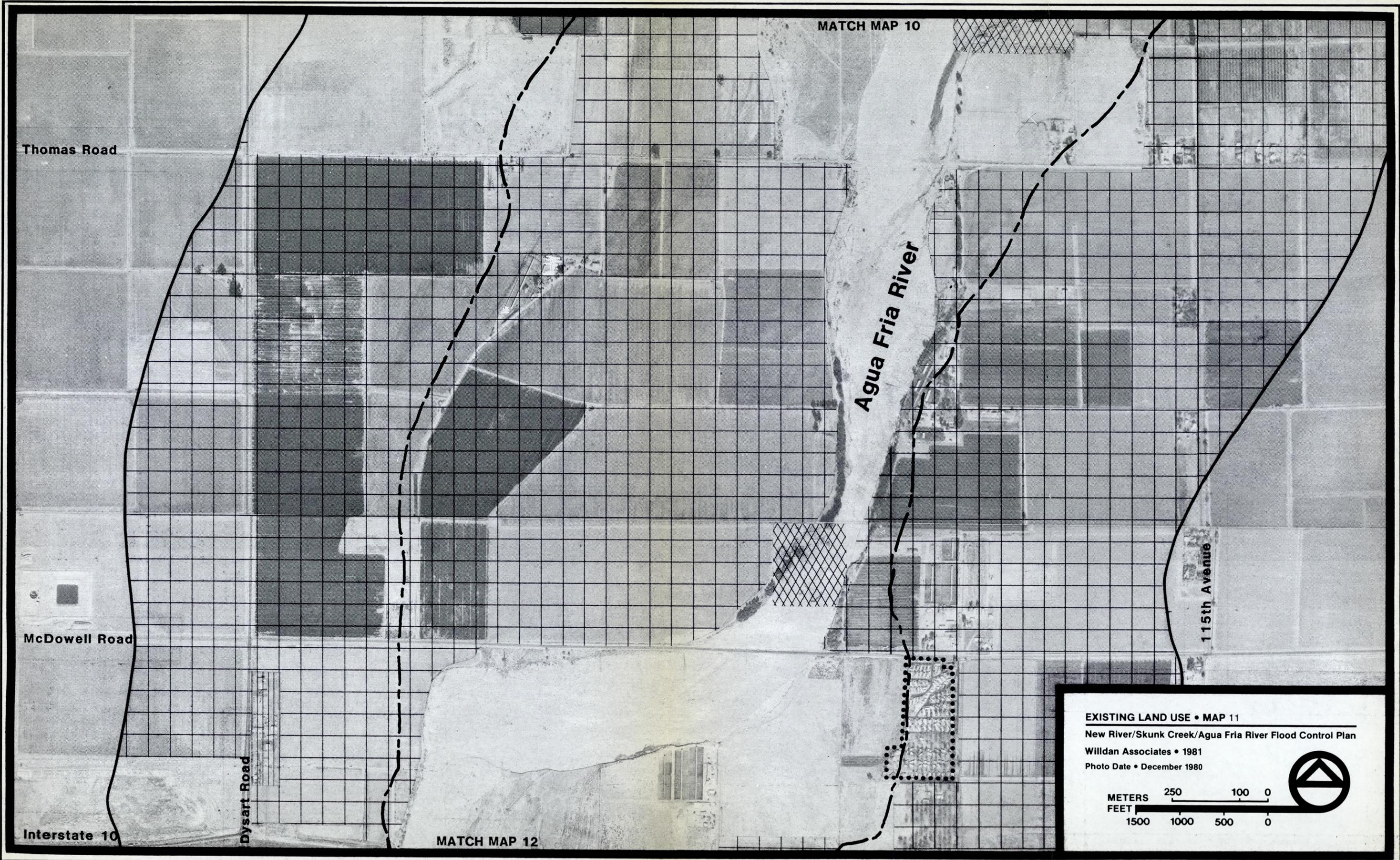
Dysart Road

Roosevelt Canal Flume

MATCH MAP 11

EXISTING LAND USE • MAP 10
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 10

Thomas Road

Agua Fria River

McDowell Road

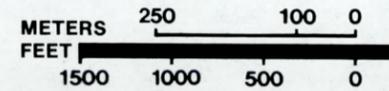
115th Avenue

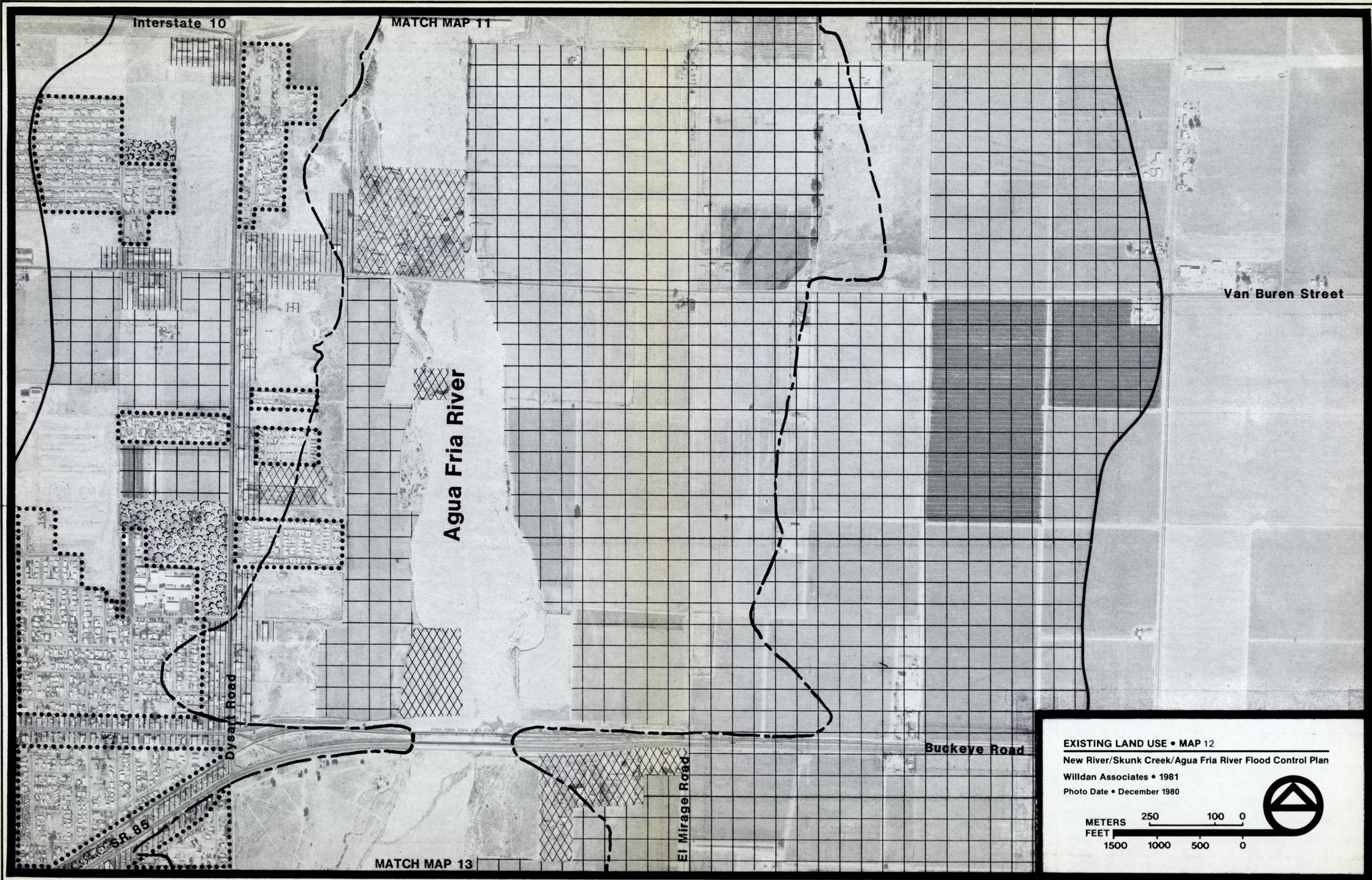
Dysart Road

Interstate 10

MATCH MAP 12

EXISTING LAND USE • MAP 11
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





Interstate 10

MATCH MAP 11

Van Buren Street

Agua Fria River

Buckeye Road

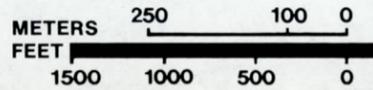
Dysart Road

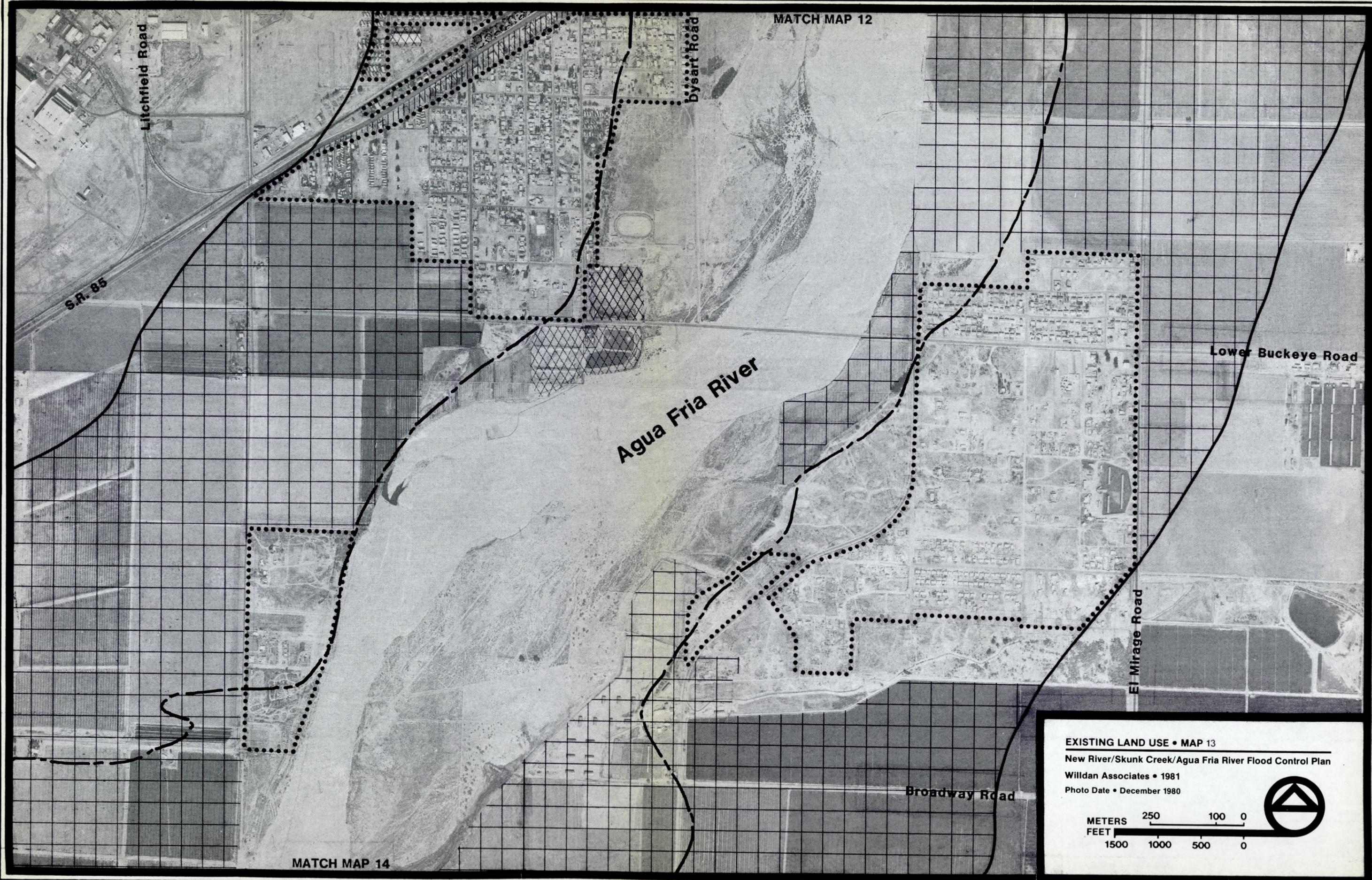
El Mirage Road

SR 85

MATCH MAP 13

EXISTING LAND USE • MAP 12
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 12

MATCH MAP 14

Litchfield Road

Bysart Road

S.R. 85

Agua Fria River

Lower Buckeye Road

El Mirage Road

Broadway Road

EXISTING LAND USE • MAP 13
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981
 Photo Date • December 1980



METERS 250 100 0
 FEET 1500 1000 500 0

MATCH MAP 13

Bullard Avenue

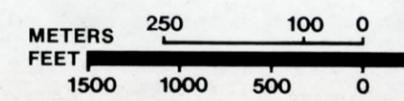
Agua Fria River

Dysart Road

Southern Avenue

Gila River

EXISTING LAND USE • MAP 14
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981
 Photo Date • December 1980



VI. EXISTING AND PROPOSED LAND USE DESCRIPTIONS

The following presents each reach of the study area by map and discusses current land uses, municipal and county proposed land uses, and potentials for wildlife habitat. This information is also mapped on the four map sets included in this document.

Reach I

Map 1 follows the course of New River downstream from the proposed New River Dam site to south of Pinnacle Peak Road. The reach is virtually undisturbed by development and the most pristine in the study area. This section is characterized by a braided river channel with islands of potential wildlife habitat interspersed throughout. The area is primarily uninhabited and virtually inaccessible by conventional automobile traffic. At this date, no municipal or county development plans for the area have been proposed. The cities of Peoria and Glendale, and Maricopa County have jurisdiction in this portion of the study area.

Map 2 extends from south of Pinnacle Peak Road to Beardsley Road. Potential wildlife habitat on the northern portion of this reach is similar to Map 1, however, the natural desert surrounding the channel has been replaced by agricultural fields. South of Deer Valley Road, the area is characterized by potential wildlife habitat areas on each bank. Future land use plans show the east side of the channel developed for residential uses by the City of Glendale. Peoria and Maricopa County have jurisdiction over the remainder of the study area.

Map 3 depicts New River's course, from Beardsley to Bell Road, along 83rd Avenue. Agriculture is the dominant adjacent land use. Two small potential wildlife habitat

areas are identified in the northern section and a linear habitat area in the southern portion on the west channel bank. This linear area, which extends into Map 6, is proposed for recreation/open space uses by the City of Peoria. The rest of the study area outside the 100-year floodplain is proposed for residential development. The cities of Glendale and Peoria have jurisdiction within the study area.

Reach 2

Map 4 portrays Skunk Creek from Adobe Dam southwest to approximately 1,600 feet west of 59th Avenue. The area around Beardsley and 43rd Avenue is unsightly because it has been used as an unauthorized dumping area. While a large potential wildlife habitat area has been identified at this location, restoration is imperative for the area to foster wildlife and open space values of significance. An additional potential wildlife habitat area has been identified downstream; the area extends into Map 5 and is surrounded by agricultural uses. Two sand and gravel areas are in operation within the 100-year floodplain along this stretch of the channel. Future land use plans for Glendale and Phoenix, show that the study area is to be developed primarily for residential uses with an area north of the channel around 59th Avenue slated for commercial development.

Map 5 shows Skunk Creek from approximately 1,600 feet to west of 59th Avenue to the proposed Arizona Canal Diversion Channel. A trail node is proposed along this stretch at the intersection of the creek and the proposed Arizona Canal Diversion Channel (U.S. Army Corps of Engineers, 1980). Existing uses in the study area are a mixture of residential, agricultural, and vacant lands within the jurisdictions of Maricopa County and the cities of Peoria and Glendale. Proposed future land uses will convert existing agricultural and vacant lands to residential and commercial uses. Channelization of the

creek is proposed by the U.S. Army Corps of Engineers from the Arizona Canal Diversion Channel downstream to 0.25 miles (0.4 km) north of Greenway Road (1976).

Reach 3

Map 6 depicts the New River-Skunk Creek confluence from Bell Road to Cactus Road. Several potential wildlife habitat areas are located within this stretch of channel. Peoria's existing Greenway Sports Complex and a proposed greenbelt extends for 0.75 miles (1.2 km) along Skunk Creek. The areas adjacent to the 100-year floodplain are predominantly agricultural; however, sand and gravel operations are also located in the area. Future land use plans depict the area as primarily residential interspersed with commercial and industrial uses. Channelization of the river has been proposed adjacent to Desert Harbor, a proposed residential development on the west side of the river south of Greenway Road. These approved plans show a 125 foot (38 m) bottom width channel with a 15 foot (4.5 m) depth. Also at the confluence, the Flood Control District proposes an open space area on property under their ownership. Maricopa County and the City of Peoria have jurisdiction within this reach of the study area.

Map 7 traces the channel from just north of Grand Avenue to south of Olive Avenue. Sun City, a completed planned residential development, is directly west of the channel. East of the channel, under the jurisdiction of Maricopa County and Peoria, a mix of agricultural, residential, commercial, and industrial uses occurs. In the future, residential development is planned to fill in vacant and agricultural areas on both sides of the channel. A large park south of Grand Avenue is proposed by the City of Peoria in conjunction with linear park development. The proposed greenbelt serves to separate conflicting uses while providing recreation space. A straightening of the channel is proposed immediately north of Olive Avenue. Both sides of this proposed channel are

slated for recreation open space uses. Also, the U.S. Army Corps of Engineers has proposed 3,000 feet (914.4 m) of channelization at Grand Avenue to allow free flow of a 100 year flood through the existing bridge. A levee would extend upstream of the channelization along the east bank of the river to Thunderbird Road (1976). South of the channelization at Grand Avenue, the Corps also proposes bank stabilization on the west bank to 0.25 mile (0.4 km) south of Peoria Avenue. Potential habitat areas identified are adjacent to existing residential and industrial areas. The viability of these areas to continue to sustain wildlife will depend upon the amount of protection from misuse and encroachment by adjacent land uses.

The **Map 8** area, extending from Olive Avenue to just north of Glendale Avenue, is primarily used for agricultural purposes with scattered rural residences. A large wildlife habitat area is identified within and immediately adjacent to the main channel. Maricopa County and Peoria have jurisdiction over the lands north of Northern Avenue. Residential uses in this area are proposed to fill in lands now used for agriculture. South of Northern Avenue lands are to remain agricultural with a proposed Glendale golf course located between 107th and 115th Avenues at the site of an existing landfill. The City of Glendale has strip annexed those lands along the south side of Northern Avenue between 91st and 115th Avenue.

Map 9 depicts the confluence of New River with the Agua Fria River from Glendale Avenue to just north of Camelback Road. The river channels separate land uses. East of the New River, agriculture is the primary use, the channel area remains as natural open space, and on the west a mix of land uses occurs including agriculture, scattered residences, open space, and commercial. There is a large wildlife habitat area in the confluence area and a long strip of habitat on the eastern bank of the New River. Sand and gravel operations south of Glendale Avenue are located in the New River channel

northwest of the habitat area. The City of Glendale has proposed a new municipal airport south of Glendale Avenue at the confluence, and a rest node for the Sun Circle Trail is also proposed adjacent to this location. Glendale, Phoenix, and Maricopa County each have jurisdiction within the study area. In addition, Goodyear has strip annexed a portion of land immediately adjacent to and west of El Mirage Road, south of Bethany Home Road.

Reach 4

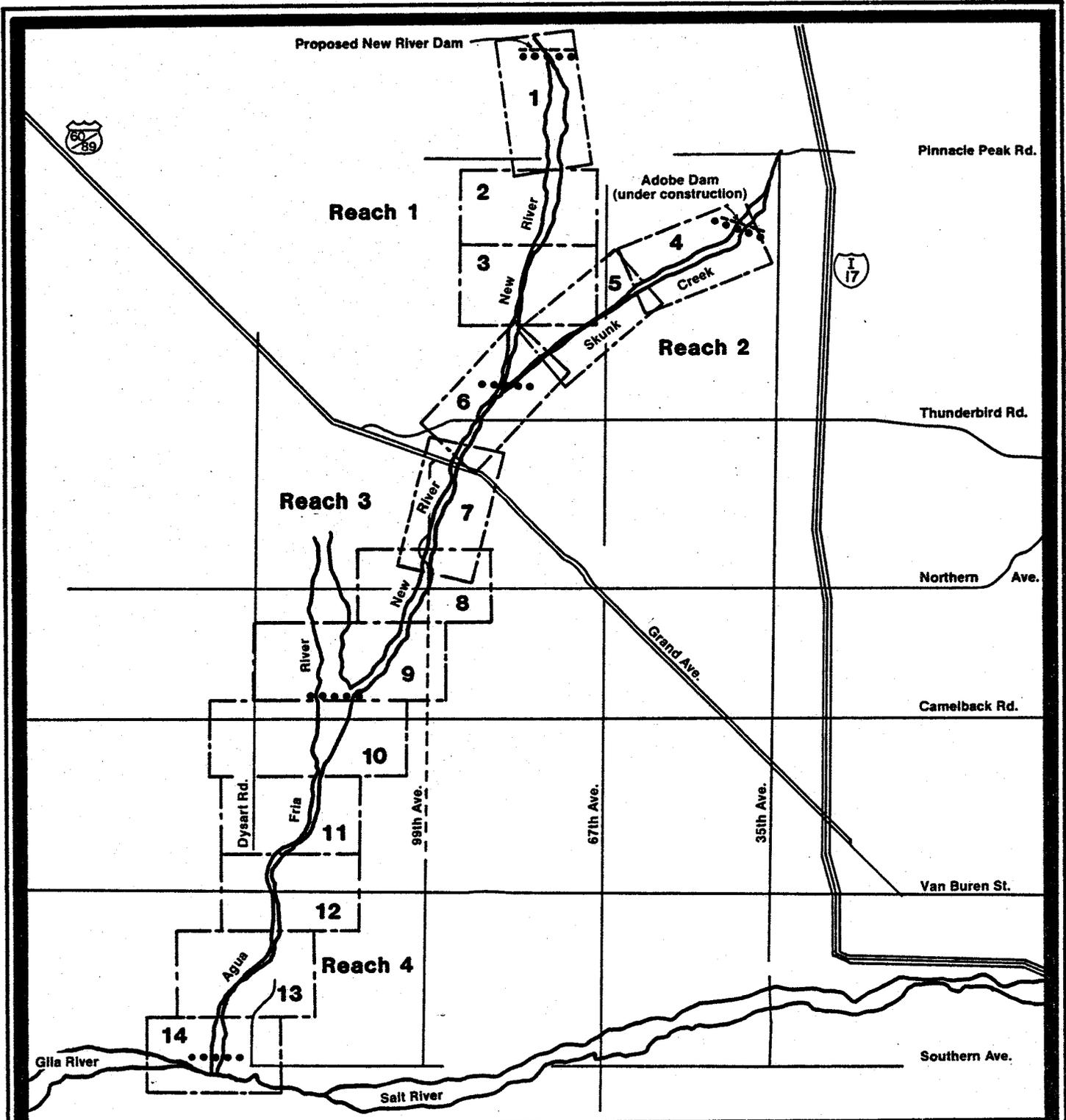
Map 10, extending from north of Camelback Road to the Roosevelt Canal Flume, represents an area with existing land uses similar to Map 9. The Agua Fria River floodplain increases significantly, widening to over a mile (1.6 km) at some points. Sand and gravel operations exist within the channel and agricultural uses occur on either side of the channel. Currently, there is a large stand of trees on the east side of the channel south of Camelback Road. Residential uses are proposed to replace existing agricultural uses in the study area. Maricopa County has jurisdiction over the study area with the cities of Goodyear, Avondale, and Phoenix each having strip annexed portions.

Map 11 represents a stretch of the Agua Fria River, from south of the Roosevelt Canal Flume to Interstate 10, that is a unique area with regards to wildlife habitat because of a grove of large Tamarisk trees. Large stands of trees parallel the channel from Thomas to McDowell Roads. The existing channel is proposed for realignment to accommodate passage of flood water under the proposed McDowell Road and Interstate 10 bridges; consequently, the riparian habitat presently associated with this reach will no longer be located within the channel. Presently, land uses in the study area are primarily agricultural; however, future plans show residential development north of McDowell Road, and commercial development south of this roadway. Maricopa County, Avondale, and Goodyear have jurisdiction within the study area.

Map 12, from Interstate 10 to south of Buckeye Road, shows the east side of the channel being used primarily for agriculture, with the west side a mix of land uses including residential, industrial, commercial and park land. The Avondale Comprehensive Plan Update (1980) designates a large portion of the channel for future parks and recreation use. Other elements of the general plan for Maricopa County and Goodyear show the conversion of agricultural lands to residential and commercial uses. The U.S. Army Corps of Engineers has proposed some excavation of the existing channel at Buckeye Road to allow free flow of flood water (1976).

Map 13 extends from south of Buckeye Road to south of Broadway Road. Two large potential wildlife habitat areas occur in this section. The Corps' Overall Master Plan (1980) proposes a rest node be located south of Lower Buckeye Road adjacent to the channel and the sewage treatment plant. Much of the study area is cultivated land with a large residential area located east of the channel at Lower Buckeye and El Mirage Roads. Agricultural areas on the east will be converted to residential uses, while those on the west will remain as is or be used for industrial purposes. A large portion of the study area falls within the Avondale planning area, but is under the jurisdiction of Maricopa County. Goodyear has jurisdiction for lands in the extreme northwest corner of the study area.

Map 14 extends from south of Broadway Road to Southern Avenue. A large stretch of potential wildlife habitat area continues from Map 13 along the east bank of the Agua Fria River upstream from its confluence with the Gila River. The surrounding area is principally agricultural, and is to continue as such according to future land use plans. This area is predominantly under the jurisdiction of Maricopa County with the cities of Avondale and Goodyear having strip annexed some portions.



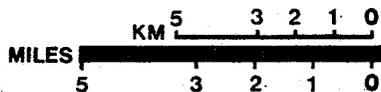
PROPOSED CHANGES IN EXISTING LAND USE • KEY MAP

New River/Skunk Creek/Agua Fria River Flood Control Plan

Willdan Associates • 1981

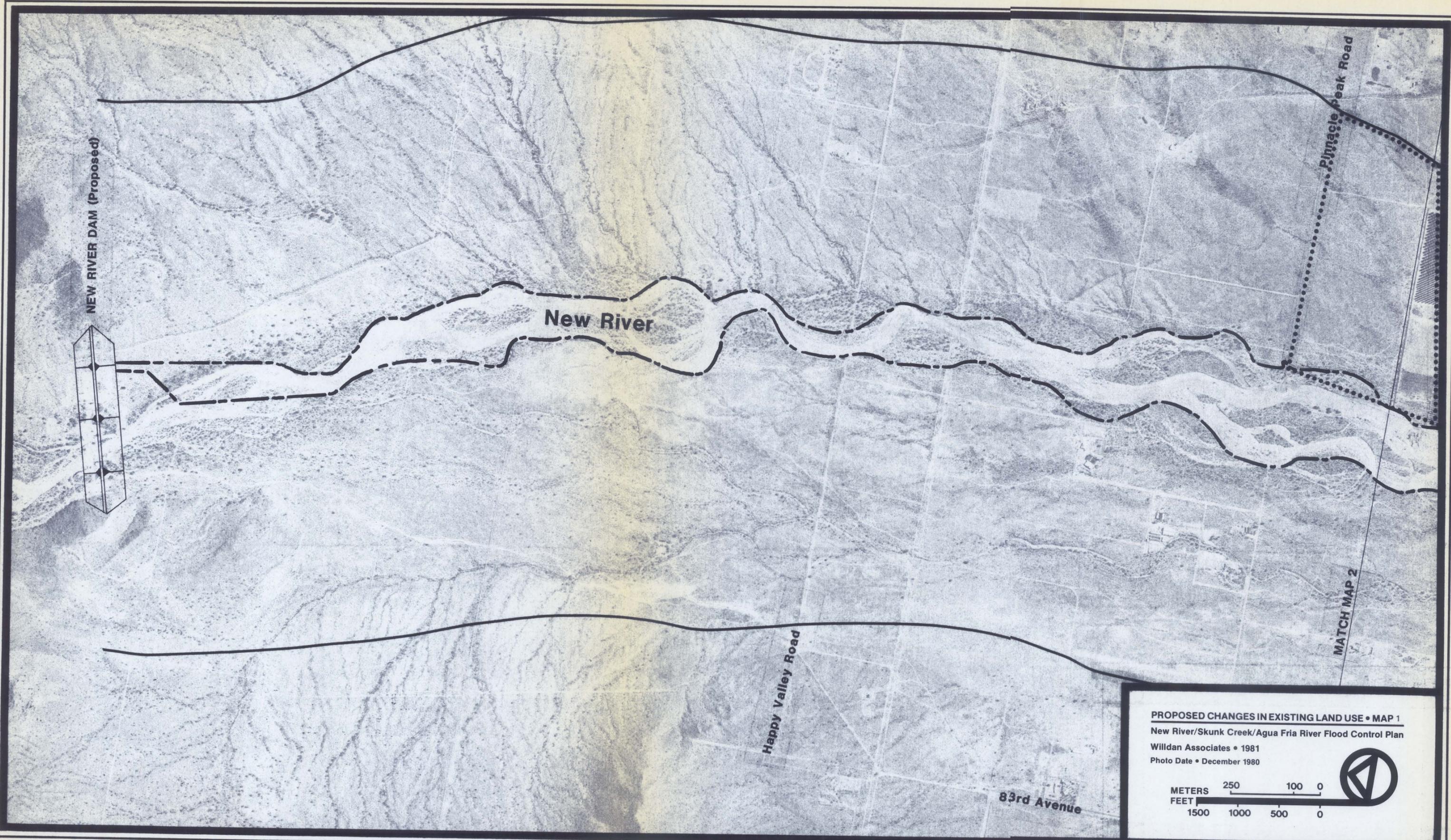
KEY MAP LEGEND

-  Map Areas
-  Reach Boundary



PROPOSED CHANGES IN EXISTING LAND USE LEGEND

-  Study Area Boundary
-  100 Year Floodplain
-  Residential
-  Commercial
-  Industrial
-  Recreation/Open Space



NEW RIVER DAM (Proposed)

New River

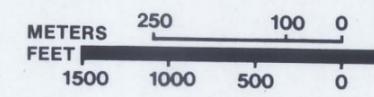
Pinnacle Peak Road

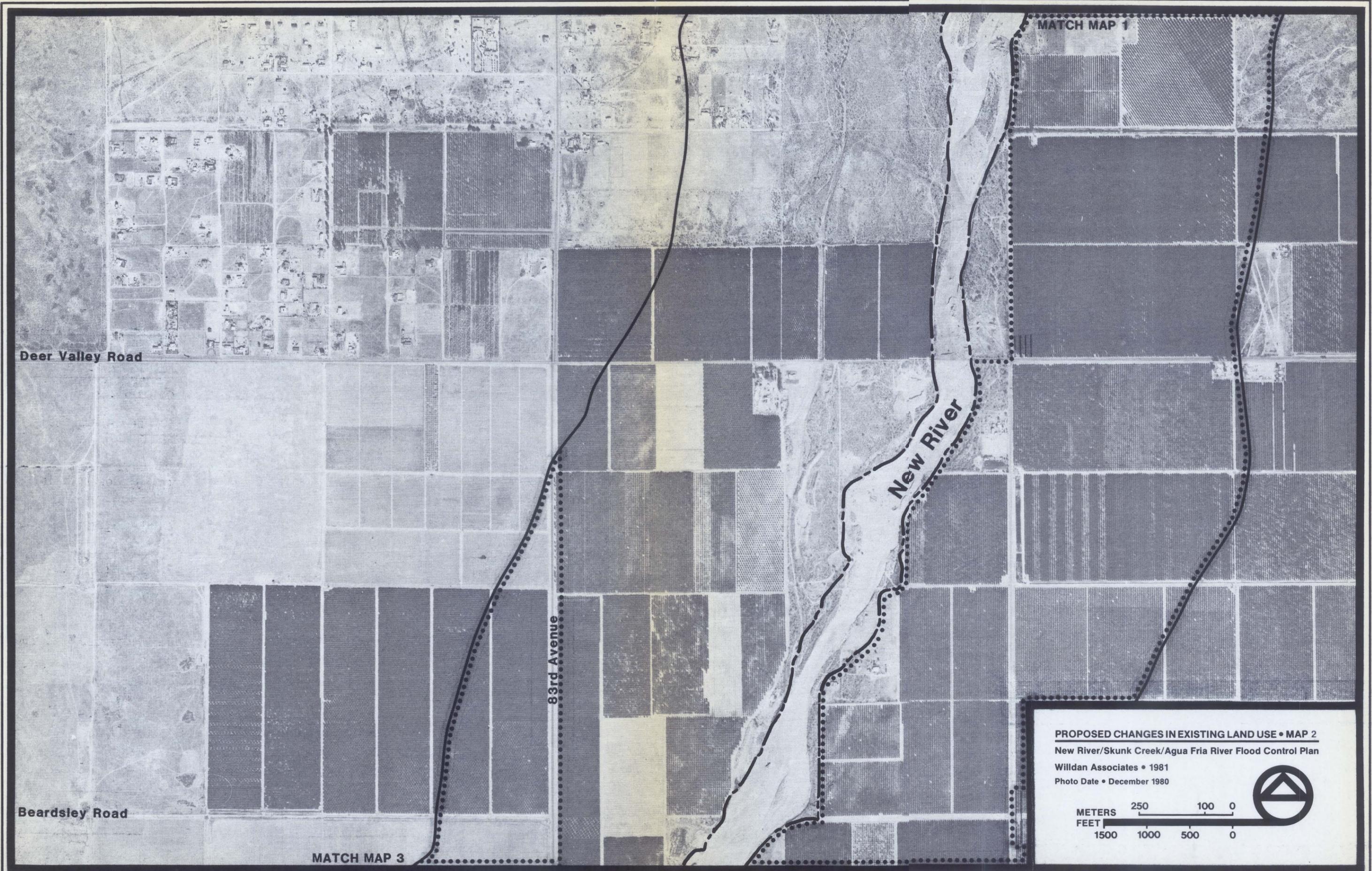
Happy Valley Road

83rd Avenue

MATCH MAP 2

PROPOSED CHANGES IN EXISTING LAND USE • MAP 1
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 1

Deer Valley Road

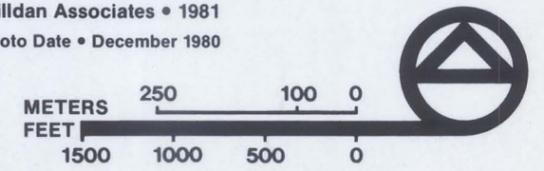
New River

83rd Avenue

Beardsley Road

MATCH MAP 3

PROPOSED CHANGES IN EXISTING LAND USE • MAP 2
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980



MATCH MAP 2

83rd Avenue

New River

75th Avenue

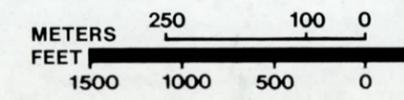
Union Hills Drive

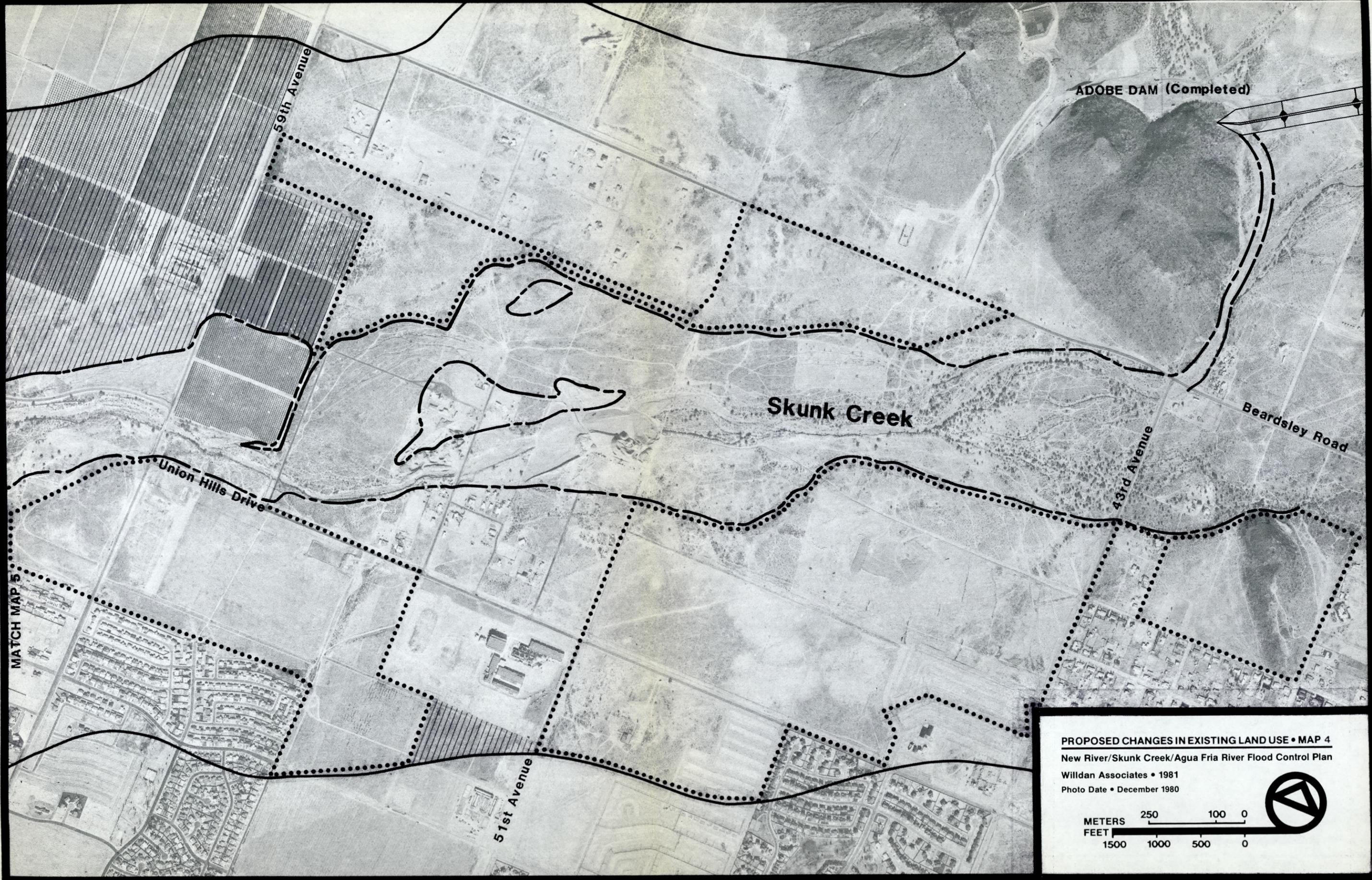
91st Avenue

MATCH MAP 6

PROPOSED CHANGES IN EXISTING LAND USE • MAP 3
New River/Skunk Creek/Agua Fria River Flood Control Plan

Willdan Associates • 1981
Photo Date • December 1980





ADOBE DAM (Completed)

Skunk Creek

Beardsley Road

43rd Avenue

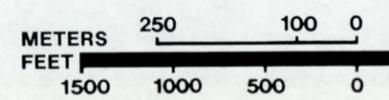
Union Hills Drive

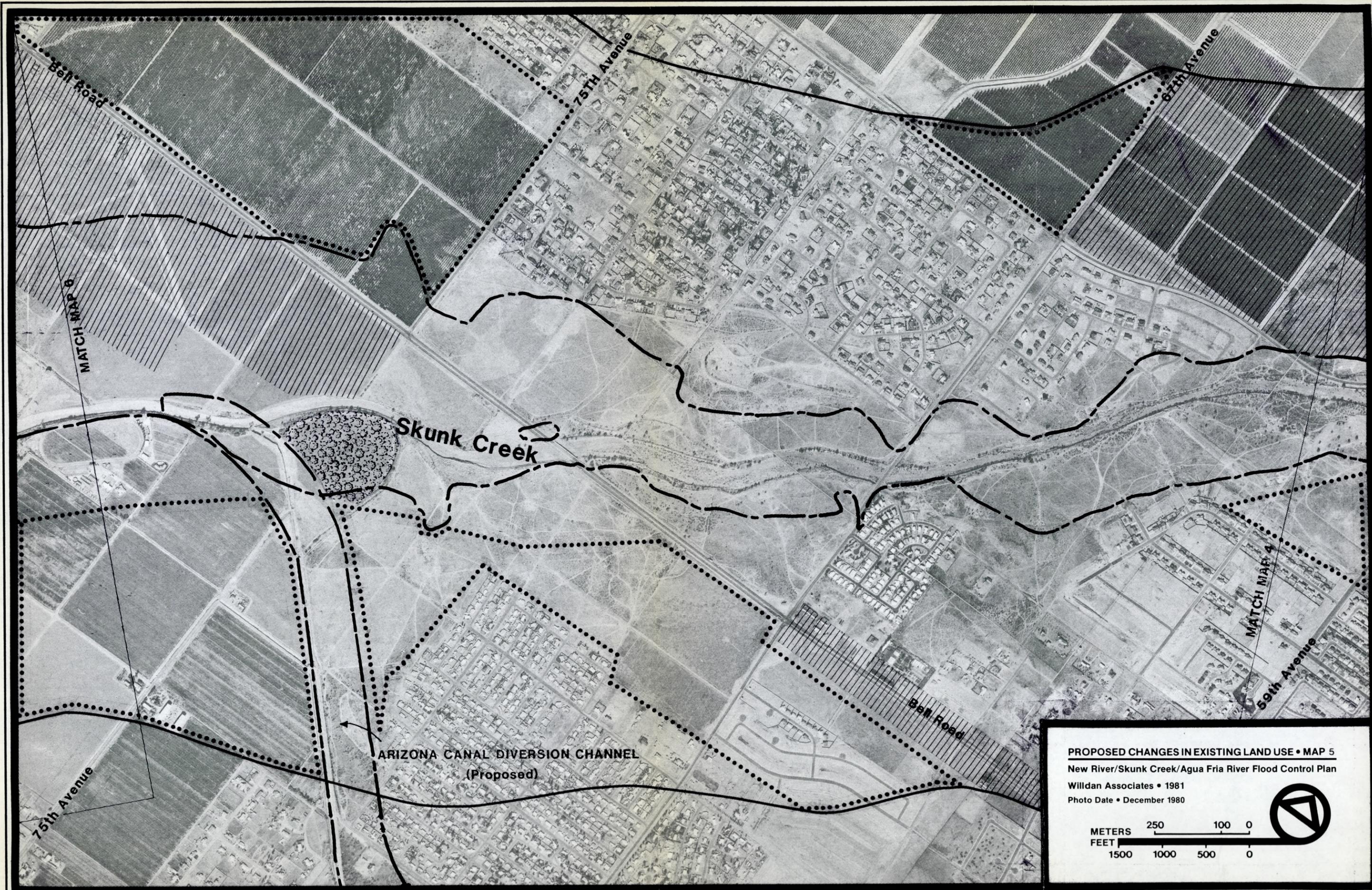
59th Avenue

51st Avenue

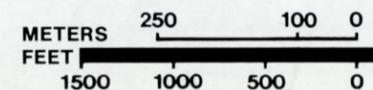
MATCH MAP 5

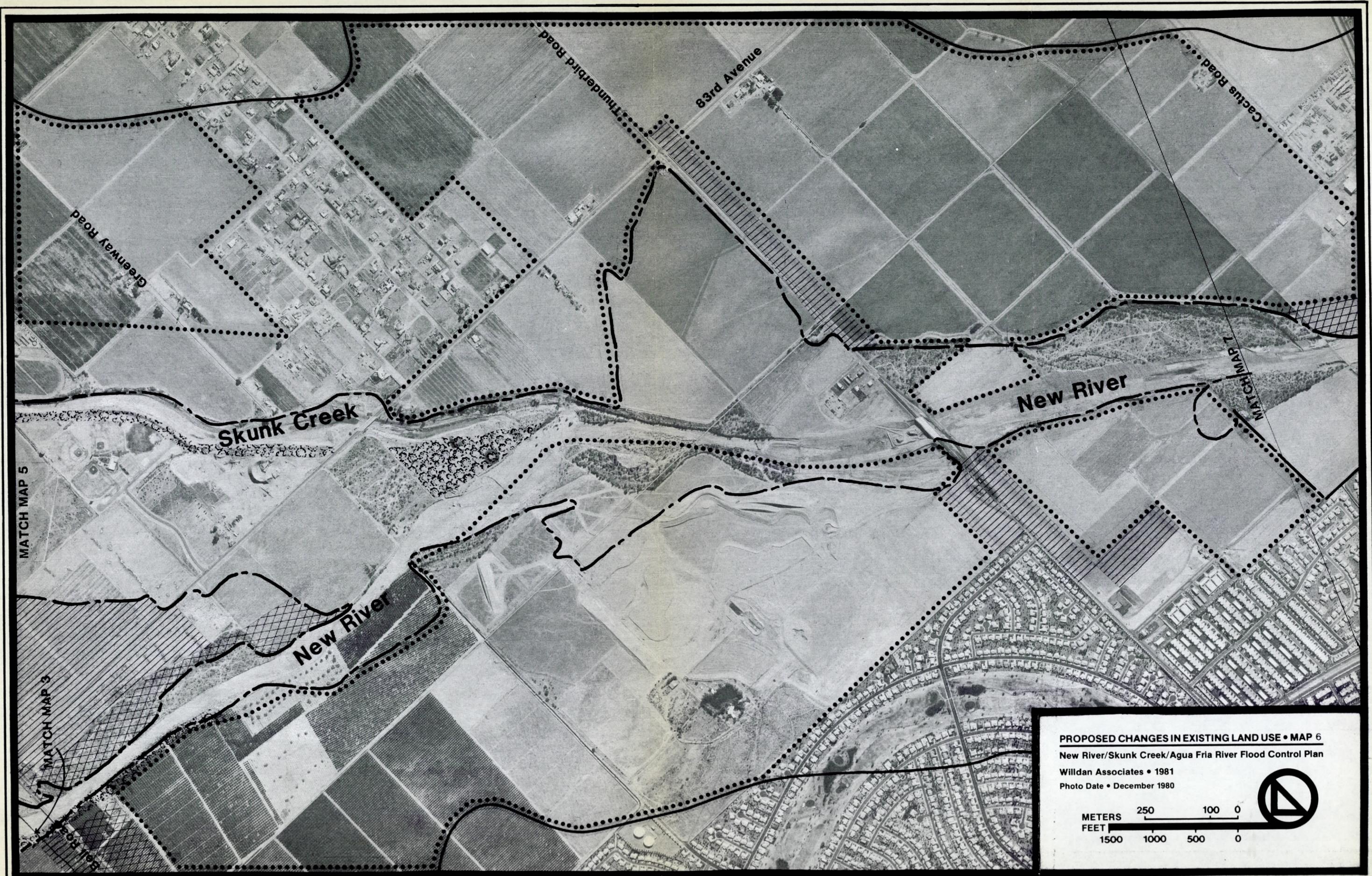
PROPOSED CHANGES IN EXISTING LAND USE • MAP 4
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980



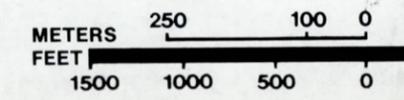


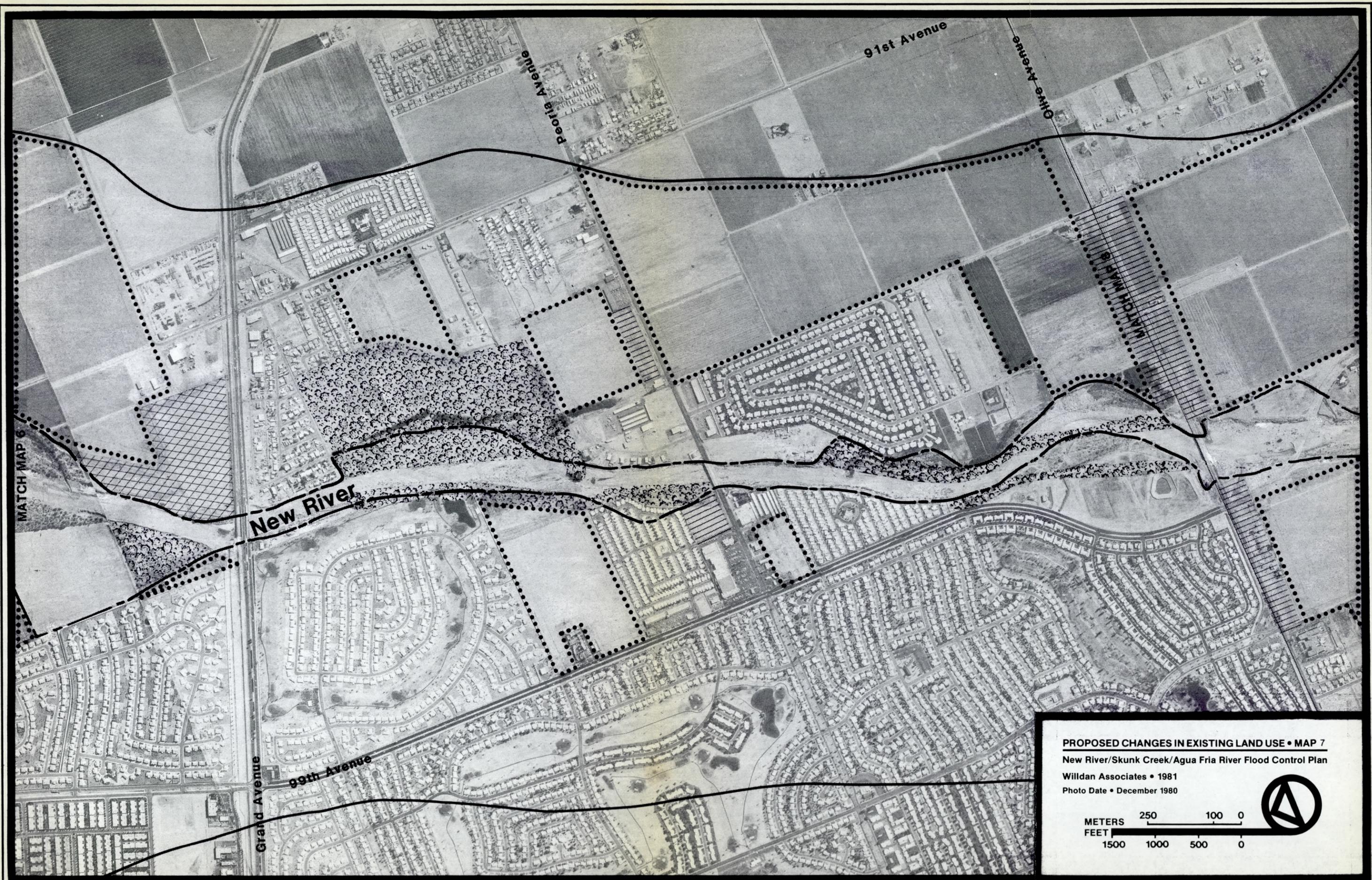
PROPOSED CHANGES IN EXISTING LAND USE • MAP 5
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





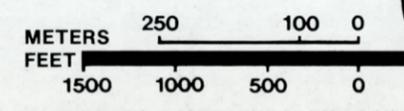
PROPOSED CHANGES IN EXISTING LAND USE • MAP 6
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980

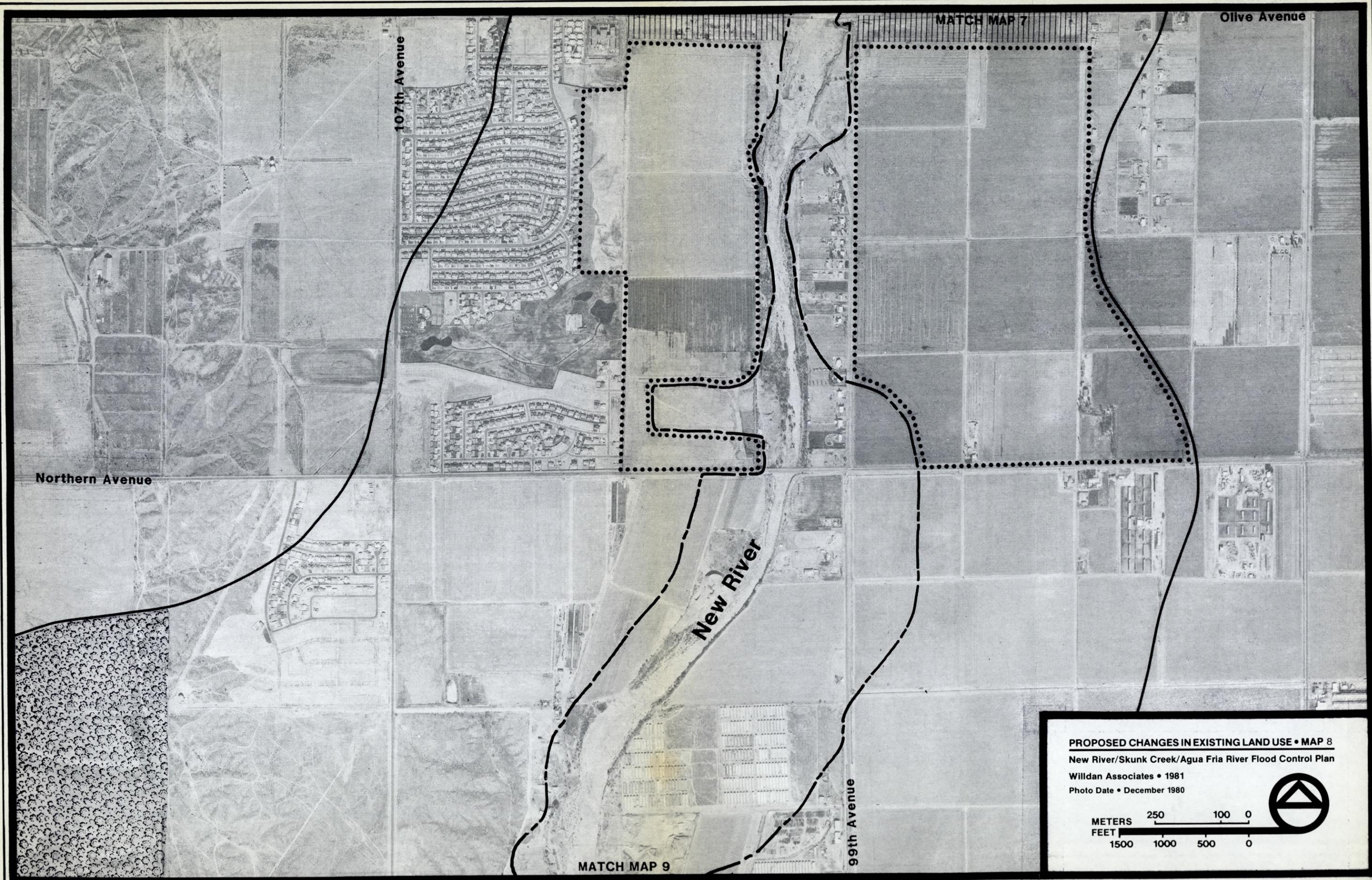




MATCH MAP 6

PROPOSED CHANGES IN EXISTING LAND USE • MAP 7
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





Northern Avenue

107th Avenue

MATCH MAP 7

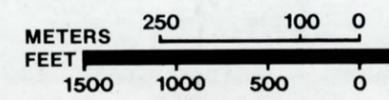
Olive Avenue

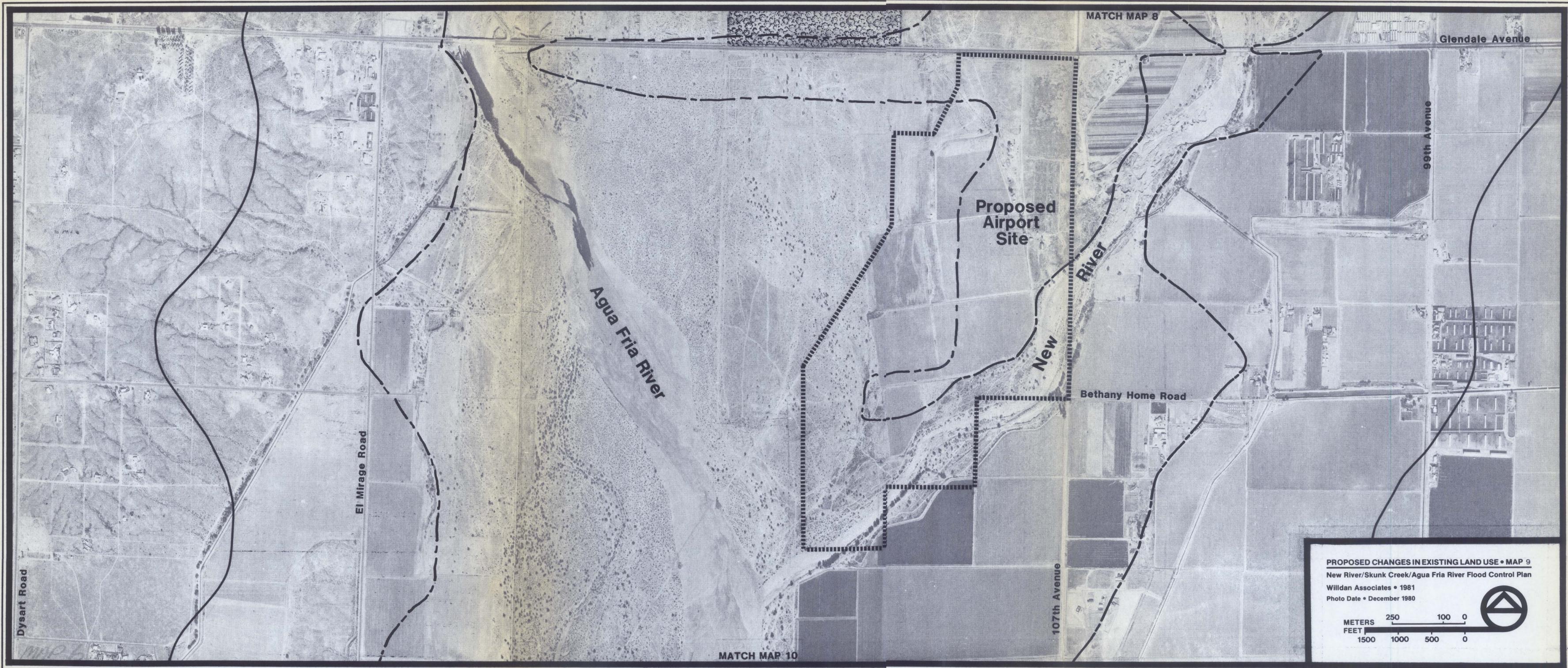
New River

99th Avenue

MATCH MAP 9

PROPOSED CHANGES IN EXISTING LAND USE • MAP 8
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980







MATCH MAP 9

Camelback Road

Agua Fria River

Indian School Road

107th Avenue

Roosevelt Canal Flume

Dysart Road

MATCH MAP 11

PROPOSED CHANGES IN EXISTING LAND USE • MAP 10
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980

METERS 250 100 0
FEET 1500 1000 500 0



MATCH MAP 10

Thomas Road

Agua Fria River

115th Avenue

McDowell Road

Dysart Road

Interstate 10

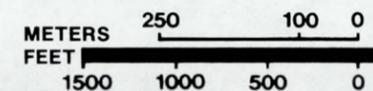
MATCH MAP 12

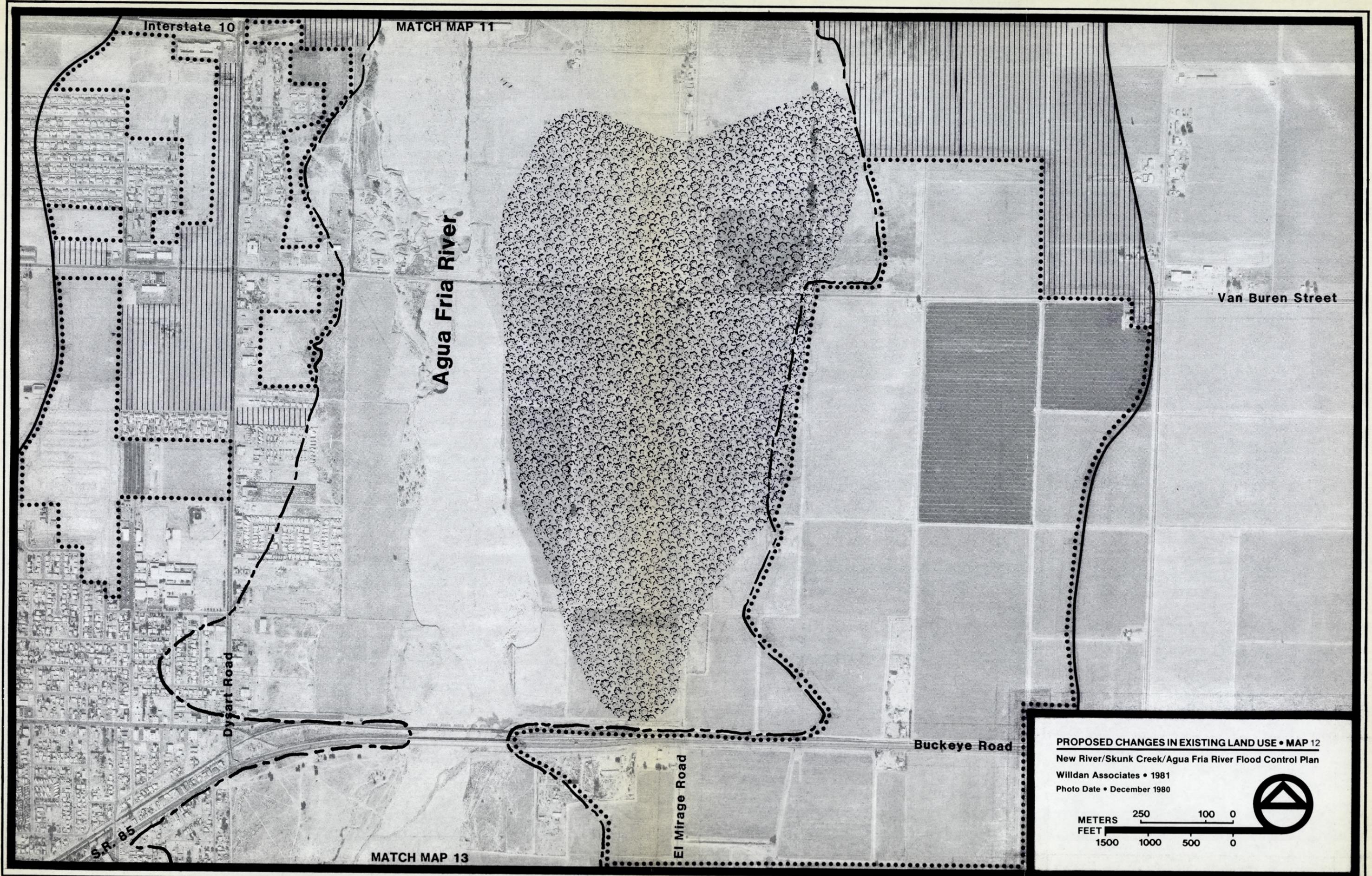
PROPOSED CHANGES IN EXISTING LAND USE • MAP 11

New River/Skunk Creek/Agua Fria River Flood Control Plan

Willdan Associates • 1981

Photo Date • December 1980





Interstate 10

MATCH MAP 11

Agua Fria River

Van Buren Street

Dysart Road

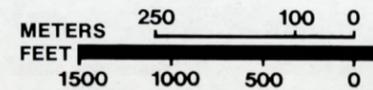
Buckeye Road

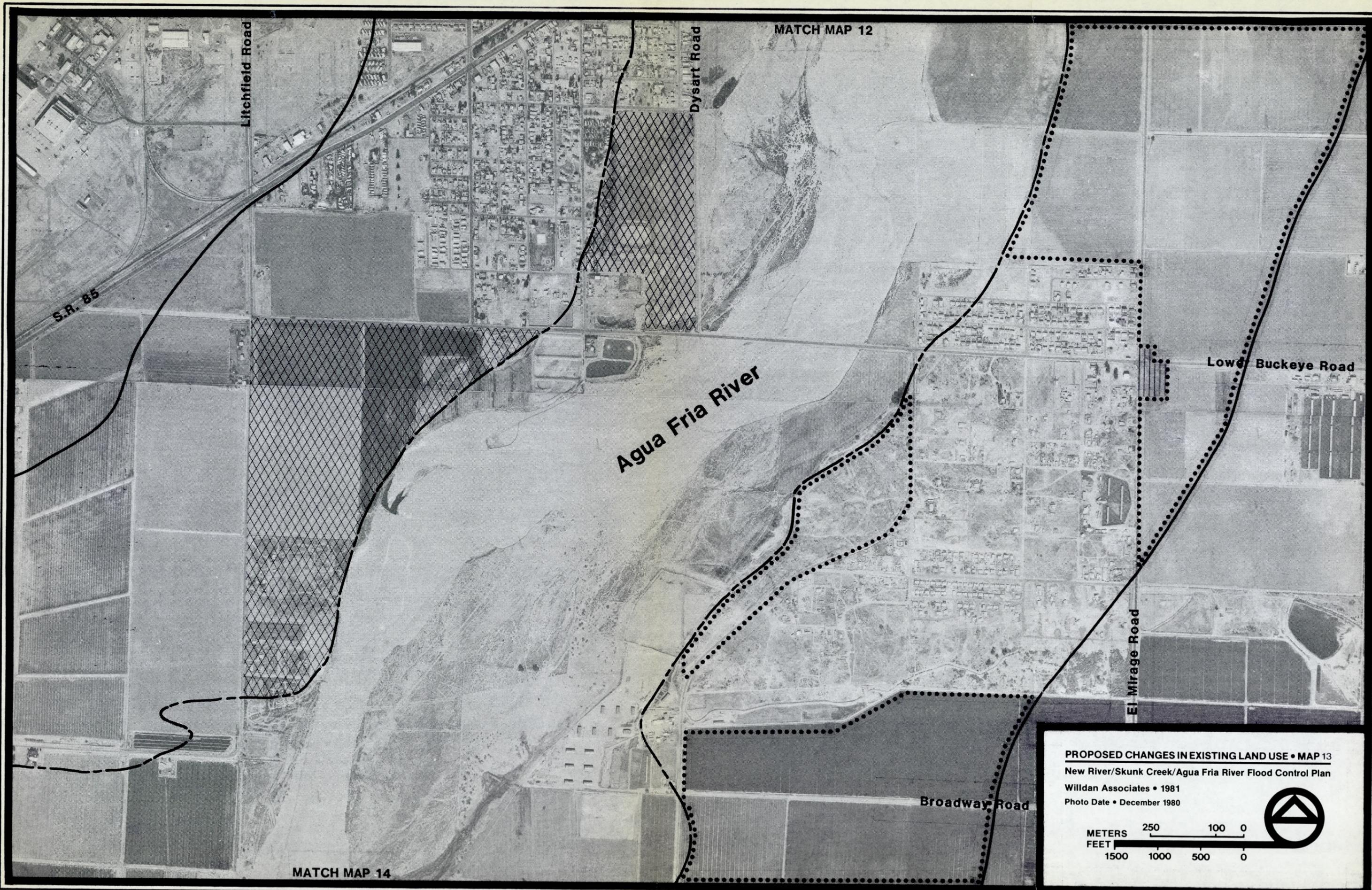
S.R. 85

MATCH MAP 13

El Mirage Road

PROPOSED CHANGES IN EXISTING LAND USE • MAP 12
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 12

MATCH MAP 14

Agua Fria River

Litchfield Road

Dysart Road

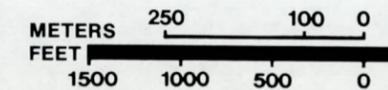
S.R. 85

Lower Buckeye Road

El Mirage Road

Broadway Road

PROPOSED CHANGES IN EXISTING LAND USE • MAP 13
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980



MATCH MAP 13

Bullard Avenue

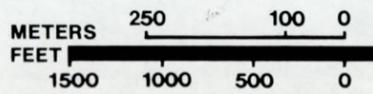
Agua Fria River

Dysart Road

Southern Avenue

Gila River

PROPOSED CHANGES IN EXISTING LAND USE • MAP 14
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981
 Photo Date • December 1980



VII. FLOOD CONTROL ALTERNATIVES

Recognizing the heterogeneous character of the study area, the philosophy behind development and presentation of the New River/Skunk Creek/Agua Fria River Conceptual Flood Control Plan is that alternatives would conceptually represent the potentials for flood control. This strategy avoids committing to a particular alternative and encourages creative decision making. Widely dissimilar goals for the river corridors by various agencies and municipalities makes a singular recommendation of a particular alternative at this level of planning counter-productive. The goal of this conceptual flood control plan is to provide the vehicle for dissimilar interests to work toward feasible solutions to the flooding problems. This strategy may require tradeoffs with some perceived losses and gains by all concerned; however, the result will give the region a publicly acceptable and environmentally sound outcome.

Hydrology

The study area maps show the 100-year floodplain delineation based on assumed future conditions. This was assembled from the best available data (U.S. Army Corps of Engineers, 1976), but is as yet an unofficial delineation. For development of this plan, it was assumed Adobe Dam on Skunk Creek, the proposed New River Dam on New River and the proposed Arizona Canal Diversion Channel would be constructed according to the U.S. Army Corps of Engineers New River and Phoenix City Streams Plan recommendations (1976). The 100-year flow on the rivers for these future conditions is shown in Table 3. The "100-year flood" is defined as having an average frequency of occurrence at a designated location of once in 100 years, although it may occur in any year or consecutive years.

The duration of a 100-year flood is dependent on the type of storm occurring and its location. It is possible for flood stages to rise from the riverbed to the flood crest in less than eight hours following intense local thunderstorms. In other cases, it may take as long as thirty-six hours for flood stages to crest during and after winter or summer storms.

**Table 3: New River/Skunk Creek/Agua Fria River
Estimated Flow Rates**

Location	100-year Flood Flow Rate
Reach 1 New River @ Proposed New River Dam	2,350 cfs
New River @ Happy Valley Road	4,250 cfs*
New River @ Pinnacle Peak Road	6,130 cfs*
New River 0.1 mile (0.16 km) U/S of Deer Valley Drive	7,870 cfs*
New River 0.1 mile (0.16 km) U/S of Beardsley Road	12,000 cfs
New River @ Union Hills Drive	13,860 cfs*
New River 0.2 miles (0.32 km) U/S of Bell Road	13,860 cfs*
Reach 2 Skunk Creek @ Adobe Dam	1,730 cfs
Skunk Creek @ Bell Road	13,000 cfs
Skunk Creek D/S of the Arizona Canal Diversion Channel	35,000 cfs
Reach 3 New River U/S of New River/Skunk Creek Confluence	19,000 cfs
New River D/S of New River/Skunk Creek Confluence	41,000 cfs
Reach 4 Agua Fria River D/S of Agua Fria River/ New River Confluence	95,000 cfs
Agua Fria River @ Camelback Road	95,000 cfs
Agua Fria River @ Indian School Road	94,000 cfs
Agua Fria River @ McDowell Road	91,000 cfs
Agua Fria River @ I-10 Freeway	91,000 cfs
Agua Fria River @ Avondale	90,000 cfs
Agua Fria River @ Agua Fria River/Gila River Confluence	90,000 cfs

Source: U.S. Army Corps of Engineers, 1981A.

*Obtained verbally from U.S. Army Corps of Engineers Personnel.

New hydrology data and a 100-year floodplain delineation developed by the U.S. Army Corps of Engineers are forthcoming. This information will update that used when the project plan for the New River and Phoenix City Streams Plan Formulation (1976) was completed. New hydrology data clearly affects the region and the requirements of the local sponsor to acquire flowage easements because this new information is likely to result in a larger area being considered within the 100-year floodplain. Consequently, the 100-year floodplain limits provided on the map sets in this document may change significantly when compared with the new delineation.

Alternatives Development

For each reach of the study area sections have been selected for flood control alternatives development. A nominal and maximum width channel have been developed for these sections based on the flow rates presented in the hydrology description. An additional alternative of "No Action" has also been considered, and would include the implementation of the Corps recommended plan for the New River, Skunk Creek, and Agua Fria River. The so-called "No Action" plan also includes limited floodproofing and channelization, in combination with acquisition of property within the 100-year floodplain.

The first alternative, nominal width channels, consists of a leveed or excavated channel with bottom widths that range from 150 feet (46 m) to 1105 feet (337 m). A nominal width channel, if developed, requires less area for passage of a 100-year flood because flows would occur at a greater depth and velocity than a natural or maximum width channel. As an alternative, the maximum width channel could be constructed with overbank areas to accommodate linear park development.

The bottom channel width of the maximum alternative ranges in distance from 150 feet (46 m) to 2400 feet (731.5 m) and may also include levees or an excavated channel. The greater width of the maximum alternative allows for preservation of wildlife habitat and open space within the confines of the channel, while in most cases decreases the areal extent of the 100-year floodplain. Both alternatives allow for hiking and riding trails development in the channel, on the maintenance road, in the required right-of-way, or a combination of the three. Proposed levees would be constructed with native materials and channels would be excavated. Both would have side bank protection to provide for stability of the side slopes where required. Detailed design of embankment and channel stabilization and the associated soils analysis are beyond the scope of this project.

Illustrative typical crosssections are provided for each alternative location on the Flood Control Alternatives Maps. Each of the crosssections show the future 100-year floodplain limits, the 100-year water surface with and without implementation of the alternative, side slopes, horizontal and vertical scale, bottom channel width, and, where applicable, habitat areas, trails, or open space areas. Illustrative locations for plan views have also been prepared for a selected nominal and maximum width channel showing possible conceptual uses of the channel.

The alternatives presented are intended to be used as guides in the local coordination and decision making process for the physical development of these river corridors. It is likely that a combination of nominal, maximum, and the "No Action" alternative will achieve the goals of all the concerned agencies and public groups.

VIII. ENVIRONMENTAL EFFECTS OF THE CHANNELIZATION ALTERNATIVES

The effects of nominal and maximum width channels are described in the following paragraphs.

Topography

Construction of earth bottom channels and levees in the study area would modify the topography of the natural streambeds.

Geology and Soils

Channelization of the streambeds would remove the portion of land area required for the construction of the alternative from future sand and gravel extraction operations. However, periodic removal of sediment debris in the channel and mining operations outside the channel right-of-way would be allowable. Fill material, consisting of soils and rock, would be committed for the construction of levees for the life of the project. Beneficially, loss of soils on agricultural and natural lands due to flooding would be eliminated from areas outside of the proposed channels.

Surface and Subsurface Hydrology

The channelization alternatives would constrict the natural streambeds affecting the depth, velocity and percolation of surface flows. Because the areal extent of the floodplain would be restricted with the earth bottom alternatives, percolation expected under normal conditions would be decreased by an undetermined amount resulting in a greater volume of water emptying into the Gila River. Increased urbanization of lands surrounding the channels would create a greater amount of runoff into the channels.

Water Quality

Neither surface water nor groundwater quality would be significantly affected by the alternatives.

Vegetation

Construction of the nominal width alternative would destroy all vegetation from within the channel right-of-way for the life of the project. Recurring vegetation would be removed periodically with channel clearing and maintenance. The channel would also prevent the periodic flooding required by riparian vegetation for health and reproduction. The maximum width alternative allows for vegetated areas within the channel right-of-way; however, channel clearing of new growth would be required periodically for maintenance of low flow channels. In the study area, the natural occurrence of desert wash habitats are less frequent than in unaffected natural desert areas because of disturbing and destructive urban land uses and loss of essential conditions for growth. No Federal or State listed threatened or endangered species would be affected by channel construction.

Wildlife

Vegetation communities destroyed for construction of an alternative would displace wildlife to other areas, contributing to their demise. Destruction of riparian habitat along the Agua Fria River could also adversely impact the Audobon Society's Christmas Bird Count area. Channels would inhibit wildlife movement and migration, and eliminate ponding areas used by many wildlife species. Channelization would also encourage the development and urbanization of the existing 100-year floodplain eliminating suitable habitat and further stressing wildlife populations.

Archaeological and Historical Resources

No prehistoric or historic sites have been identified within the 100-year floodplains of the New River, Skunk Creek, or Agua Fria River.

Land Use

Lands presently in the floodplain that are currently restricted from certain types of development could be intensively developed with the flood protection provided by the channelization alternatives. This would allow for implementation of the general land use plans for Avondale, Glendale, Peoria, and Maricopa County. The amount of potentially developable land would vary depending on which alternative was

implemented. More intensive urban development would increase both the tax base and urban service responsibilities of the County and local governments. For the life of the project, lands would be permanently committed for levees, channels, bank stabilization or protection, undevelopable open space, public use areas, wildlife habitat, or combinations thereof.

Land uses that would impede the flow of flood waters in the channels would be restricted. In some cases mining operations may need to be relocated.

Population

The opportunity to develop what are now undevelopable lands within the existing 100-year floodplain for urban land uses would stimulate population growth in the study area. Additional public use areas, fulfillment of municipal land use plans, along with the economic stimulation presented by construction activities are all factors that are likely to benefit area residents.

Transportation

Either alternative will reduce the amount of disruption that flooding has caused in the past, due to closing of unbridged river crossings and the damage caused to bridges whose design flow capacity would be surpassed. Traffic flow in the study area itself would not be expected to increase as a direct result of implementation of an alternative; however, development induced by a reduction in potential flood hazard will inevitably be accompanied by an increase in the demand for transportation facilities and services.

Economy

Development of either alternative would be expected to substantially stimulate the economy of the surrounding area. Tax revenues to Maricopa County and to the cities along the river would be expected to increase accordingly. These increases, however, would be partially offset by increased demands for services from these local entities. While significant agricultural use of the floodplain has been disappearing in recent years the channelization alternatives would further promote this trend. Agricultural lands

might be developed for industrial and other commercial activities, narrowing future non-urban uses of the floodplain.

Open Space and Public Use Areas

Lands presently in the floodplain slated for open space preservation in the Corps plan as flowage easements are restricted from certain types of development and would essentially remain as open space. The proposed alternatives would allow for development of this open space reducing the total amount. However, the reduction in open space would still be in accordance with the land use plans of Peoria, Glendale, and Avondale because sites for public use are designated in these plans.

The alternatives would present the chance to implement municipal recreation plans in the study area, while also providing protection to the existing Greenway Sports Complex in Peoria. Maricopa County's proposed trails development plans could also be accomplished within the channel area. Sites for rest nodes would need to be acquired outside of the required channel.

Aesthetics

In some areas, the proposed alternatives may destroy natural desert and, hence, the aesthetic values associated with these areas. Generally, the study area has already been modified by human-related development and disturbances. Uncontrolled dumping and extractive operations in the river corridors engender the most negative views. Channel excavation would not create a visual barrier of pleasant views, although levee construction would be visible. In many cases, aesthetic treatments can be applied to mitigate negative affects of both channels and levee construction.

IX. RECOMMENDATIONS

These recommendations are presented for use as a guide in developing more specific and concrete recommendations as the result of discussions and negotiations with the local agencies and municipalities involved. In order to address the major issues, concerns, and opportunities for the New River/Skunk Creek/Agua Fria River study area three alternatives were considered in this plan. The nominal width channel, maximum width channel, and no action alternatives, as described in previous sections, provide the plan with a range of alternatives for flood control along the 30 mile (48 km) length of the study area. Each alternative is capable of standing alone as a flood control solution, but combinations of the three could also provide a flood control system to the three rivers. The existing and future conditions in the study area and agency input in combination with the alternatives provides the basis for the following recommendations. The recommendations are primarily concerned with the following significant issues and attempt to avoid, whenever possible, negative impacts to the existing conditions:

- o Land Use Impacts
- o Impacts on Wildlife Habitat Areas
- o Social Impacts
- o Transportation Impacts
- o Economic Impacts

Reach 1 - New River-Proposed New River Dam to Skunk Creek

Map 1 - The present condition of this area dictates its preservation as a natural area; consequently, the 100-year floodplain is designated as a potential wildlife habitat area with buffers. A nominal width channel would either destroy or disturb much of the existing habitat, and a maximum width channel is not feasible because the existing stream channel is fairly restricted.

Map 2 is similar in condition to **Map 1** with a habitat area in evidence to just upstream of Deer Valley Road. At this location, potential habitat becomes somewhat limited and a transition zone occurs with the area south of Deer Valley Road exhibiting little or no vegetation. From this roadway downstream, the channel is restricted. To prevent

serious impact to the potential wildlife habitat area on the upper and lower portions of the map, "No Action" or a maximum width channel with an excavated low flow channel and overbank areas to preserve the vegetation are recommended.

Map 3 - The location of extensive sand and gravel mining operations, the fairly restricted channel, and the random habitat areas indicate a nominal width channel be applied to this section.

Map 6 - Proposed urban development in the Peoria land use plans show a nominal channel is appropriate on the New River to the confluence with Skunk Creek.

Reach 2 - Skunk Creek-Adobe Dam to New River

Map 4 - From Adobe Dam to Beardsley Road the channel is restricted; therefore, improvements are not appropriate beyond the outlet channel for Adobe Dam proposed by the U.S. Army Corps of Engineers. From Beardsley Road downstream to 51st Avenue a large potential wildlife habitat area suggests no improvements be made. From 51st Avenue downstream a nominal channel is advised allowing for implementation of existing land use plans within the City of Glendale.

Map 5 - A nominal width channel is proposed in this entire section to allow implementation of land use plans and protection of the proposed trail node and commercial area at the confluence of the Arizona Canal Diversion Channel.

Map 6 - From Peoria's Greenway Sports Complex located just downstream of the Arizona Canal Diversion Channel to 83rd Avenue along Skunk Creek, a continuance of a nominal channel with a 200 foot (61 m) overbank area for recreation open space uses is recommended. This will limit impacts on the proposed linear park and habitat area at the confluence of the New River and Skunk Creek.

Reach 3 - New River-Skunk Creek to the Agua Fria River

Map 6 - Desert Harbor, a proposed residential development is on the west side of New River south of Greenway Road. Approved plans show a minimum width channel through the habitat area at the Skunk Creek/New River confluence to 0.25 mile (0.4 km) south of Thunderbird Road. It is recommended that with a 200 foot (61 m) overbank area this

action could preserve the habitat. Dedication of the habitat area by the developer for open space uses would preserve it while also allowing for protection of proposed residences where habitat is not significant. One-quarter mile (0.4 km) south of Thunderbird Road, a "No Action" is recommended to preserve the habitat areas on either side of the existing channel.

Map 7 - Except for the area near the Grand^{out} Avenue Bridge and the adjacent railroad bridge where certain structural improvements are proposed in the U.S. Army Corps of Engineers Plan, "No Action" is suggested to preserve the habitat area north of Grand Avenue. A transition to a nominal width channel_{is recommended} downstream of Grand Avenue extending to Olive Avenue.

Map 8 - Because of existing habitat conditions along this stretch of the river and the extent of the floodplain south of Northern Avenue, a maximum width channel alternative should be implemented 0.25 (0.4 km) miles south of Olive Avenue extending to Glendale Avenue. In this case, existing habitat areas would be within the confines of the maximum width channel but would remain relatively undisturbed.

Map 9 - The site of the proposed Glendale Airport on the west side of the New River and a potential habitat area on the east side of the channel would suggest a maximum width channel be selected for this stretch. To prevent exceeding the bridge capacity at Glendale Avenue, a nominal width channel 0.12 miles (0.19 km) north of the bridge to 0.25 miles (0.40 km) south of Glendale Avenue is recommended. At this point, a transition to the maximum width channel could be made. A maximum width channel would provide protection to existing residences and the proposed Glendale Airport Site, while also preventing major disturbance to the habitat area depicted on **Map 9**.

Reach 4 - Agua Fria River-New River to the Gila River

Map 10 - It is proposed that a maximum width channel continue from **Map 9** along the Agua Fria River to 0.5 mile (0.8 km) south of Camelback Road. A nominal width channel starting at this point downstream and continuing past the Roosevelt Canal flume will avoid, for the most part, the mining operations south of Indian School Road.

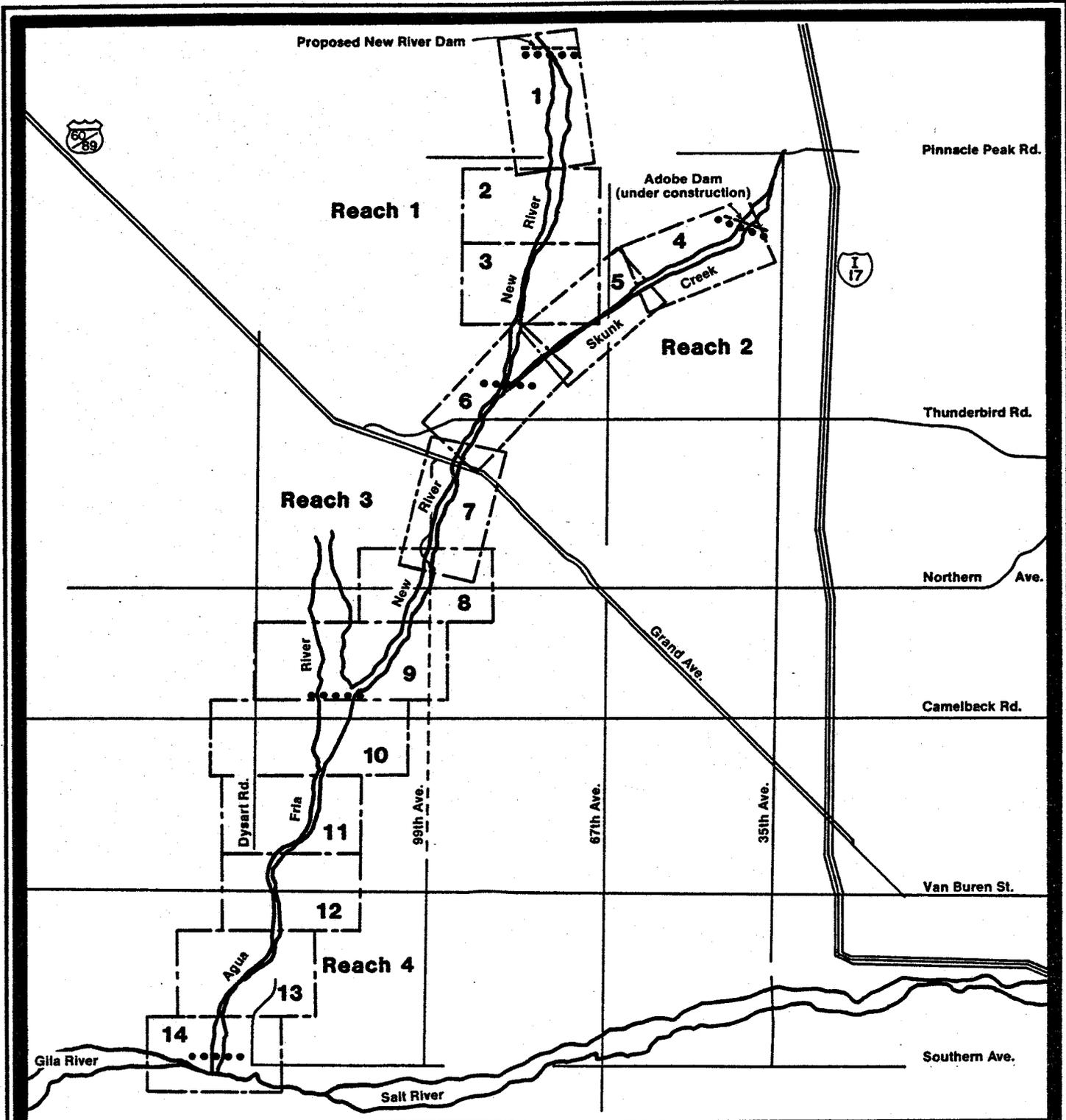
Map 11 - A realignment of the channel is proposed along the Agua Fria River in this section by the Flood Control District of Maricopa County. The realignment is intended

to straighten the existing channel and prevent damage to the Interstate 10 bridge and the proposed McDowell Road bridge. The realignment would be a nominal channel width and would not directly impact the existing habitat area, but would indirectly affect this riparian area by allowing for development. This habitat area is unique in that large trees, riparian in nature, parallel the existing channel. These trees presently derive their water from adjacent agricultural fields. It is recommended these be preserved and provided a water source for their continued health and reproduction.

Map 12 - A nominal channel width is recommended along this stretch from Interstate 10 to 0.25 mile south of Buckeye Road. This would allow for implementation of Avondale's general land use plans including residential and parks development.

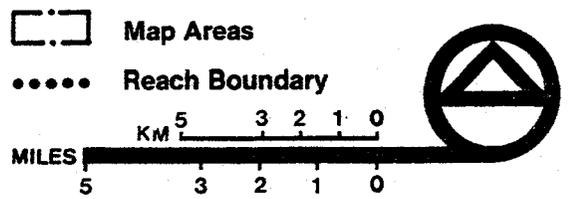
Map 13 - South of Buckeye Road a transition to a maximum width channel is advocated for preservation of existing habitat areas south to the Gila River. A maximum width channel would protect existing developments and allow for implementation of land use plans for this portion of the study area.

Map 14 - A maximum width channel to the confluence of the Gila River would assist in the preservation of existing vegetation in this stretch.



FLOOD CONTROL PLAN ALTERNATIVES • KEY MAP
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981

KEY MAP LEGEND



FLOOD CONTROL PLAN ALTERNATIVES LEGEND

- Study Area Boundary
- 100-Year Floodplain
- Existing/Proposed Recreation Area
- Wildlife Habitat Area (Potential)
- Channel Centerline
- Nominal Width Channel Alternative
- Maximum Width Channel Alternative



NEW RIVER DAM (Proposed)

New River

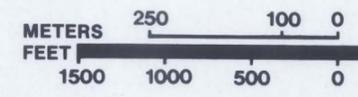
Pinnacle Peak Road

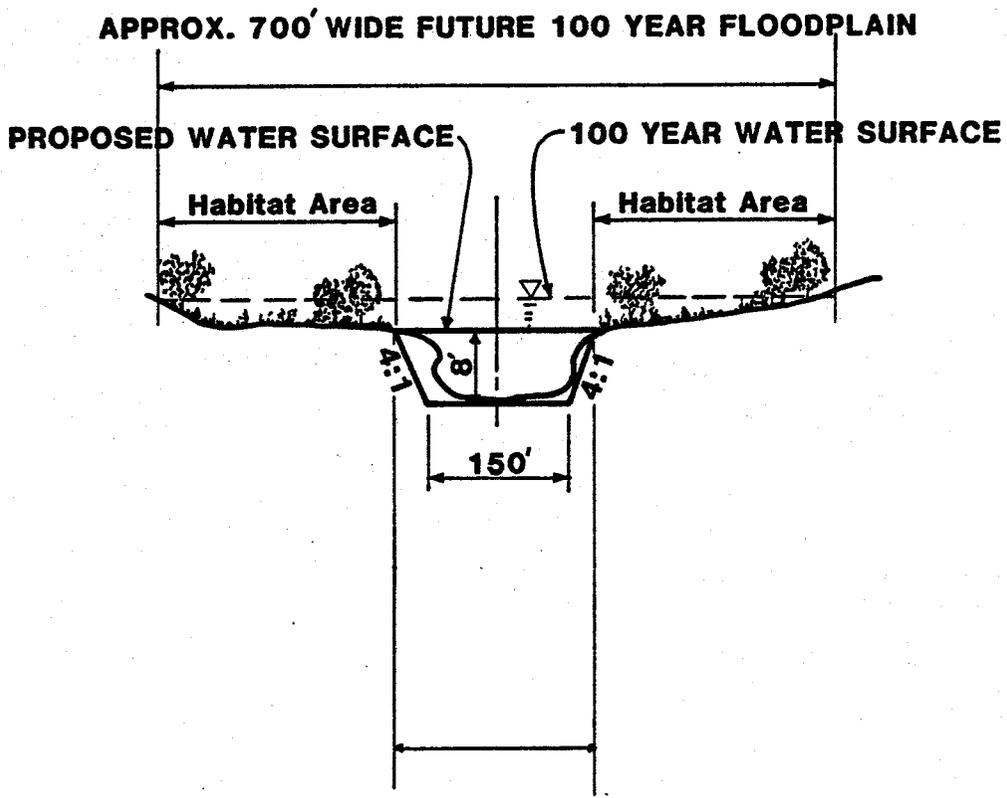
Happy Valley Road

83rd Avenue

MATCH MAP 2

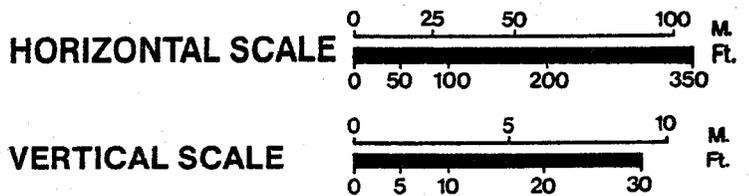
FLOOD CONTROL PLAN ALTERNATIVES • MAP 1
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980

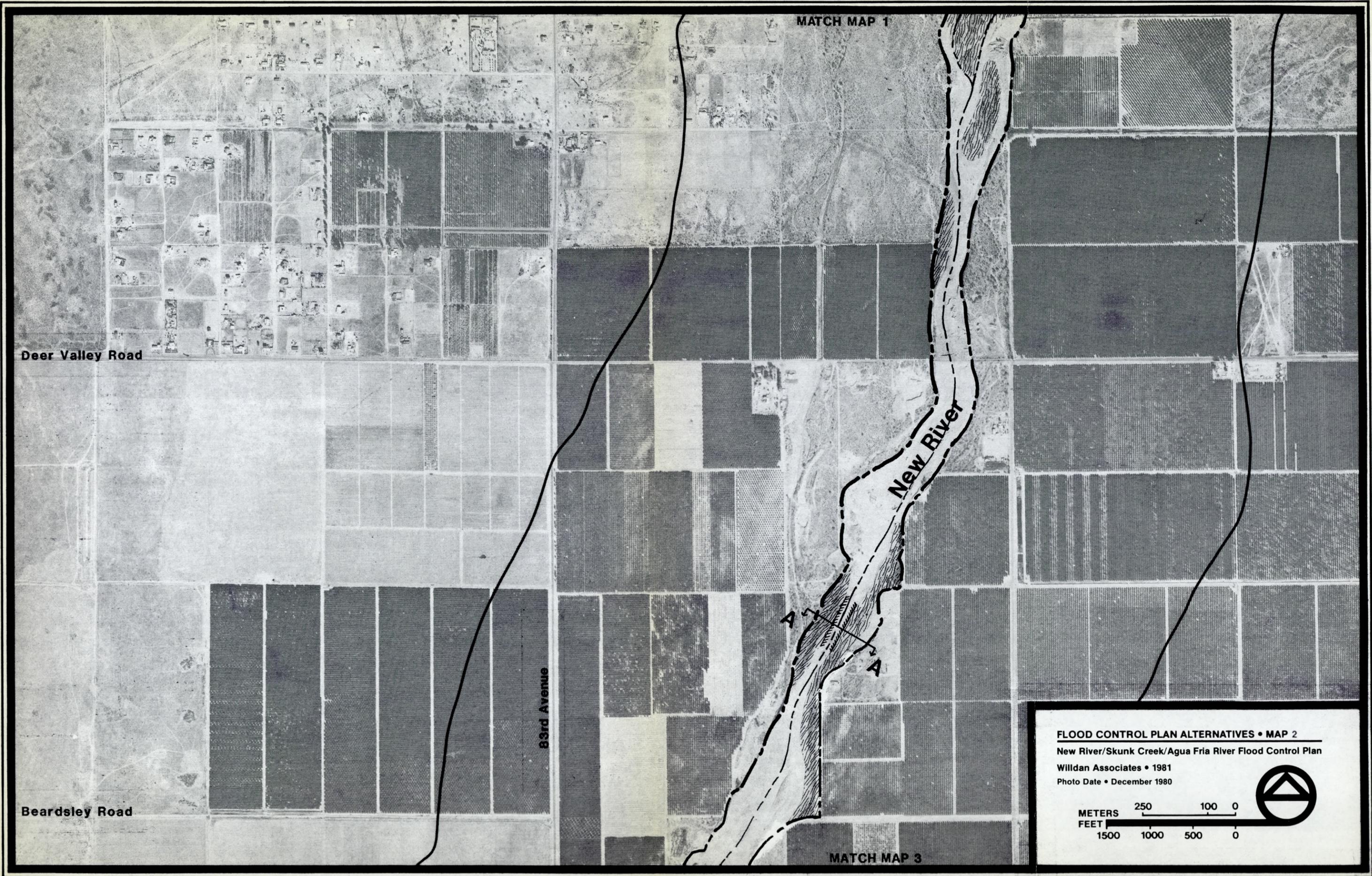




APPROX. 200' WIDE PROPOSED 100 YEAR FLOODPLAIN

Illustrative Typical Section A-A • Map 2
MAXIMUM WIDTH CHANNEL • REACH 1
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981





MATCH MAP 1

Deer Valley Road

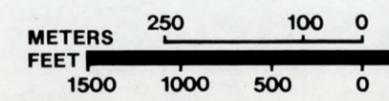
New River

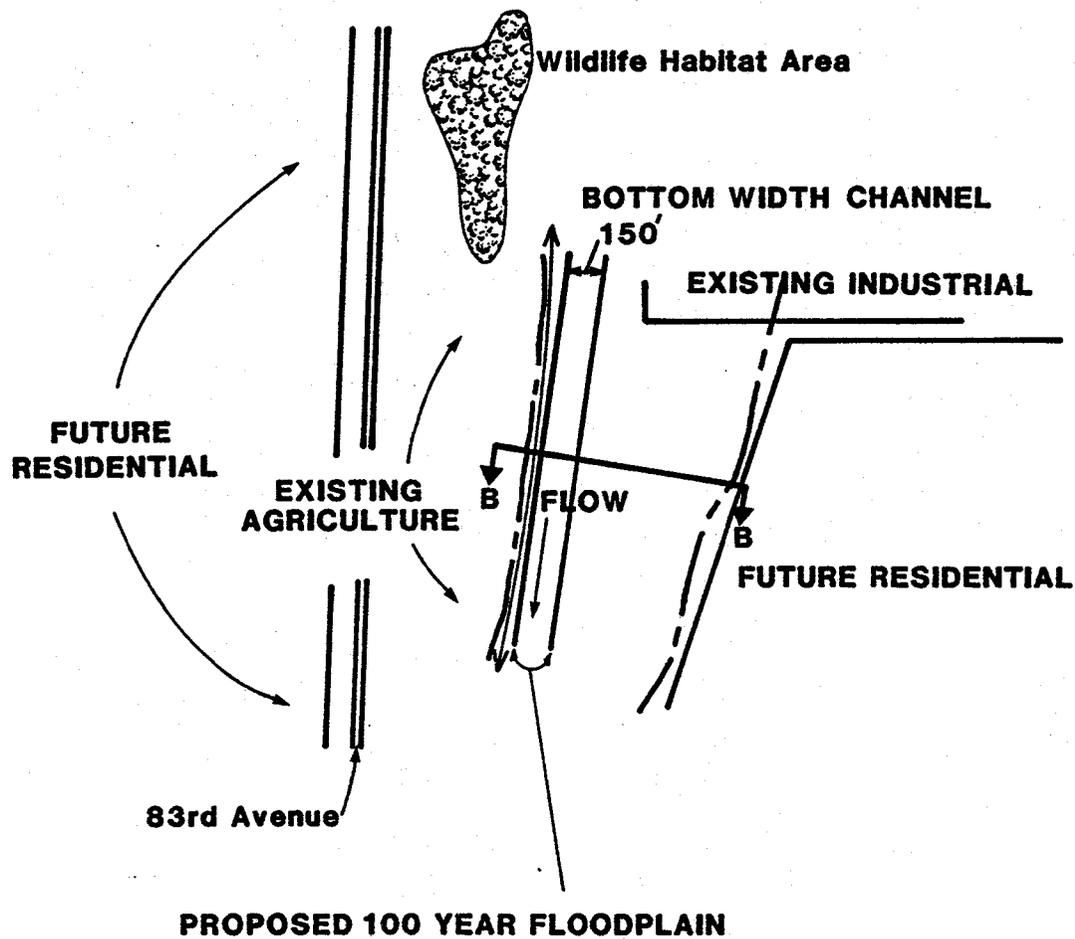
83rd Avenue

Beardsley Road

MATCH MAP 3

FLOOD CONTROL PLAN ALTERNATIVES • MAP 2
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980

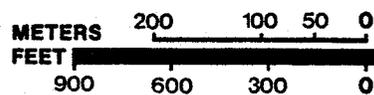


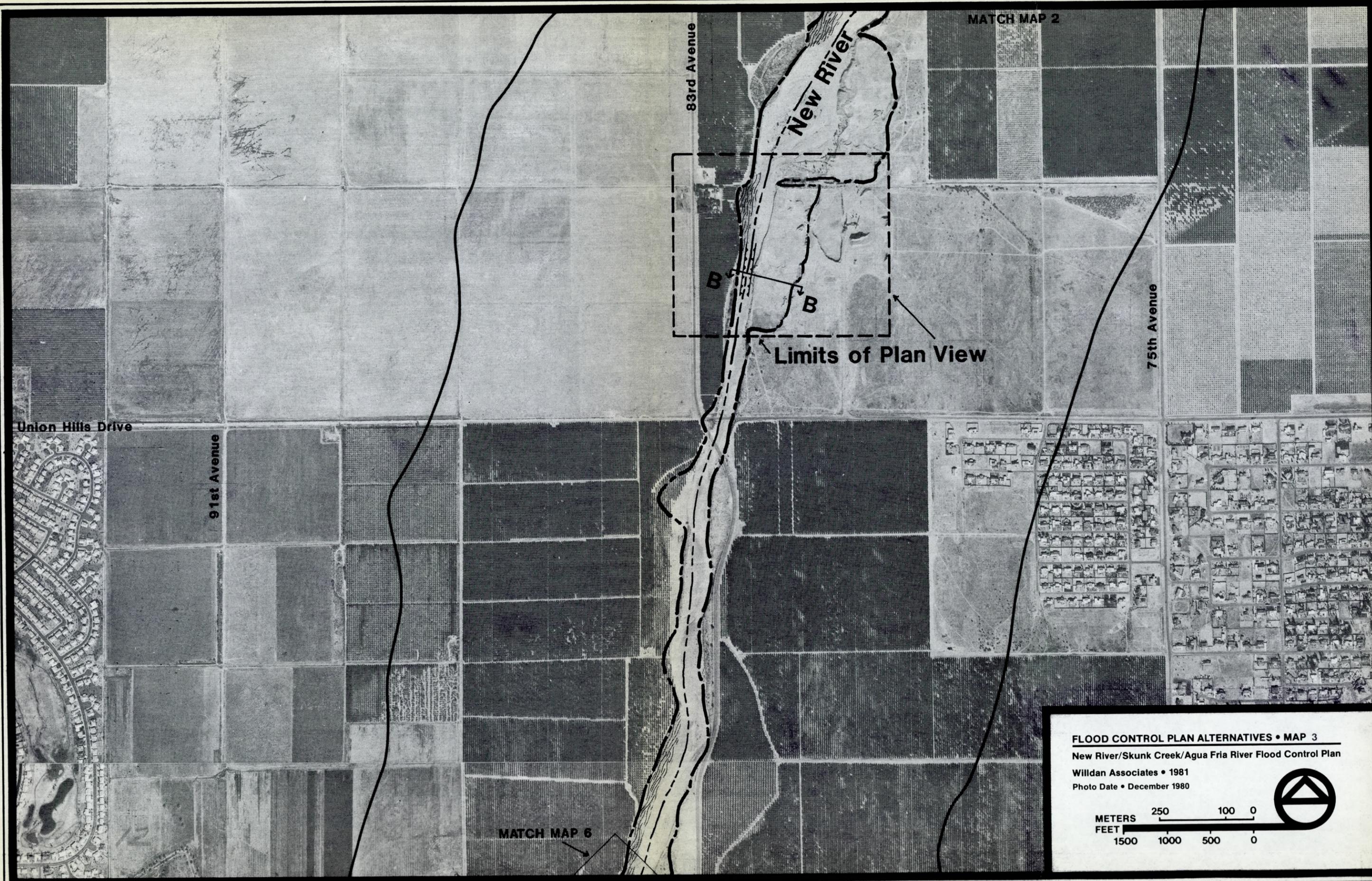


**Plan View for Section B-B • Map 3
NOMINAL WIDTH CHANNEL • REACH 1**

New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981

- Future 100-Year Floodplain
- Levee Alignment
- Riding and Hiking Trail





MATCH MAP 2

83rd Avenue

New River

75th Avenue

B

B

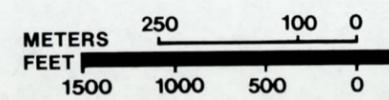
Limits of Plan View

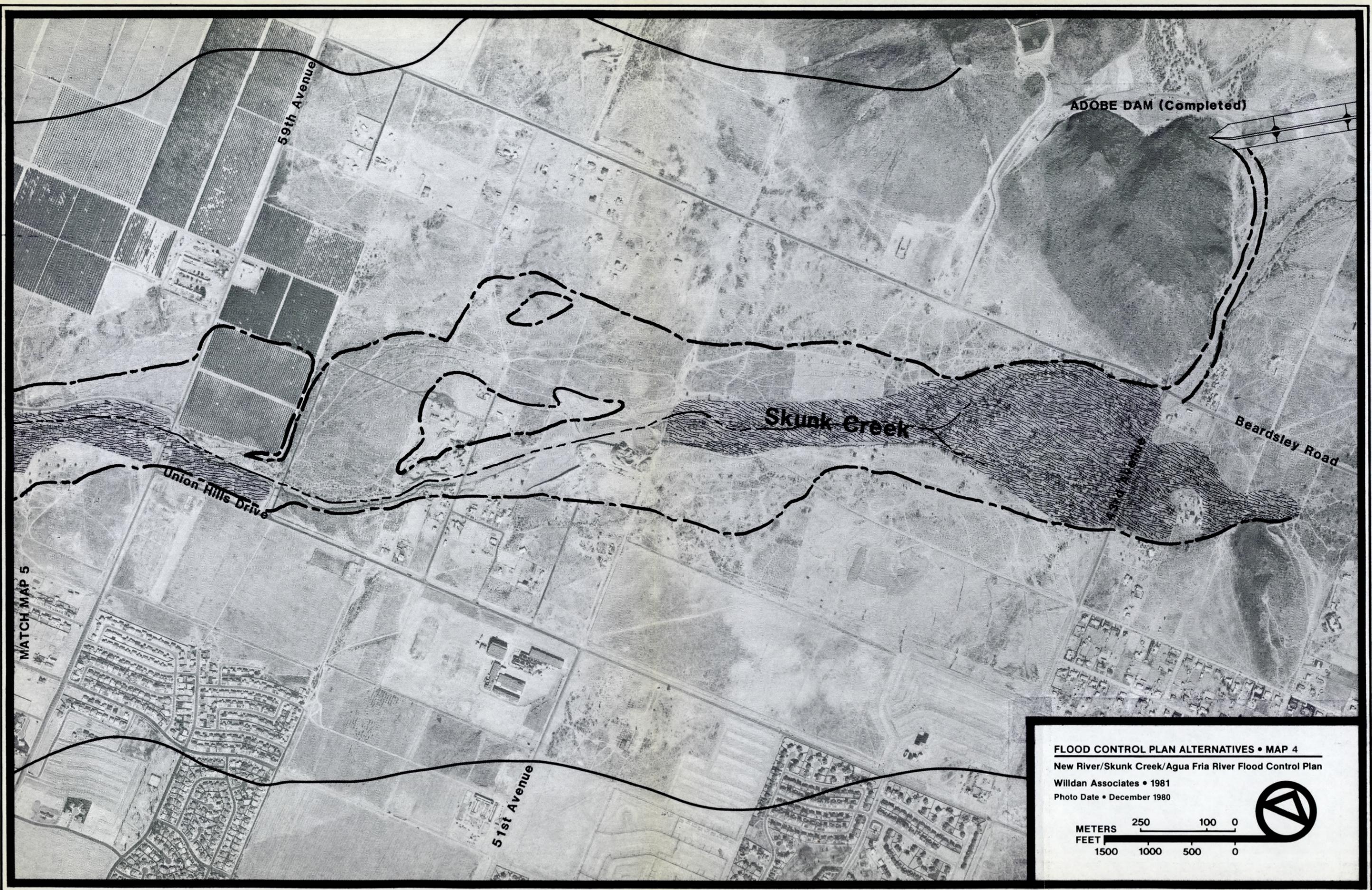
Union Hills Drive

91st Avenue

MATCH MAP 6

FLOOD CONTROL PLAN ALTERNATIVES • MAP 3
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 5

ADOBE DAM (Completed)

Skunk Creek

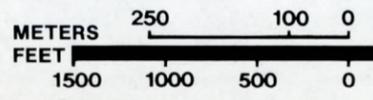
Beardsley Road

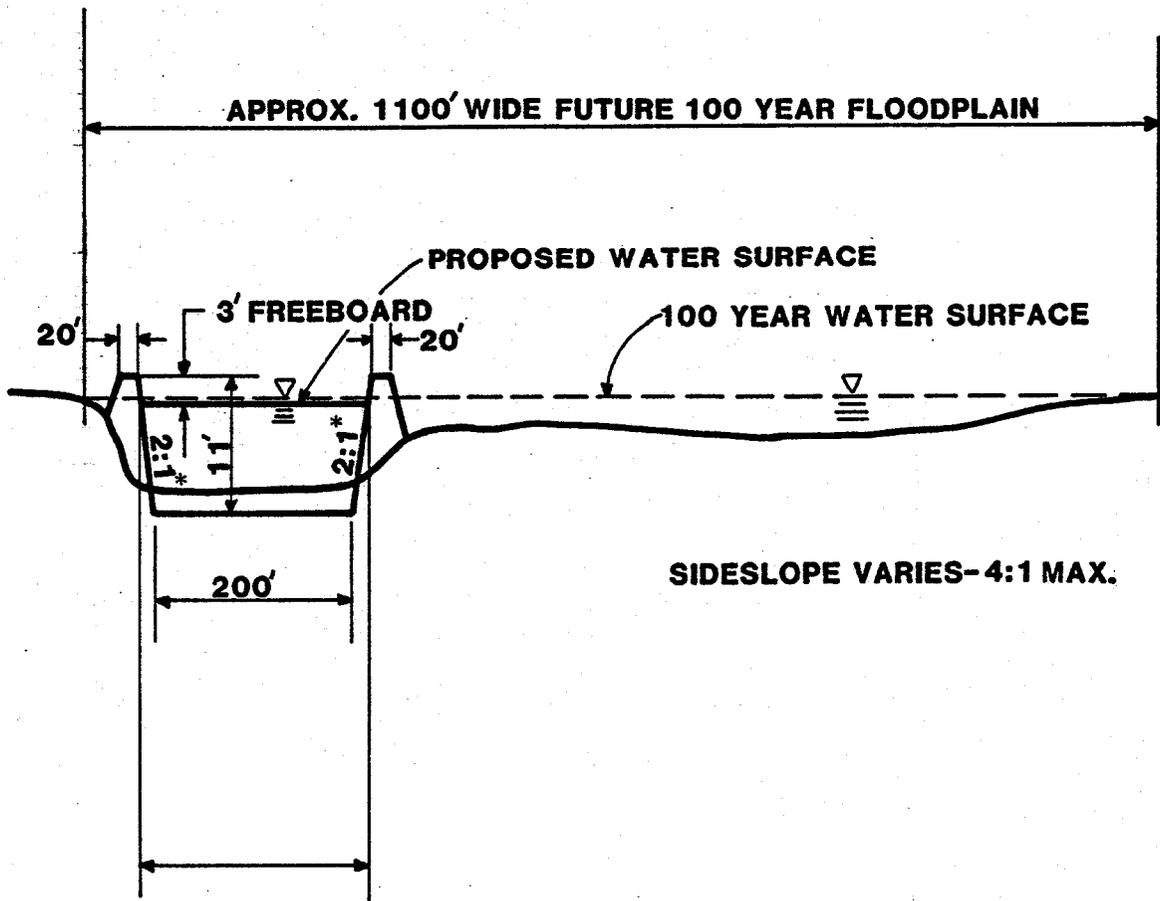
Union Hills Drive

59th Avenue

51st Avenue

FLOOD CONTROL PLAN ALTERNATIVES • MAP 4
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980

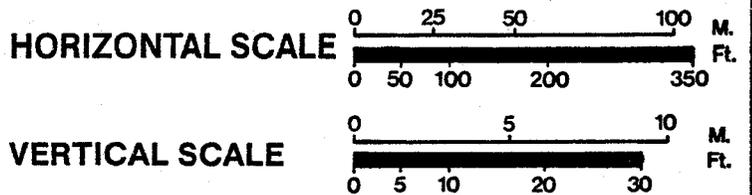


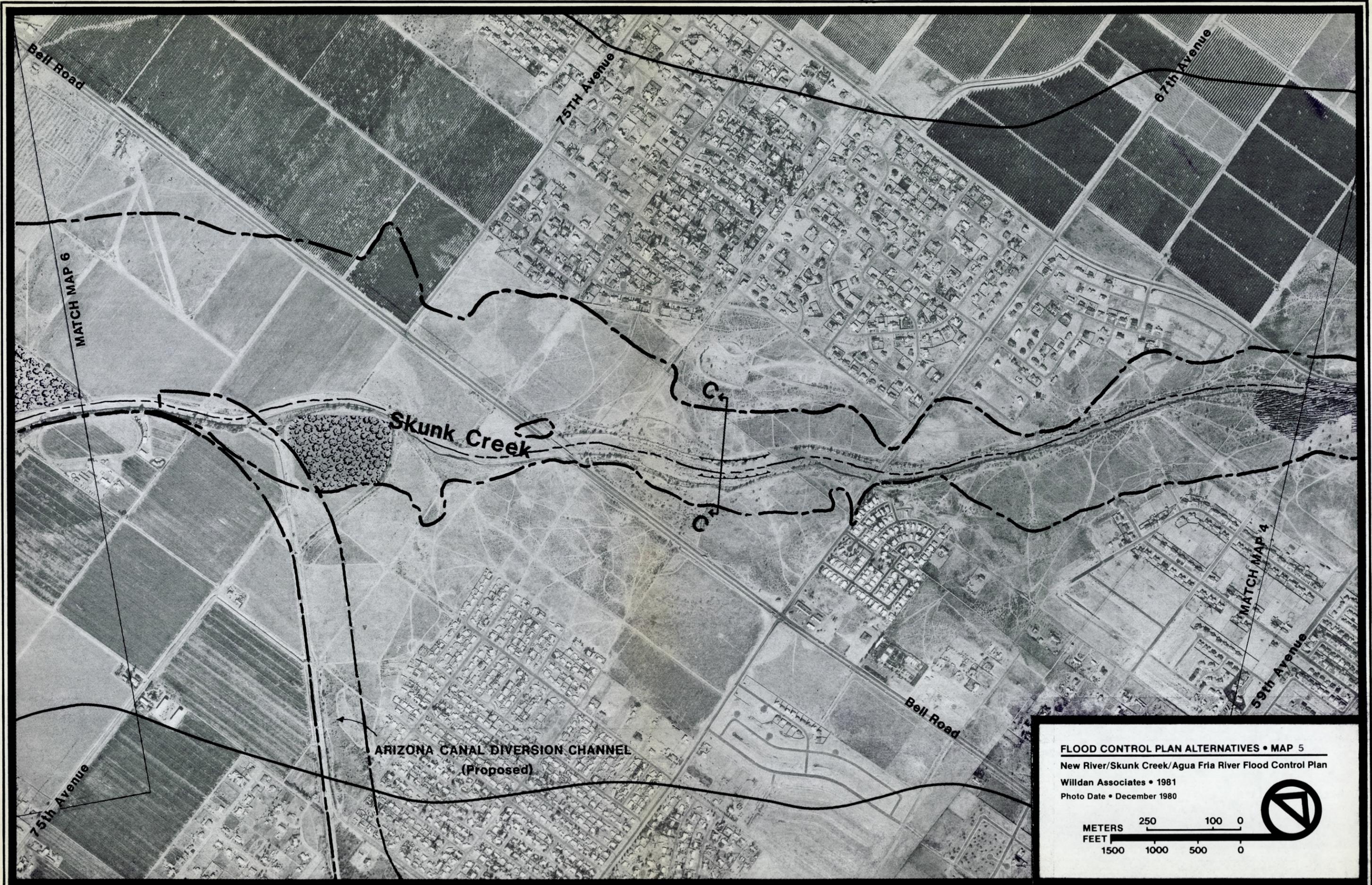


APPROX. 230' WIDE PROPOSED 100 YEAR FLOODPLAIN

**Illustrative Typical Section C-C • Map 5
 NOMINAL WIDTH CHANNEL • REACH 2**
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981

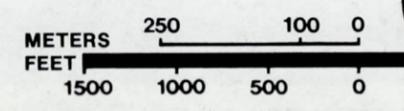
*** Bank Stabilization
 Required for 2:1 Slopes**

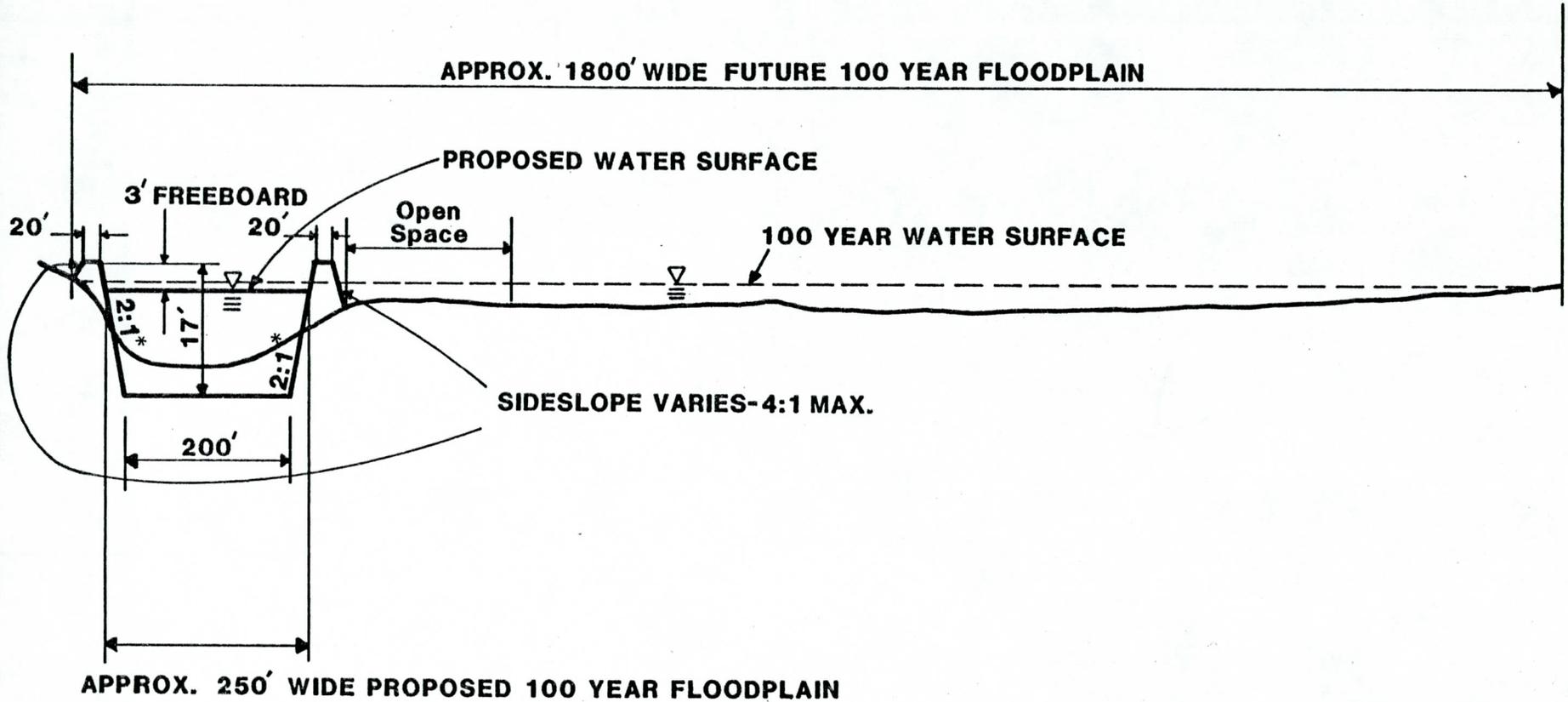




ARIZONA CANAL DIVERSION CHANNEL
(Proposed)

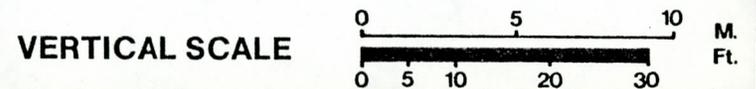
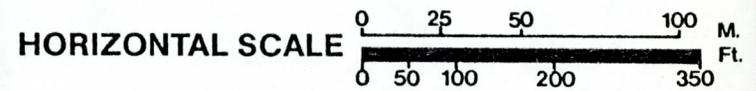
FLOOD CONTROL PLAN ALTERNATIVES • MAP 5
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980

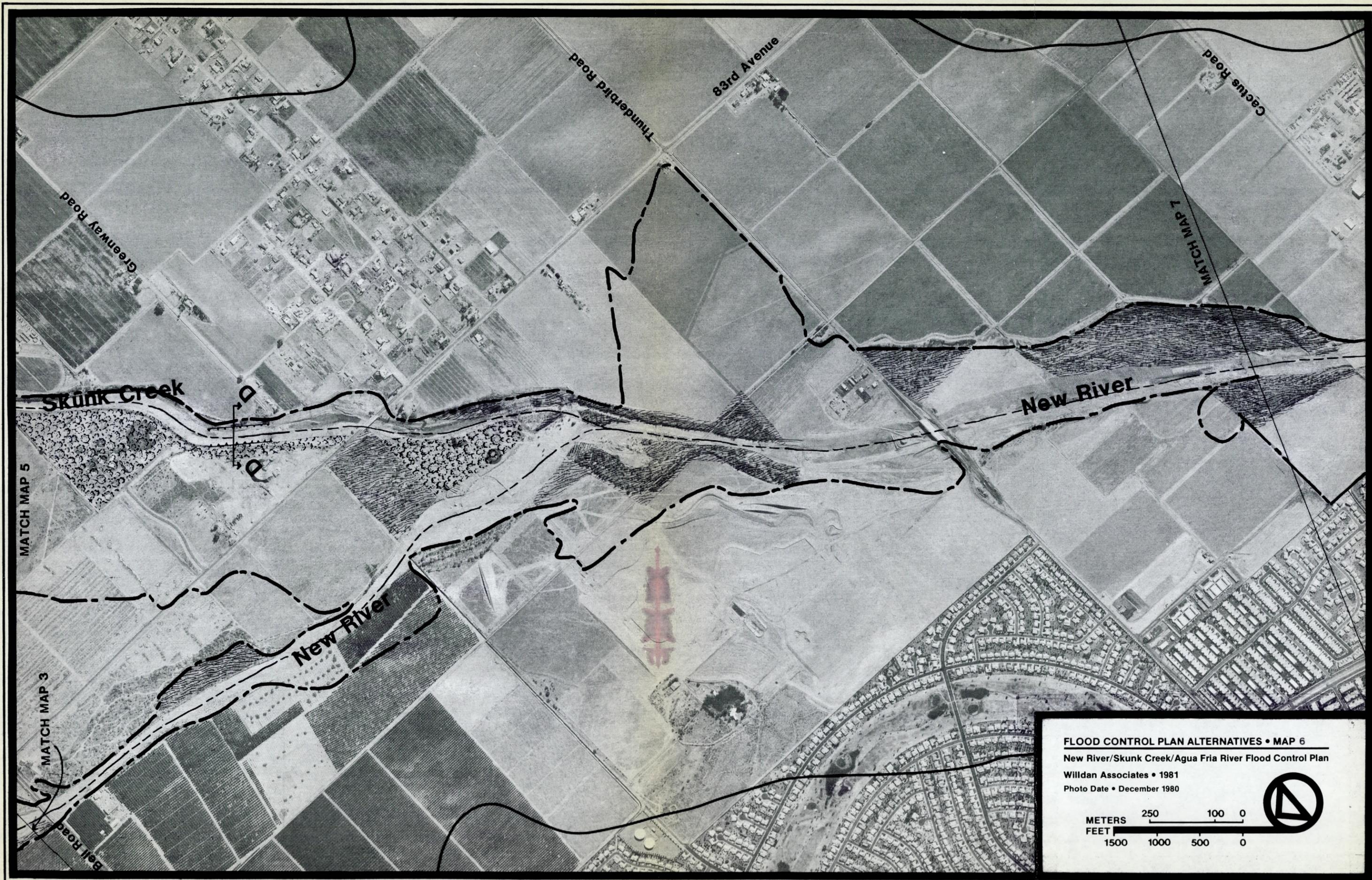




*BANK STABILIZATION REQUIRED FOR 2:1 SLOPES

Illustrative Typical Section D-D • Map 6
 NOMINAL WIDTH CHANNEL • REACH 2
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981





MATCH MAP 5

MATCH MAP 3

MATCH MAP 7

Skunk Creek

New River

New River

83rd Avenue

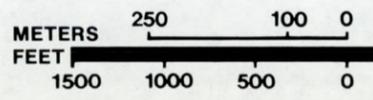
Thunderbird Road

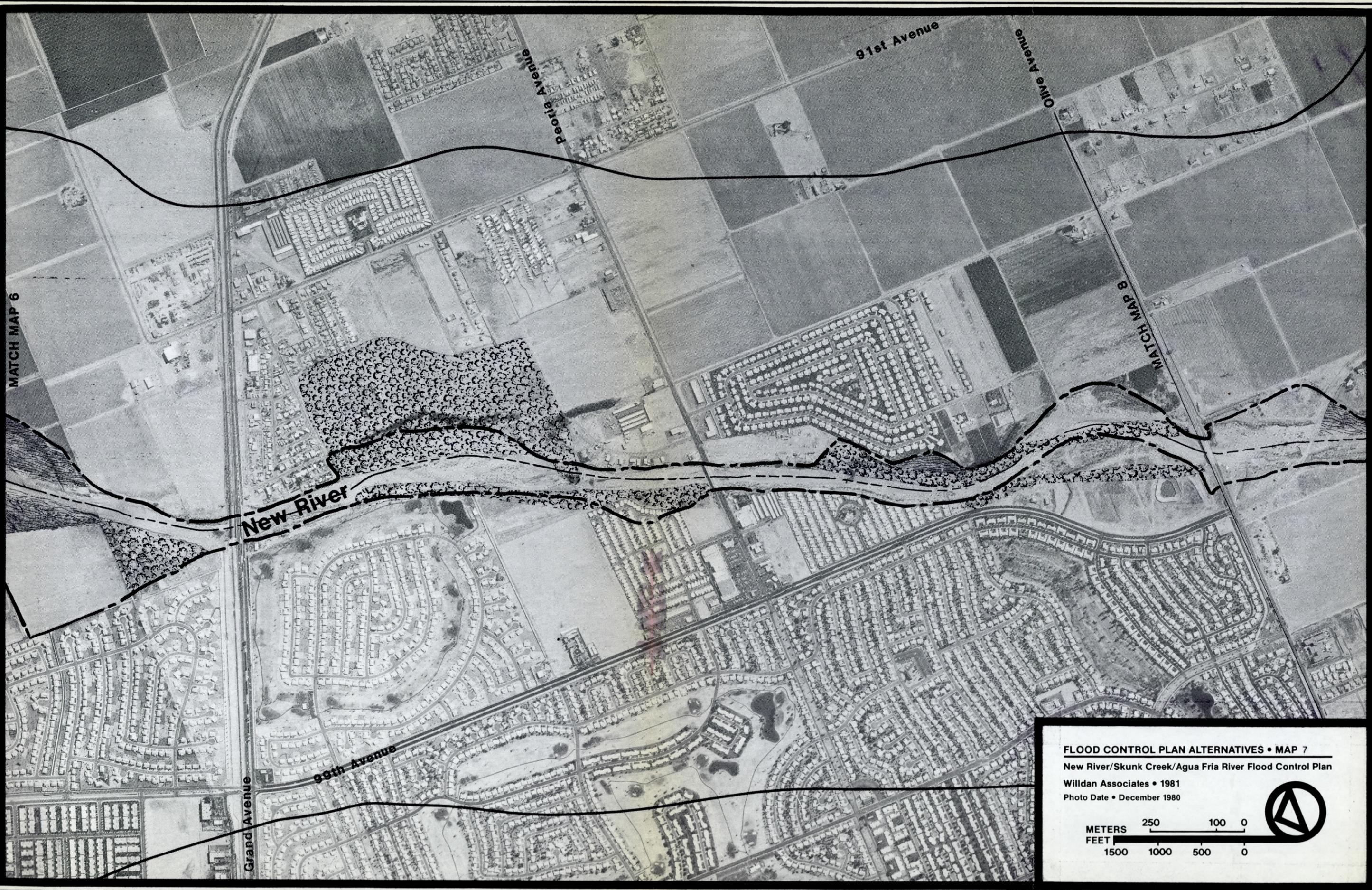
Cactus Road

Greanway Road

Bell Road

FLOOD CONTROL PLAN ALTERNATIVES • MAP 6
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981
 Photo Date • December 1980



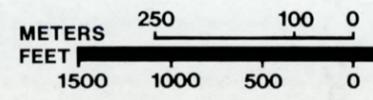


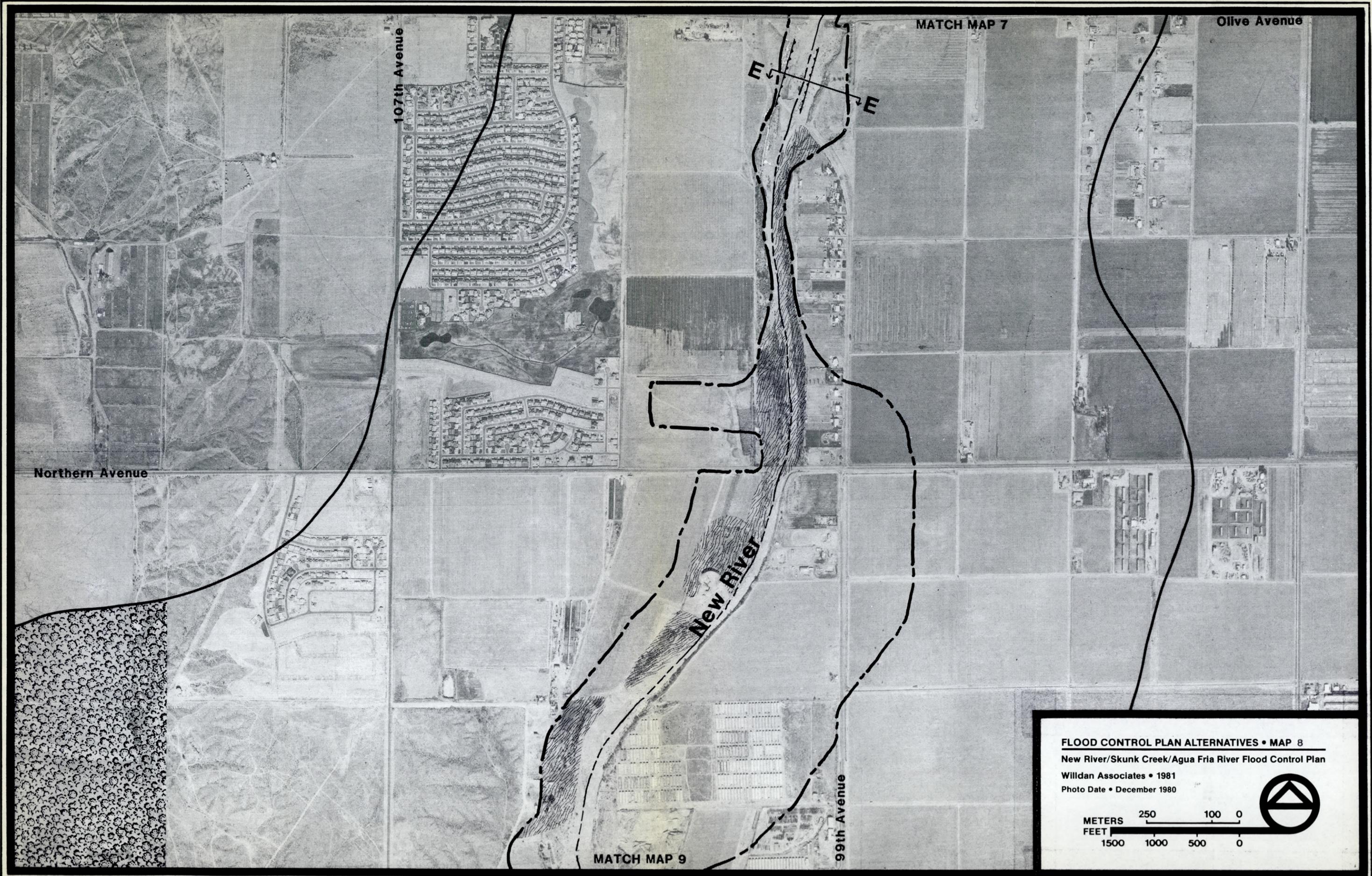
FLOOD CONTROL PLAN ALTERNATIVES • MAP 7

New River/Skunk Creek/Agua Fria River Flood Control Plan

Willdan Associates • 1981

Photo Date • December 1980





MATCH MAP 7

Olive Avenue

107th Avenue

E E

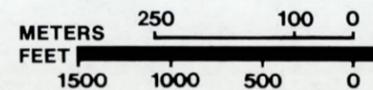
Northern Avenue

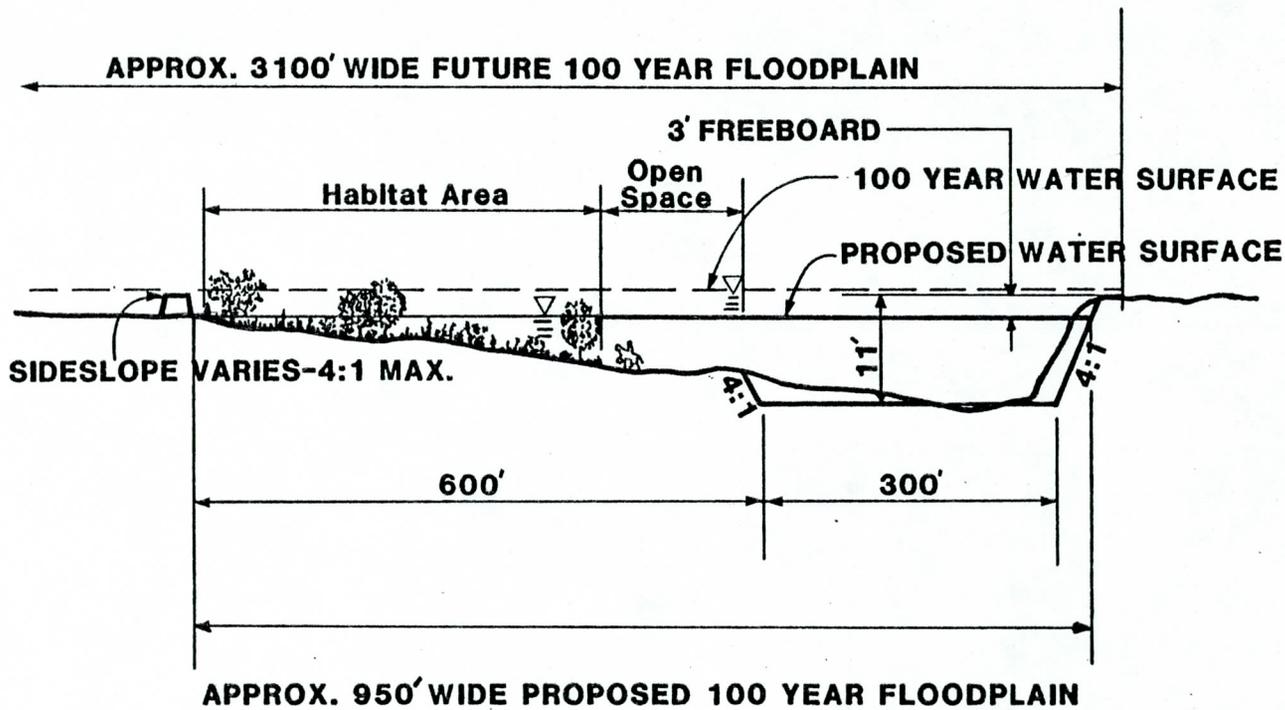
New River

MATCH MAP 9

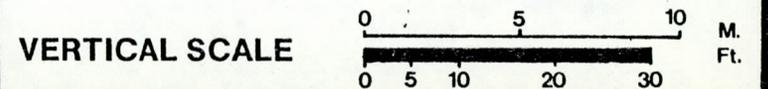
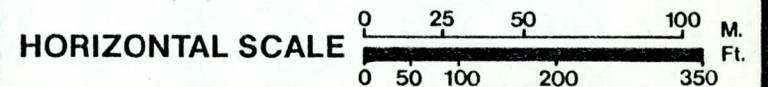
99th Avenue

FLOOD CONTROL PLAN ALTERNATIVES • MAP 8
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





Illustrative Typical Section F-F • Map 9
MAXIMUM WIDTH CHANNEL • REACH 3
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981





MATCH MAP 8

Glendale Avenue

99th Avenue

Agua Fria River

New River

Bethany Home Road

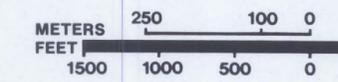
107th Avenue

El Mirage Road

Dysart Road

MATCH MAP 10

FLOOD CONTROL PLAN ALTERNATIVES • MAP 9
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





MATCH MAP 9

Camelback Road

Agua Fria River

Indian School Road

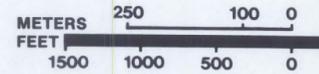
107th Avenue

Dysart Road

Roosevelt Canal Flume

MATCH MAP 11

FLOOD CONTROL PLAN ALTERNATIVES • MAP 10
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980



MATCH MAP 10

Thomas Road

McDowell Road

Interstate 10

Dysart Road

Agua Fria River

115th Avenue

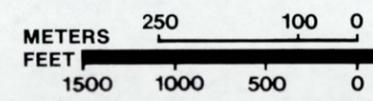
MATCH MAP 12

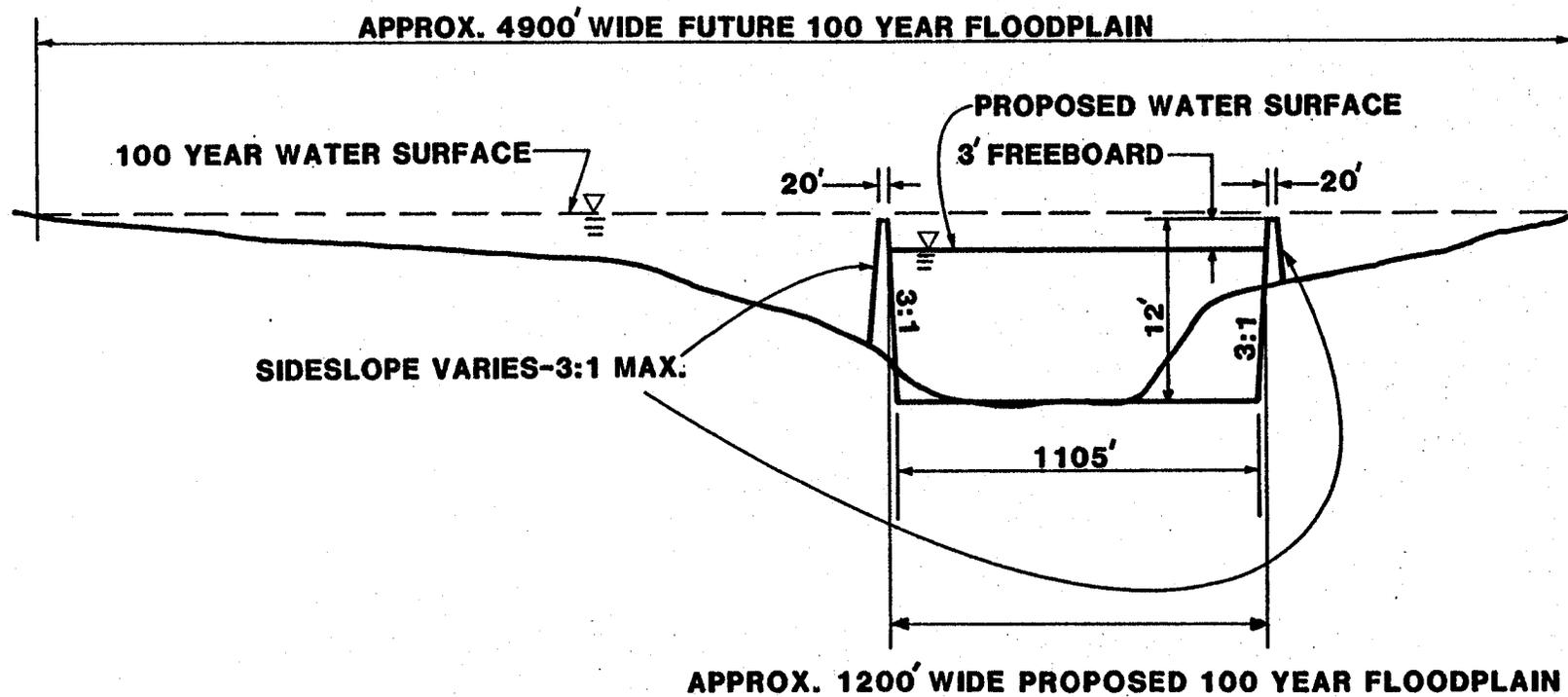
FLOOD CONTROL PLAN ALTERNATIVES • MAP 11

New River/Skunk Creek/Agua Fria River Flood Control Plan

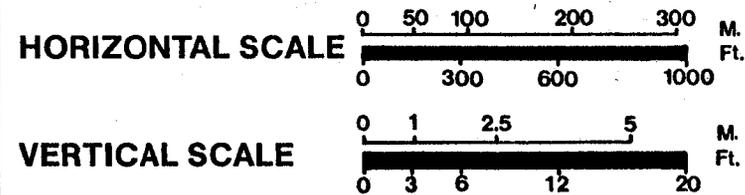
Willdan Associates • 1981

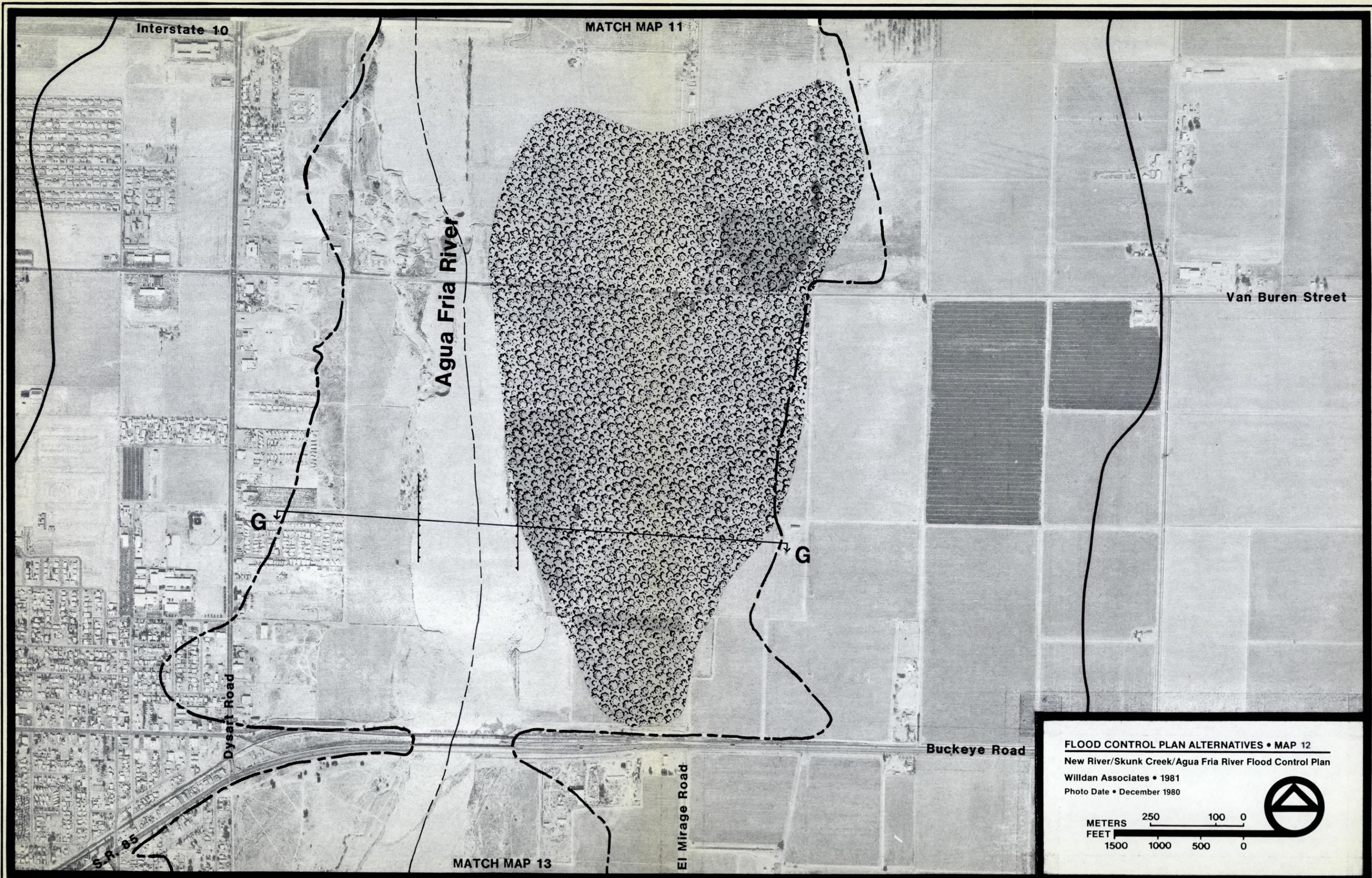
Photo Date • December 1980





Illustrative Typical Section G-G • Map 12
NOMINAL WIDTH CHANNEL • REACH 4
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981





Interstate 10

MATCH MAP 11

Agua Fria River

Van Buren Street

G

G

Dysart Road

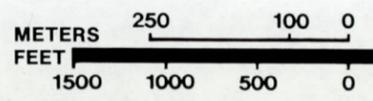
Buckeye Road

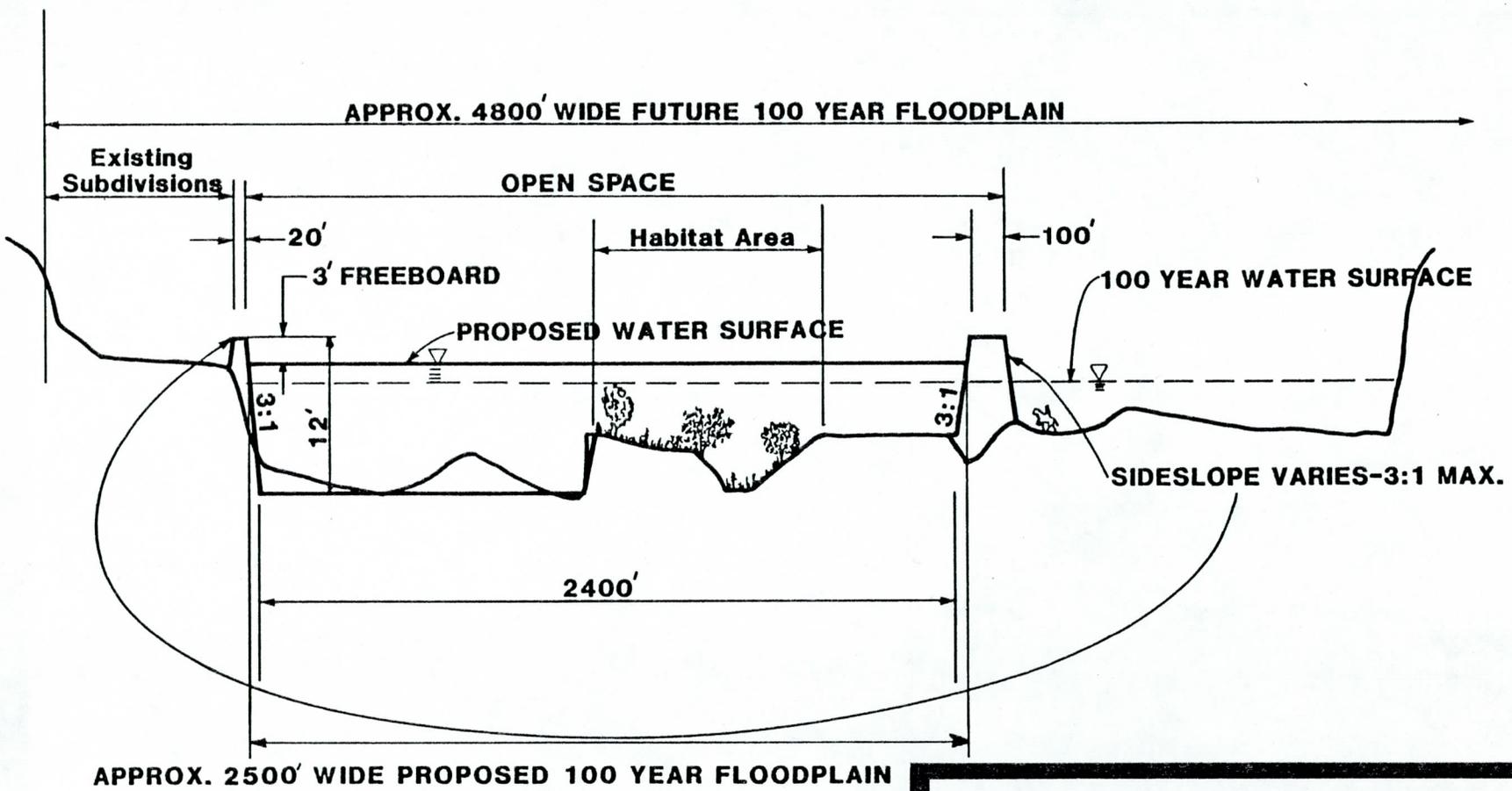
S.R. 85

El Mirage Road

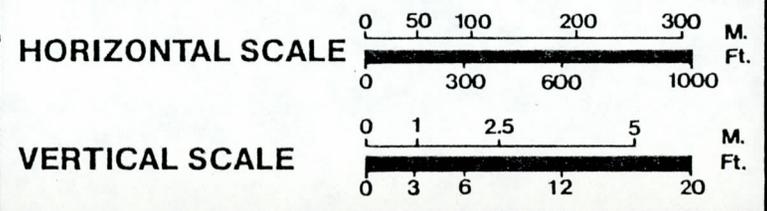
MATCH MAP 13

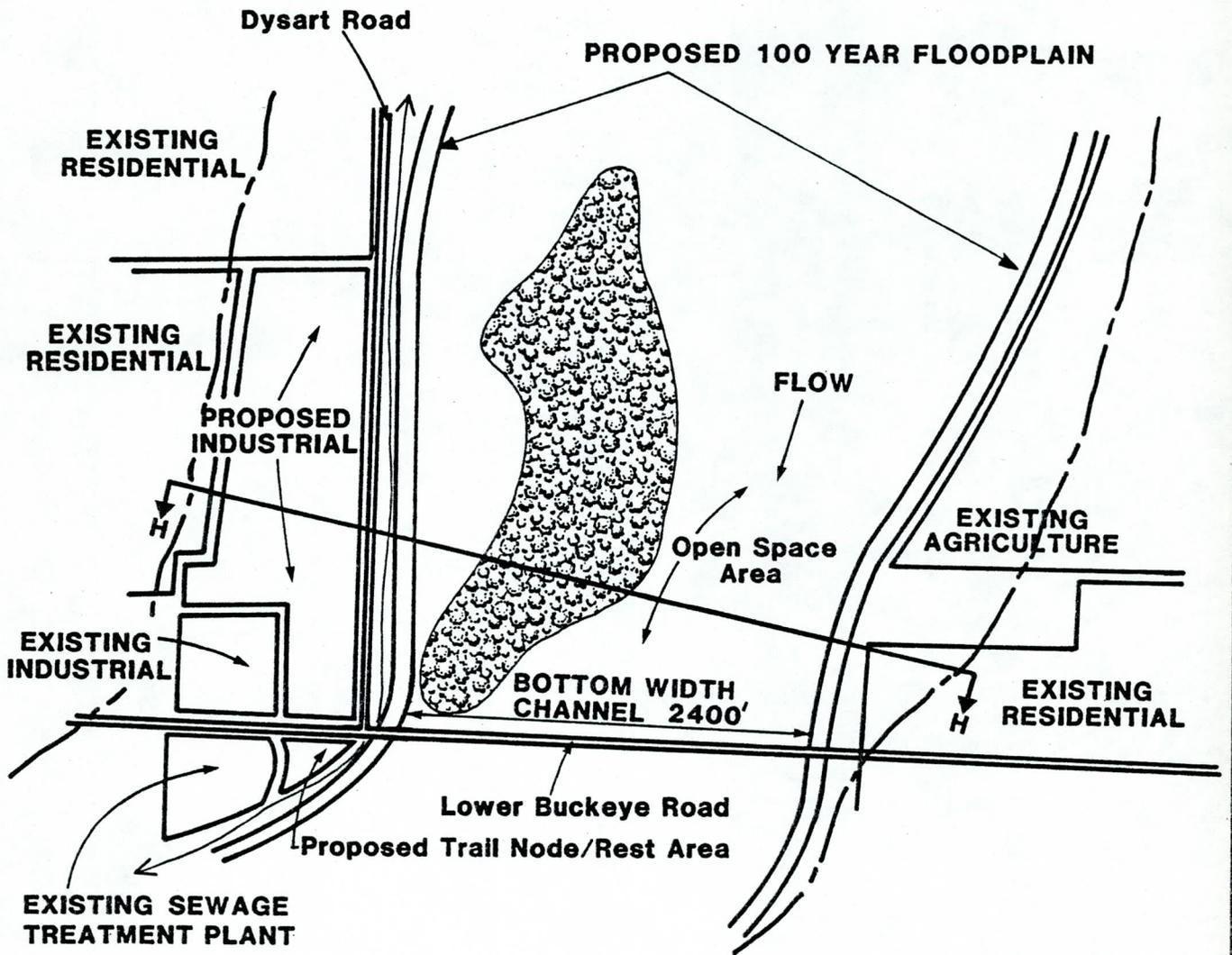
FLOOD CONTROL PLAN ALTERNATIVES • MAP 12
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980





Illustrative Typical Section H-H • Map 13
MAXIMUM WIDTH CHANNEL • REACH 4
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981

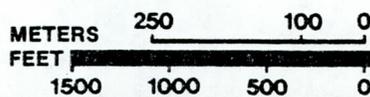


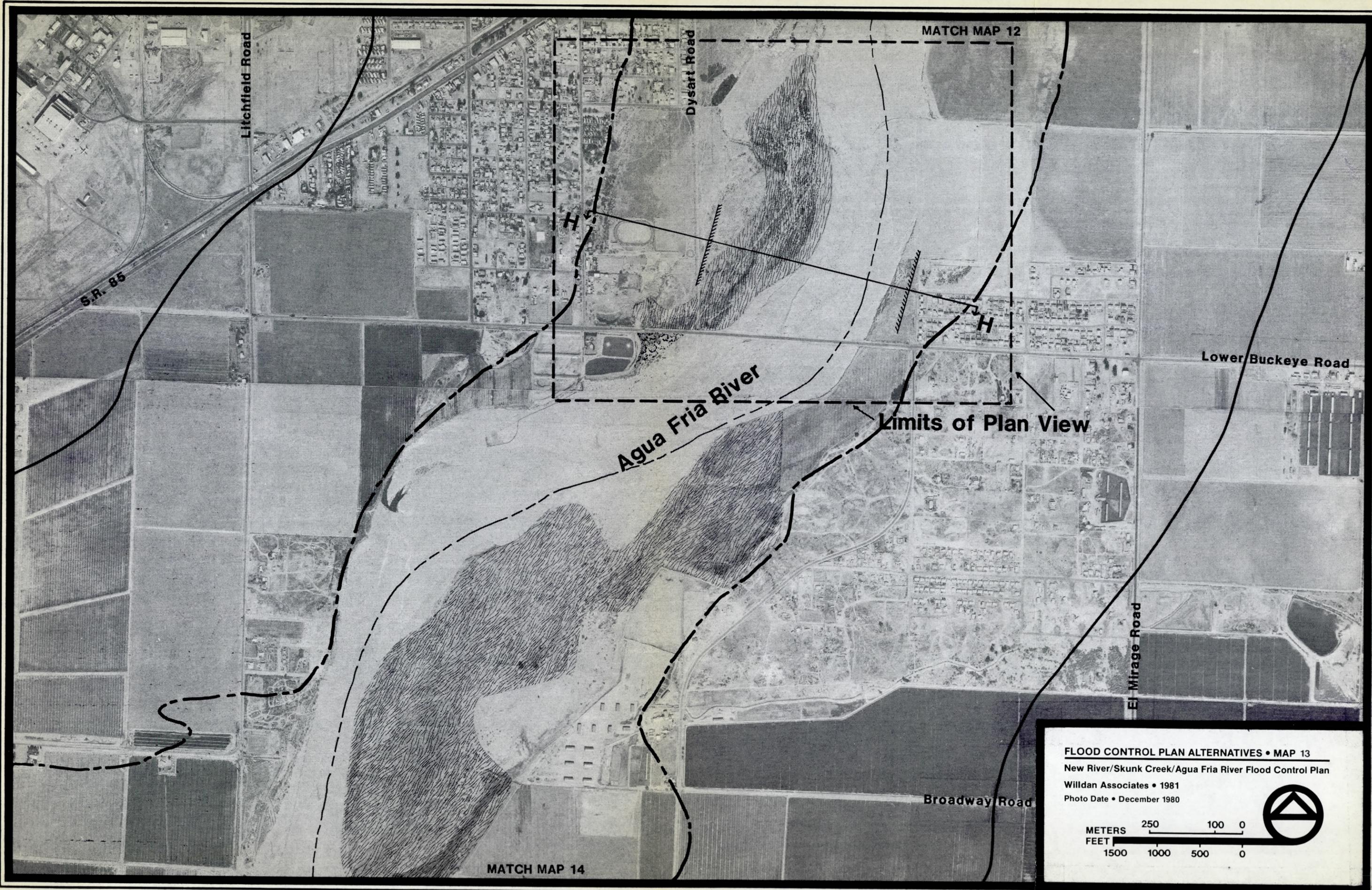


**Plan View for Section H-H • Map 13
MAXIMUM WIDTH CHANNEL • REACH 4**

New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981

-  Future 100-Year Floodplain
-  Levee Alignment
-  Riding and Hiking Trail
-  Wildlife Habitat Area

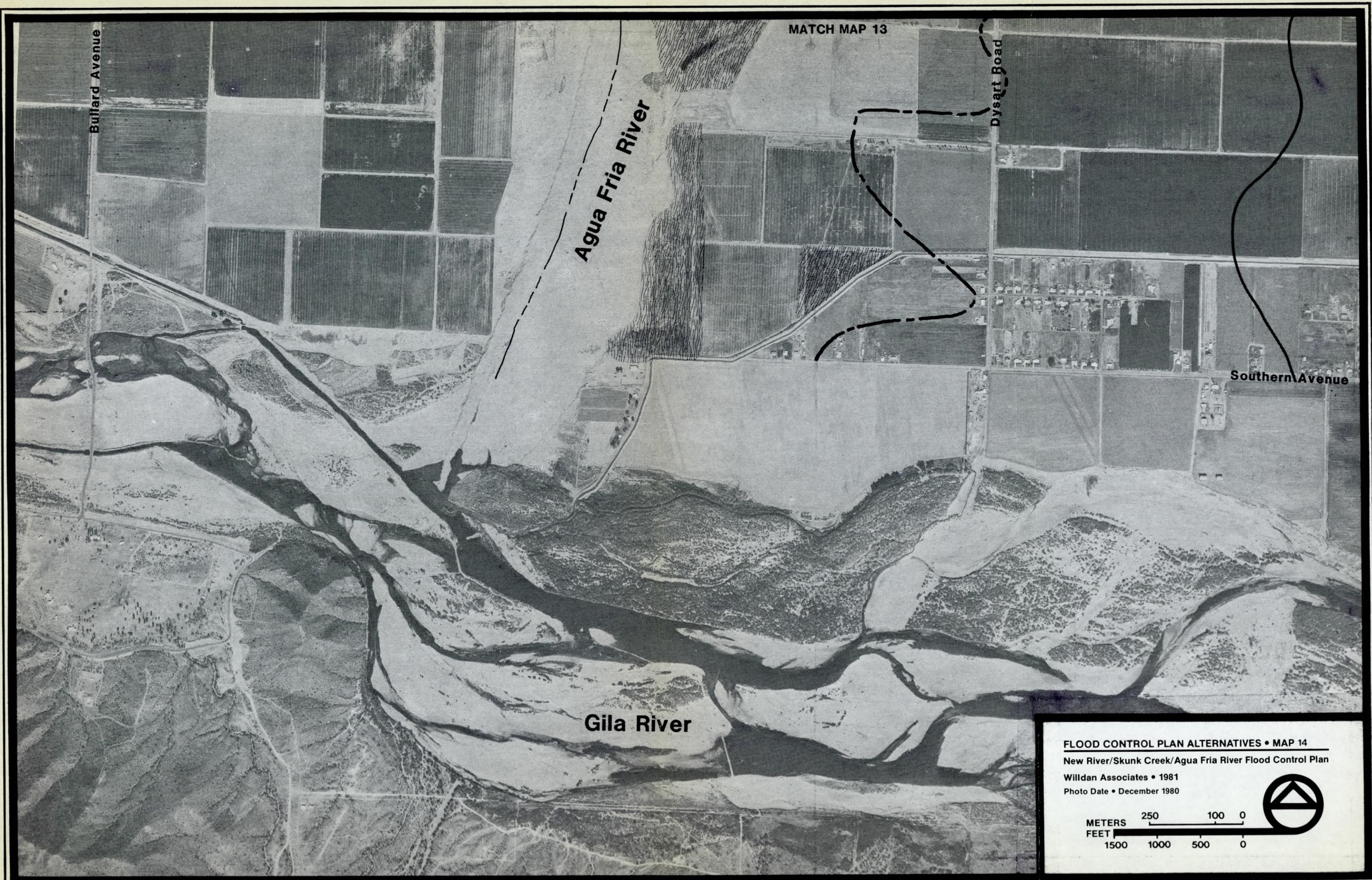




FLOOD CONTROL PLAN ALTERNATIVES • MAP 13
 New River/Skunk Creek/Agua Fria River Flood Control Plan
 Willdan Associates • 1981
 Photo Date • December 1980

METERS 250 100 0
 FEET 1500 1000 500 0





Bullard Avenue

MATCH MAP 13

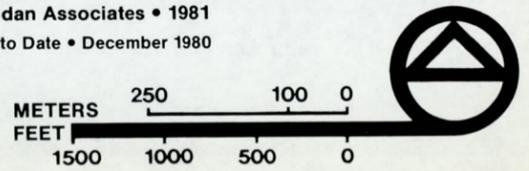
Dysart Road

Agua Fria River

Southern Avenue

Gila River

FLOOD CONTROL PLAN ALTERNATIVES • MAP 14
New River/Skunk Creek/Agua Fria River Flood Control Plan
Willdan Associates • 1981
Photo Date • December 1980



CONCLUSIONS

The recommendations presented here have been designed to minimize impacts; however, implementation will have some negative impacts along with beneficial effects. Temporary short-term impacts directly related to construction of a nominal or maximum width channel would include relocations of mining operations, nuisances from fugitive dust and noise, traffic disruption, and displacement of wildlife to adjacent lands. Adverse long-term impacts would include effects on wildlife populations because of alteration or destruction of habitat and possible modification of migration patterns; increased services for channel maintenance would be required for the life of the project; and, in the event existing agricultural lands were removed from the floodplain, urban development would likely occur in those areas reducing the amount of lands now reserved for open space uses by the Corps Plan. Long-term beneficial effects of the recommendations primarily relate to what would happen if lands were removed from the 100-year floodplain and there was a reduction in total width of the floodplain. More intensive development would occur and the municipalities, while required to provide additional services, would also receive the tax benefits associated with increased development. Transportation routes would be less disrupted during times of flooding. The social impacts of relocations, and health and safety factors related to flooding would be reduced. The recommendations would allow, for the most part, attainment of municipal land use plans, development of recreation areas and trails, and preservation of potential wildlife habitat areas while also reducing somewhat real estate requirements for flowage easements.

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