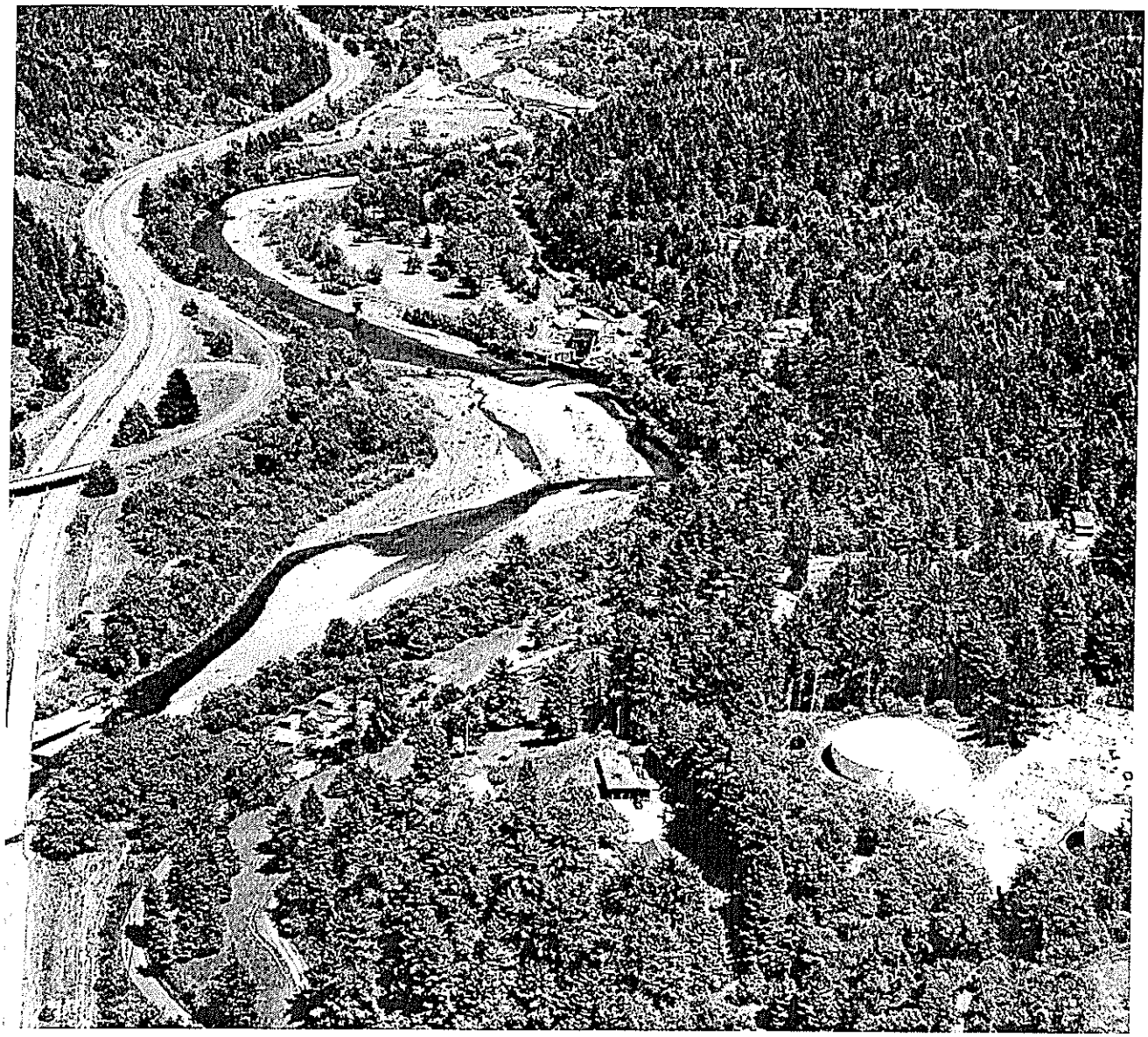
Humboldt Bay Municipal Water District

Habitat Conservation Plan
For Its Mad River Operations



Final Approved HCP – April 2004

Humboldt Bay Municipal Water District

Habitat Conservation Plan for its Mad River Activities

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Executive Summary

Under Section 10 of the federal Endangered Species Act (ESA), the Humboldt Bay Municipal Water District (District) has elected to pursue an Incidental Take Permit for its Mad River activities. As required by the ESA, the District has prepared this Habitat Conservation Plan (HCP) to support issuance of this permit. The overall purpose of this effort is to describe conservation measures that the District will undertake to minimize and mitigate adverse impact to the listed species, in order to gain long-term regulatory certainty with federal agencies, such as the National Marine Fisheries Service (NMFS), the US Fish and Wildlife Service (USFWS), and other federal agencies from which the District requires permits to operate.

The District is the only water supplier in the greater Humboldt Bay area. The District sells "raw" water to industrial users on the Samoa Peninsula, and treated water on a wholesale basis to the cities of Eureka, Arcata and Blue Lake, and the Humboldt, McKinleyville, Fieldbrook, and Manila Community Services Districts. Through its Mad River operations, the District serves a population of approximately 80,000 people in the greater Humboldt Bay area, which represents roughly two-thirds of the entire county.

Four anadromous salmonid species are addressed in this HCP, as follows:

chinook salmon, coho salmon, steelhead trout, and coastal cutthroat trout.

Three of these HCP species -coho salmon, chinook salmon, and steelhead - are listed as "threatened" under the federal ESA. The California Fish and Game Commission recently determined that coho salmon warrant listing as "threatened" under the State ESA. These three species occur in the Mad River and could potentially be impacted by the District's operations. Coastal cutthroat trout are also found in the Mad River. Although they are not currently listed, they are a species of concern, and the USFWS is presently conducting a status review for this species. Therefore, they may be listed in the future. Staff from the NMFS and the USFWS concurred with the selection of these four species as the species to be addressed in this HCP.

The District's "covered activities" were identified as those activities which occur on the Mad River that could cause "take" as defined by the ESA. Ten covered activities, in which the District is currently engaged, are addressed (Section 5). Future possible activities are also identified (Section 13). The District's covered activities can be broadly categorized as: 1) flow release and management activities, 2) diversion activities in the Essex Reach of the Mad River (sub-surface via Ranney Collector system, and surface via the direct diversion facility), 3) maintenance activities, including repair of existing structures if damaged, and 4) periodic excavation and fill activities.

The District believes that the net benefits resulting from its operations are far greater than the adverse impacts associated with its operations. The net benefits are derived from the District's flow releases from Ruth Lake, especially during the critical low-flow months (summer and early fall). Before District operations, the Mad River would regularly "go dry" in the summer. Since the District began its operations, flows in the Mad River have been consistent and reliable year-round, and flow augmentation has occurred in every month except December. It is estimated that the District's operations increase aquatic habitat by approximately 450 acres during the critical low-flow months. More flow creates more aquatic and riparian habitat; therefore, the District's operations benefit the listed salmonid species, as well as other aquatic species.

However, by definition, the District's "covered activities" may cause an adverse impact on HCP species. The impacts associated with each covered activity are described, along with corresponding mitigation measures and monitoring.

Of particular interest is the retrofit project proposed for the direct diversion facility (Station 6) to mitigate and minimize adverse impacts. Operation of Station 6 is the one covered activity where a certain level of "take" is known to occur. To understand and quantify the level of take resulting from operation of Station 6, the District conducted a comprehensive fish study at that facility during 1998. The results from that study indicated that incidental take from Station 6 is very low - less than 0.2% of the estimated population of juvenile salmonids in the Mad River. With the District's proposed mitigation at Station 6, take should be further reduced. The retrofit project involves: 1)

replacing a number of the existing fish screens with new screens that meet the NMFS criterion for screen mesh-size opening, 2) eliminating gaps in the subsurface portion of the structure to comply with the NMFS opening criterion, 3) retrofitting the screens such that fish are no longer lifted from the water, thereby eliminating the need for the fish bypass system, and 4) changing operations of the screens such that the new screens are fully submerged during the chinook emergence period. Following completion of the retrofit project, a comprehensive monitoring program will evaluate whether the retrofit project is successful, as compared against biological goals.

This HCP was written to coordinate with Section 7 of the ESA, to assure that the issuance of an Incidental Take Permit will not jeopardize the existence of any listed species. Section 7(a)(2) of the ESA requires that Federal agencies ensure that their actions will not likely jeopardize the continued existence of any endangered (and threatened) species, or result in the destruction or adverse modification of designated critical habitat. The District's operations do not pose jeopardy to any of the HCP species.

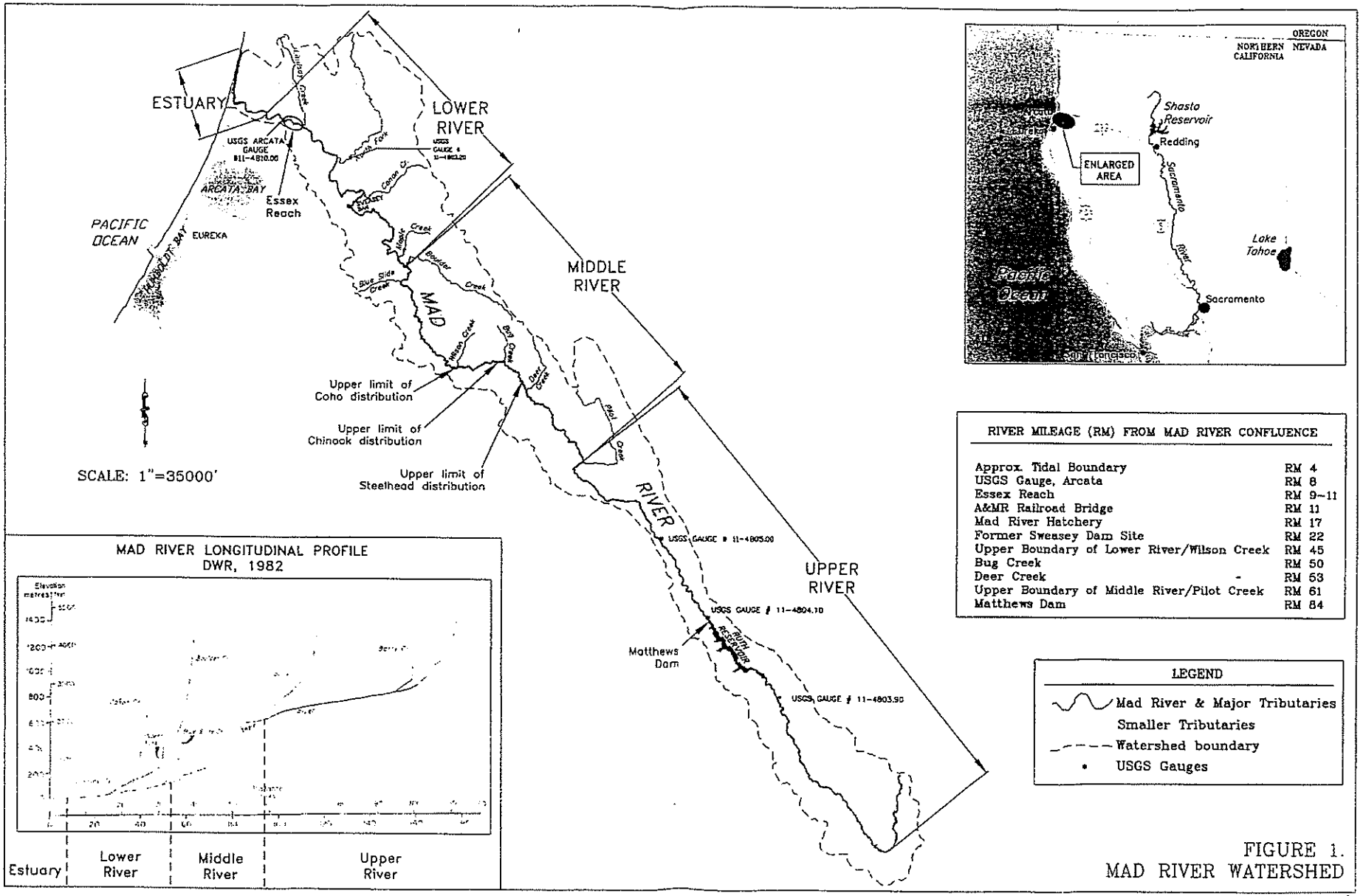

FIGURE 1.
MAD RIVER WATERSHED

Habitat Conservation Plan

1. Introduction

The purpose of this Habitat Conservation Plan (HCP) is to provide information to the National Marine Fisheries Service (NMFS), the US Fish and Wildlife Service (USFWS), the California State Department of Fish and Game (CDFG), and other interested parties and agencies, regarding the Humboldt Bay Municipal Water District's Mad River operations and how they affect salmonid species listed under the Endangered Species Act (ESA). The plan also addresses how the District plans to comply with the ESA.

1.1 Overview of the Humboldt Bay Municipal Water District

The Humboldt Bay Municipal Water District (District) was organized in 1956 under California's Municipal Water District Act. Since the early 1960s, the District has reliably supplied water to customers in the greater Humboldt Bay area of Humboldt County, California.

The District's source of supply is Ruth Lake, a 48,000 acre-feet reservoir, located approximately 85 miles upstream from the mouth of the Mad River. The District carefully plans and manages its release of water from Ruth Lake to meet its diversion requirements and its in-stream flow requirements, for the protection of fish. The District's releases from Ruth Lake provide a significant increase in flow during the Mad River's critical low-flow months, compared to naturally occurring flows (e.g. flows prior to the District). The increased flows consistently provide an increase in aquatic habitat, which in turn provides direct benefits to fish.

The District's diversion facilities are located on the Mad River at Essex, 75 miles downstream from Ruth Lake. The District diverts water at Essex for two separate systems, 1) a domestic system, which supplies treated drinking water, and 2) an industrial system, which supplies untreated "raw" water. Water for the industrial system is supplied by a surface diversion facility (Station 6). Water for the domestic system is drawn from four Ranney collectors located in the Mad River; the collectors draw water from the aquifer sixty to ninety feet below the riverbed.

The District is the only water supplier in the greater Humboldt Bay area. The District sells raw water to industrial users on the Samoa Peninsula, and treated water on a wholesale basis to the cities of Eureka, Arcata and Blue Lake, and the Humboldt, McKinleyville, Fieldbrook, and Manila Community Services Districts. Via the wholesale relationship, the District serves a population of approximately 80,000 people, or roughly two-thirds of the entire county.

1.2 Endangered Species Act

Three species of anadromous salmonids on the Mad River have been listed under the Endangered Species Act (ESA) and a fourth is under consideration.

- In 1997, the Secretary of Commerce listed coho salmon in the Southern Oregon and Northern California Evolutionary Significant Unit (ESU) as "Threatened" and subsequently designated fish-accessible reaches of the Mad River as critical habitat (50 CFR Part 226).
- In 1999, the Secretary listed chinook salmon in the California Coastal ESU as "Threatened", and designated fish-accessible reaches of the Mad River as critical habitat for the chinook as well. However, in May 2002, the critical habitat designation for chinook was vacated by a federal court ruling.
- In 2000, the Secretary listed steelhead in the Northern California ESU as "Threatened" but critical habitat has not yet been designated.
- The fourth salmonid species under consideration is the coastal cutthroat trout. The National Marine Fisheries Services (NMFS) completed a Status Review of coastal cutthroat trout, and determined that listing was not warranted in the Southern Oregon-California Coast ESU. However, in 1999, jurisdiction for coastal cutthroat trout was transferred from NMFS to the USFWS. USFWS does not utilize ESUs in its definition of a species under the ESA, and is currently undertaking a new Status Review, which is not complete at this time.

1.3 The ESA's Impact on the District

The ESA listings have numerous implications for the District. First, the ESA defines and prohibits "take" of listed species. Several of the District's Mad River activities may result in a low level of "take." Second, in conjunction with other environmental laws and regulations, the ESA has increased the cost and complexity of conducting business on the Mad River. In particular, the cost and difficulty of securing permits has increased dramatically. For example,

the District must secure an Army Corps of Engineers (ACOE) permit every five years, under Section 404 of the Clean Water Act. Given the ESA listings, the ACOE must now enter into formal consultation with the NMFS and USFWS prior to issuing any permit. The Services must issue a Biological Opinion to the ACOE, determining if the District's actions pose jeopardy to the continued existence of these species, or if the actions pose a significant adverse affect on critical habitat. The District's most recent ACOE permit renewal took almost two years to complete, and significant time and effort was expended by all agencies.

1.4 Purpose of this HCP

Section 10 of the federal ESA allows for the issuance of Incidental Take Permits, which authorize a level of take associated with an otherwise lawful activity. The District has elected to pursue a fifty (50) year Incidental Take Permit for all of its Mad River activities. As required by the ESA, the District has prepared a comprehensive Habitat Conservation Plan (HCP) to support issuance of this permit. The overall purpose of this effort is to outline conservation measures that the District will undertake to minimize and mitigate adverse impact to the listed species, in order to gain long-term regulatory certainty with the federal agencies (e.g., NMFS, USFWS, and other federal agencies which issue permits, leases or exemptions to the District).

In accordance with guidance provided in NMFS' HCP Handbook (NMFS, 1996), including its five-point policy addendum (2000), the District is submitting this HCP for its Mad River activities covering coho, chinook, and steelhead. The HCP will provide the following information:

- Impacts to the listed species likely to result from the District's Mad River activities;
- Measures the District will undertake to minimize, mitigate, and monitor such impacts;
- Procedures to deal with adaptive management and changed circumstances.

The HCP will serve as the basis for issuance of an Incidental Take Permit from NMFS for coho, chinook and steelhead. Although this HCP does not seek coverage for coastal cutthroat trout, it provides information on that species to support a possible Candidate Conservation Agreement with the USFWS, given the status review in progress for that species.

2. The HCP Boundaries

The HCP Handbook discusses the merits and disadvantages of drawing an HCP boundary that is either too large or too small. If the boundary drawn is too small, the HCP may not be sufficiently comprehensive. If the boundary drawn is too large, the HCP may become too complicated, resulting in "an overextended, protracted HCP effort." The HCP boundaries described below achieve a reasonable balance, and are appropriate for the District's activities and their effect on the salmonid species addressed in this HCP.

A number of criteria were considered when selecting the boundaries of the HCP area. According to the HCP Handbook, the "HCP boundaries should encompass all areas within the applicant's project, land use area, or jurisdiction within which any permit or planned activities likely to result in incidental take are expected to occur." In addition to the Handbook's recommendations, three other criteria were considered: 1) the concept of "critical habitat," as defined in the 1973 Endangered Species Act (ESA), which includes all accessible river reaches, all substrate and adjacent riparian zones of listed species, and all areas below specific dams or longstanding, naturally impassable barriers; 2) the geographic distribution of salmonids in the Mad River; and 3) other utilized but non-contiguous areas in which the District operates, which include lands leased from the U.S. Forest Service at Ruth Lake.

For the District's Mad River operations, the HCP boundaries are described as follows:

- Width: The width of the HCP area is the Mad River's bankfull channel and adjacent riparian zone.

- Upstream boundary: The HCP area's upstream boundary is defined by how far salmonids migrate up the river. For steelhead, Deer Creek (River Mile (RM) 53) usually defines the upper migration limit. However, during periods of high flow combined with geomorphic stability, steelhead may be able to migrate further upstream. Therefore, the upstream boundary of this HCP was selected at Matthews Dam (RM 84).

- Downstream boundary: The HCP area's downstream boundary is defined as the mouth of the Mad River (RM 0) because the District's activities—specifically, bypass flows below its diversions at Essex - may affect the Mad River estuary.

- Noncontiguous areas. The HCP area also includes facility and maintenance areas at Essex (owned by the District) and at Matthews Dam (leased from the Forest Service).

Refer to Figure 1, next page, for a map of the Mad River watershed which illustrates a number of features of the watershed, including the distribution limits of the salmonid species addressed in this HCP.

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3. The Environmental Setting

Although much could be written on the Mad River environment, this plan's description will be confined to that information needed to understand the factors that directly limit the distribution or abundance of anadromous salmonids, in both space and time.

The hydrology of the Mad River is characteristic of many North Coast California streams. Storms are episodic; river stage height may fluctuate many feet from its peak storm runoff, to the baseflow stage in between storms. Most rainfall occurs in the late fall, through winter, and into the middle of spring. Snowfall occurs but its storage and melting are not considerable hydrograph components. Prior to the District's operations, in the upper river zone and below the former Sweasey Dam, the river channel would frequently "dry up" during the late summer. However, with water storage in Ruth Lake, and with bypass flows at the Essex Reach, the river flows continuously year round. Additional information about the Mad River environment is presented in Appendix A.

The two primary environmental factors limiting fish populations are the area's hydrology and its geography; therefore, the temporal and spatial aspects of each will be discussed below.

The geography of the Mad River, with respect to fish abundance and distribution, can be partitioned into four zones (Table 1, Figure 1). Anadromous fish fully occupy the two lower zones. In the middle river zone, migration barriers limit access to below Wilson Creek for coho, Bug Creek for chinook, and usually Deer Creek for steelhead. Under certain conditions, steelhead may be able to migrate further upstream and utilize the upper river zone and Pilot Creek. Therefore, the upper river zone is differentiated from the middle zone by the limited periods of time when high flows coincide with geomorphic stability, such that steelhead are able to negotiate the barriers.

Table 1. Spatial Environment – The Mad is comprised of Four Zones

Zone	Extent	Upper Extent Defined by:	Primary Fish Uses:
Estuary	RM 0 to RM 4	That portion of river that is tidally influenced	Rearing before outmigration to ocean.
Lower River (Low gradient, relatively stable morphology)	RM 4 to RM 34	The confluence of Boulder Creek. Includes Lindsay Creek; the North Fork; and Canon, Maple, and Boulder Creeks	As a "highway" to tributaries during upstream and downstream migration. Spawning and rearing of most anadromous species.
Middle River (Steep gradient, morphologically unstable)	RM 34 to RM 61	The confluence of Pilot Creek	Upstream migration barriers at RM 45, 49, and 53 stratify fish species by their ability to reach upper river. Steelhead spawning and rearing.
Upper River (Steep gradient, unstable)	Above RM 61	The Mad River watershed boundaries	Naturally of limited use by any anadromous fish due to barriers and intermittent summer flows. Since the District began operations (1962), the District has maintained summer flows.

Most of the District's operations that may impact fish occur in the Lower River zone, from RM 9 to RM 11, where the District maintains its diversion facilities. This two-mile reach, referred to as the "Essex reach," is characterized by its low gradient, high degree of confinement, sand and small gravel substrate, and lack of woody debris.

Unfortunately, the source of large woody debris, particularly from more resistant conifer species, along the lower Mad River was depleted during the 1800s. Normally large woody debris, particularly trees with their root system intact, enter the river at points where bank erosion or debris slides occur. While there is bank erosion in the Blue Lake Valley reach immediately above the Essex reach, there are virtually no large conifers remaining on the banks. Therefore, any erosion that occurs today does not provide the Essex reach with large woody debris. The Essex reach is naturally confined and has stable banks, with Cottonwoods as the main riparian overstory component. To protect the occasional large woody debris which is deposited in the Essex reach, the District does not allow the public to salvage the woody debris for firewood.

Habitat mapping indicates that the Essex Reach is primarily pool habitat (approximately 64%), which offers little shelter for fish, especially when combined with the lack of woody debris.

However, the Essex reach is a critical corridor for migration of both juveniles and adults, and also provides spawning habitat, particularly for chinook in low-water years. Refer to Appendix E-3 for detailed habitat description and mapping of this reach.

The temporal aspects of the Mad River's environmental setting are described by the interactions between hydrology and fish behavior. A particular season or time of year cannot be identified as most important to fish; life stages of fish require various flow regimes at various times (Table 2).

Table 2. Temporal Environment – Life Stages of Fish

Fish Life Cycle: Species	Months During which Life Stage Occurs	Peak During which Life Stage Occurs
Egg Incubation:		
Coho Salmon	November - May	
Chinook Salmon	November - mid-May	
Steelhead Trout	January - June	
Cutthroat Trout	Not available	
Emergence:		
Coho Salmon	Late February - mid May	
Chinook Salmon	Late February - mid May	
Steelhead Trout	May – June	
Cutthroat Trout	March – June	
Juvenile Outmigration:		
Coho Salmon	May – June	May
Chinook Salmon	April – July	June
Steelhead Trout	May – August	July
Cutthroat Trout	Not available	
Spawning Migration:		
Coho Salmon	October - February	December
Chinook Salmon	September - February	October-January
Steelhead Trout	August - April	December-January
Cutthroat Trout	August - November	September
Spawning:		
Coho Salmon	November - February	December
Chinook Salmon	November - February	December-January
Steelhead Trout	December - April	January-March
Cutthroat Trout	November - June	January

4. Species Covered in this HCP

The number of species to be covered in this HCP results from a balance between: 1) the District's need for regulatory certainty (which argues for covering more, rather than fewer, species), and 2) the regulatory agencies' need to confine the HCP to a manageable and enforceable level (which argues for fewer species.) NMFS' HCP Handbook states that the greater the number of species addressed in the HCP, the more complicated the HCP may become. This section lists species proposed to be covered, and gives the rationale for their selection.

At this time, the Secretary of Commerce has listed three anadromous salmonids species--coho salmon, chinook salmon, and steelhead--as "threatened". These three species occur in the Mad River and may be impacted by the District's operations. Coastal cutthroat trout also occur in the Mad River. Although they are not currently listed, they are undergoing a status review by the USFWS and may be listed in the future. Because coastal cutthroat trout have a similar life history to the other three listed fish, results from the District's operations and mitigation activities would likely be similar (i.e., the District would manage the cutthroat similarly as the coho, chinook, or steelhead.) Staff from the NMFS and the USFWS concurred with the selection of these four species as the species addressed in this HCP. However, the Incidental Take Permit will only cover chinook and coho salmon, and steelhead (since only these species are listed and under NMFS jurisdiction at this time).

The HCP Handbook also suggests that the District collect and review existing information on the HCP species, focusing on the species' distribution, artificial propagation, abundance, and ecology. The Handbook recommends that research efforts should be confined to distribution or other studies that directly bear on the needs of the HCP. The District readily identified information for coho, chinook, and steelhead, but data for coastal cutthroat trout could not be found. Table 3 presents a brief summary of the data which exist for each species on the Mad River. Appendix B provides additional detail and data, including the species' evolutionary significant unit, regulatory status, life history stage, and spatial distribution.

Table 3. Available Data for Four HCP Species

Species	Designation	Years of Available Data[1]	Recent Population Estimates [1]
Coho salmon	Listed as Threatened (1997)	1971-2001 MRH. 1938-1964 Sweasey Dam. 1985-2000 Canon Cr. and North Fork Mad River	Since 1990, coho returns at the MRH ranged from 3 to 259. [2] Since 1971, numerous non-native strains of coho have been introduced to the Mad River by the MRH.
Chinook salmon	Listed as Threatened (1999)	1971-2001 MRH 1938-1964 Sweasey Dam. 1985-2000 Canon Cr. and North Fork Mad River	Since 1990, chinook returns at the MRH ranged from 1 to 67. [2]
Steelhead trout	Listed as Threatened (2000)	1971-2001 MRH. 1938-1964 Sweasey Dam. 1994-1999 summer steelhead Mad River.	Population trends complicated by two runs (winter and summer). Since 1990, steelhead returns at the MRH ranged from 915 to 11,520.
Coastal cutthroat trout	Under Status Review	Under USFWS Status Review. Previous Status Review by NMFS found little or no data.	Unknown.

(1) MRH stands for Mad River Hatchery
(2) In 1994, CDFG ceased raising coho and chinook at the Mad River Hatchery. Therefore, returning fish of these two species are voluntary, and their numbers cannot be directly compared to pre-1994 counts.

The Pacific lamprey is another species present in the Mad River, and its distribution reportedly extends as far as RM 50, which is the confluence of the Mad River and Bug Creek (CDFG Mad River Files, 1972). Although it is not listed, the USFWS has classified Pacific lamprey as a species of concern, which indicates that its long-term abundance and distribution trends are unknown. Because its abundance, distribution, and basic life history are unknown, the District would be unable to manage either its operations or mitigation activities to reduce or limit impacts. Similarly, the regulatory agencies would be unable to enforce take levels without knowing abundance and distribution. Consultation between the District and USFWS resulted in a determination to exclude the Pacific lamprey as a covered species, due to lack of life history and population data.

5. The District's Covered Activities

"Covered activities" are those activities which may result in "take," as defined by the ESA. Therefore, a District activity which may result in take (for example, operation of the fish screens at the direct diversion facility) would be a covered activity. Other activities, such as treating water for domestic use, would not be a covered activity, because water treatment does not impact nor result in take of any of the HCP species.

The HCP Handbook suggests that the applicant include "all actions within the planning area that: (1) are likely to result in incidental take; (2) are reasonably certain to occur over the life of the permit; and (3) for which the applicant has some form of control." Under these three criteria, the following lists the District's covered activities:

Current Activities which Occur on an On-going Basis:

1. Releasing flow at Matthews Dam
2. Diverting water in the Essex Reach (sub-surface via Ranney collectors and surface via direct diversion facility)
3. Bypassing flows below Essex
4. Operating the direct diversion facility (Station 6) including the fish screens
5. Dredging of forebay at Station 6
6. Maintaining adequate water surface elevation to Station 6 during low-flow months (currently done via construction of a gravel berm, but may be achieved by new grade-control structure in the future)

Current Activities which Occur only As-needed:

7. Maintaining adequate capacity in tailrace and spillway pools below Matthews Dam (by excavation if sediment, gravel or debris accumulates)
8. Gaining access to and maintaining Ranney collectors
9. Maintaining adequate flow to Station 6 (by excavation of the low-flow channel in front of Station 6 if gravel or debris accumulates)
10. Protecting banks and structures (by repairing existing rock structures and/or revetments)

Additionally, monitoring activities defined in this HCP are also included as covered activities. Potential incidental take associated with the monitoring is described further in this section.

The impacts associated with these activities, as well as proposed mitigation measures, are discussed in the following sections (Section 6, 7 and 8). Additionally, Appendix C contains a more detailed description of the District's Mad River activities.

6. Impacts from the District's Covered Activities

The overall effect of the District's Mad River operations is beneficial; however, each covered activity may impact the HCP species, and that impact may be beneficial or negative.

The primary beneficial activity is the District's flow releases during summer and early fall. Prior to the District's operations, flow would frequently become subsurface - that is, the river channel would completely dry up – in the late summer and fall. Releases from Ruth Lake now augment flows in 84 miles of the river, and even in drought periods, a minimum flow has consistently been maintained in the river. Flow augmentation has many beneficial effects, including expanding river habitat all the way to the mouth. It is estimated that increased flows associated with District releases provide approximately 450 acres of habitat for aquatic species during the low-flow months. Summer-run steelhead particularly benefit from this improved habitat.

To demonstrate that the District's operations have augmented flows compared to what otherwise occurred naturally, the average monthly discharge from Matthews Dam were analyzed between 1989 and 2001. Flow releases from Matthews Dam augment natural "pre-District" flows by at least one order of magnitude, during July through October, as demonstrated in Table 4.

Table 4. District's flow releases from Matthews compared to natural flow (in cfs)

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
"Natural" flow above Ruth Reservoir, prior to District operations	772	622	500	250	123	59	9	1	0	5	55	320
District's releases from Matthews Dam	941	812	691	342	177	111	58	70	77	77	70	281
Net increase in flows resulting from flow releases	169	190	191	92	54	52	49	69	77	72	15	-39

Additionally, the District analyzed daily mean stream flows on the Mad River as recorded by the former United States Geological Survey (USGS) Gage Station near Forest Glen (No. 11480500), which was located approximately nine miles downstream of Matthews Dam. This station was in operation from 1953 through 1994, and therefore, recorded stream flows prior to and following the District's operation at Matthews Dam (which commenced in 1961). Table 5 presents the minimum, maximum and average daily stream flows during the low-flow months for this station.

Table 5. Daily Mean Stream Flows (cfs) during Low-flow Months (Oct. 1953 to Oct 1994)

At USGS Gage Station Near Forest Glen (located approximately 9 miles downstream of Matthews Dam)

Period 1 - Prior to Operation of Matthews Dam												
	August			September			October			November		
Year	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
1953							3	16	5	4	2330	279
1954	2	7	3	2	4	3	2	11	5	5	987	120
1955	2	5	3	1	3	2	2	5	2	3	1890	176
1956	2	5	4	2	2	2	2	1050	52	10	214	42
1957	3	7	5	2	23	4	7	1400	168	32	3350	455
1958	2	18	8	6	19	14	1	5	2	2	72	13
1959	2	2	2	2	20	7	2	9	6	2	3	2
1960	2	7	5	1	3	2	2	5	3	2	1250	117
1961	1	10	5	1	8	4	2	8	3	2	380	51
AVG	**2**	**8**	**4**	**2**	**10**	**5**	**2**	**279**	**27**	**7**	**1164**	**139**
Period 2 - After Matthews Dam in Operation												
1962	12	20	14	13	21	17	16	3840	620	217	1150	379
1963	48	135	92	118	271	220	9	213	65	29	807	362
1964	94	98	96	92	98	94	91	100	95	53	420	114
1965	45	73	53	65	73	70	69	79	76	73	425	213
1966	80	111	88	76	158	91	56	75	72	52	369	128
1967	81	121	101	99	119	111	123	269	171	70	178	122
1968	72	103	90	70	108	82	63	109	82	81	367	225
1969	73	105	95	73	119	97	95	113	109	95	206	134
1970	90	104	101	98	119	105	107	127	114	107	722	235
1971	83	100	94	95	111	100	92	141	107	102	228	122
1972	79	100	93	91	128	102	80	117	107	101	198	128
1973	83	123	95	95	118	104	102	199	111	105	3060	1262
1974	97	123	114	117	124	119	111	134	117	65	169	104
1975	70	108	88	87	108	91	87	330	117	123	620	316
1976	45	71	56	54	86	62	77	102	92	37	98	78
1977	57	81	68	14	69	56	10	51	37	9	238	44
1978	69	100	89	93	114	96	91	94	93	72	95	87
1979	93	104	98	100	102	101	45	361	94	46	1500	302
1980	88	106	96	99	106	101	96	104	99	38	100	78
1981	81	93	84	81	91	85	34	139	70	27	3000	814
1982	43	76	62	70	114	91	44	182	139	111	584	181
1983	41	137	63	70	116	87	98	143	124	147	2600	584
1984	77	93	80	83	88	86	83	94	88	94	3320	867
1985	85	96	91	90	98	95	51	121	92	40	84	63
1986	99	108	104	104	129	109	100	149	112	15	115	83
1987	90	95	93	89	97	92	87	93	90	29	87	57
1988	86	98	93	92	107	98	92	109	96	24	861	201
1989	94	104	99	83	103	98	55	231	98	55	115	90
1990	80	118	107	96	103	101	96	118	105	50	99	88
1991	94	105	99	94	102	97	34	103	88	13	86	48
1992	93	97	95	88	96	92	53	88	76	11	61	33
1993	41	43	42	42	58	52	57	64	60	59	64	61
1994	51	64	56	56	67	62	65	68	67			
AVG	**73**	**97**	**85**	**81**	**107**	**93**	**72**	**250**	**112**	**67**	**688**	**238**

All of the District's other covered activities have associated impacts – either beneficial or adverse - on the HCP species. Table 6 briefly summarizes the impacts of each activity.

The primary adverse impact associated with the District's Mad River operations results from operation of the fish screens at Station 6. To quantify the effect of the fish screens, the District conducted a comprehensive fisheries study in 1998. The results of this study indicated that less than 0.2% of the estimated juvenile fish population in the Mad River are affected by the screens. Refer to Section 7 and Appendix E-1 for additional detail about the 1998 fish study. The District will be retrofitting the Station 6 screens and operation to minimize and mitigate the adverse impacts. This retrofit project is described in Section 8.1, which follows Table 6.

With respect to monitoring activities, take is expected to be very low. The most extensive monitoring will be associated with Activity 4, operation of Station 6, following the retrofit project (described in Section 8.1). Some take of juvenile salmonids may occur in association with the Station 6 monitoring. However, any such take is expected to be very low in that if fish are captured at the screens, they will likely have already perished due to impingement. Where live fish are captured during Station 6 monitoring, a few individuals may perish due to the cumulative stress of impingement and handling. If live fish are captured during Station 6 monitoring, or monitoring associated with any other activity, they will promptly be returned to the mainstem Mad River.

Table 6. Impacts on HCP species associated with the District's Covered Activities

(Activity numbers correspond to "District's Covered Activities List" in Section 5)

District Activity (and Location)	Impact	Explanation
1. Releasing flow at Matthews Dam	Beneficial	Historically, the Mad River's upper reaches frequently went completely dry. Now, the District's releases provide a reliable and continuous flow year-round. Increased flows create approximately 450 acres of additional habitat in the summer and fall, and improve other water quality parameters such as temperature, thereby benefiting aquatic species. Ruth Lake impounds water during the first fall or winter storms; however, this likely has minimal, if any, adverse effect on downstream flows or habitat. The historical flow data indicate that operation of Matthews Dam has not reduced average flows below that which occurred naturally during September, October and November (the period during which the first storms of the season occur). As presented in Tables 4 and 5, the District's operation has significantly increased average daily flows compared to what naturally occurred. (From Table 4: Sept 77 vs. 0 cfs, October 77 vs. 5 cfs, November 70 vs. 55 cfs; and From Table 5: Sept. 93 vs. 5 cfs, October 112 vs. 27 cfs, November 112 cfs vs. 27 cfs). Matthews Dam is sited such that approximately 25 percent of runoff of Mad River lies above the dam and reservoir. Mad River's total annual discharge into the Pacific Ocean has been computed on average to slightly exceed 1,000,000 acre-feet. Consequently, approximately 250,000 acre-feet of water on average passes through the reservoir, a portion of which is impounded. The reservoir has a retention capacity of 48,000 acre-feet, which in an average year is drawn down to approximately 30,000 acre-feet. Thus, under current operational conditions during an average water year, the natural runoff above the dam is diminished by 20,000 acre-feet, which represents only 2 percent of the river's total natural runoff. On a daily basis, the runoff above the dam varies greatly, from zero surface flows (July through September) to short-term daily flows in excess of 3,000 cfs during intense late fall and winter storms. At the beginning of the fall rainfall period (normally mid to late October) the reservoir level may be twenty to twenty-five feet below the spillway. As a consequence, the majority of inflow above the dam resulting from early rain storms is impounded. During this period, however, the District's operational policy and history has been to release from 50 cfs to in excess of 100 cfs during these early storm periods. The resulting short-term impact to daily runoff resulting from impoundment from early September storms is minimal, increasing to a maximum reduction in daily flows of approximately 85% in October and 97% in November (assuming the 3,000 cfs storm event). It is important to understand these "storm" flows, under natural conditions, would not reach the Essex reach nor the estuary for 60 to 70 hours, at which time the contributing flows of the remaining drainage would significantly mitigate the flow reduction impacts. (Refer to Appendix C)

Table 6 (Continued)		
District Activity (and Location)	**Impact**	**Explanation**
1. Releasing flow at Matthews Dam (Continued)		In terms of impacts upon water depth and wetted perimeter, a natural daily flow of 3,000 cfs would create significant short term increases in the depth and width of surface flows in the upper river reach. However, under natural conditions after heavy rainfall and the resulting storm flows ceased, the surface flow would quickly drop to levels significantly below the sustained flows now provided by the District. It is not possible to assess whether the extreme natural short-term flow variations in the upper reaches were more beneficial or detrimental to fisheries compared to the continuous, but more moderate flow conditions which now exist given the District's operation.
2. Diverting water in the Essex Reach (sub-surface via Ranney collectors and surface via direct diversion facility)	Negligible, if any	The District manages its releases from Matthews to meet its diversion requirements at Essex as well as its bypass requirements below Essex for the protection of fish (see activity 3, below). Appendix C provides a more in-depth discussion about the District's flow management and diversions.
3. Bypass flows below Essex	Beneficial	The District maintains minimum bypass flows below Essex in accordance with conditions in its State Water Rights Permits for the protection of fish. Providing bypass flows that are generally greater than "naturally occurring" flows create more river and riparian habitat and aids in keeping the river mouth open.
4. Operating the direct diversion facility (Station 6) including the fish screens	Adverse	The Station 6 forebay is contiguous with the main migratory route of salmonids, and functions similarly to a natural backwater pool habitat. Salmonids (both adults and juveniles) are free to swim in or out Of the forebay and intake structure. The presence of the forebay, like a natural holding pool, does not cause salmonids to delay their migration. Avian and aquatic predators can access the forebay as they can any backwater pool habitat. The predation frequency in the forebay is not known; however there is no reason to believe it is any greater than in naturally occurring backwater pools. In 1998, the District conducted a comprehensive fish study to determine the rate of capture of salmonids at the Station 6 screens. The annual capture rates at the screens were quantified as 4 coho fry, 18 chinook fry, 15 steelhead, and 0 cutthroat juveniles. These rates are less than 0.2% of estimated population in the Mad River. (See Section 7 and Appendix E-1).
5. Dredging of forebay at Station 6	Potentially Adverse	Dredging is necessary to remove accumulated silt or debris deposited in the forebay. This activity occurs each year, but only in the winter when background turbidity in the river is very high, so there is no additional adverse turbidity effect. The frequency of dredging varies based on the frequency and severity of winter storms, but typically ranges from 2 to 5 times per month during the winter season. Fish theoretically could be injured or killed if hit with the bucket. A potential benefit of removing debris from the forebay is that a relatively simple habitat is maintained, so juvenile fish may be less likely to utilize it during low-flow periods.

Table 6 (Continued)		
District Activity (and Location)	**Impact**	**Explanation**
6. Maintaining adequate water surface elevation to Station 6 during low-flow months	Adverse	Water surface elevation must be maintained at 21 feet so the pumps operate properly. A gravel berm is constructed each year when the water surface elevation at Station 6 approaches 21 feet (generally late May or June). The berm connects the existing rock jetty, which projects from the north bank of the river, with the existing grade-control rock weir (downstream of Station 6), thereby ensuring the low-flow channel goes over the grade-control weir as opposed to around it. The berm is constructed from native gravel on the outside edge of the wetted channel, and typically occupies a footprint of approximately 0.15 acres. Turbidity may be temporarily increased above background levels, and juveniles may be injured or killed during construction of the berm. The last three years (2000–2002), a federally-licensed biologist was present during construction to protect fish. The first two years, no injuries or mortality were observed. The third year, 48 juvenile steelhead were killed when they were stranded and the pool rapidly dewatered.
7. Maintaining adequate capacity in tailrace and spillway pools below Matthews Dam	Negligible, if any	Excavation will be necessary if silt, gravel or debris accumulates in the spillway or tailrace pools. The necessity for this work generally occurs only after major storm events, and thus does not occur with great frequency – using the past as a guide, excavation of the spillway or tailrace outlets has only occurred twice in the last ten-to-fifteen years. Juvenile steelheads could be injured or killed, if they were able to navigate downstream barriers and are present at time work is done.
8. Gaining access to and maintaining Ranney collectors (which may involve building temporary gravel structures in river bed)	Negligible, if any	District personnel routinely visit the collectors to perform inspections and ongoing maintenance. To gain access to the collectors located in the river bed, District personnel use a cable car, which transports them from the bank to the collector. Periodically, the District must perform major maintenance (e.g. repair or replace pumps/motors or other heavy equipment), and to do so, a temporary gravel structure must be built for a vehicle or crane to gain access to the collector. Major maintenance does not typically occur with great frequency (in the past, between five and fifteen year intervals per collector). The District also periodically flushes the collectors and discharges water onto the dry river bed. A temporary gravel berm is constructed around the collector to contain the water. This berm creates a settling basin such that any turbidity generated by the flushing activity settles out and does not enter the wetted channel. Flushing has not occurred, and is not expected to occur, with great frequency. In the past, flushing operations have only occurred two or three times in the last 20 years. These access structures and containment berms are constructed with native river run material, outside of the wetted channel, during low-flow periods. The river bed is returned to its pre-construction condition immediately following completion of the work . Currently, the District does not need to cross the river to access any of the collectors; however should the river channel change course, stream crossings may become necessary in the future.

Table 6 (Continued)		
District Activity (and Location)	**Impact**	**Explanation**
9. Maintaining adequate flow to Station 6	Adverse	Modest excavation of the low-flow channel in front of the Station 6 inlet is necessary to remove accumulated gravel/debris. Accumulated gravel must be removed before a permanent bar forms which blocks the entrance to the forebay. When the District excavates, it is through the aggraded bed (e.g. the accumulated gravel) in order to relocate the thalweg in closer proximity to the forebay entrance. The overall bed elevation and slope of the channel are not altered. There is no headwall created, as would occur from in-channel pit mining. The up and down-river riffles are still the hydraulic controls that maintain the overall slope through this reach. This work is necessary to ensure flow from the low-flow channel can freely enter Station 6. The excavated area depends on the extent of accumulation and the location of the low-flow channel in relation to the Station 6 entrance; however a typical area is only 0.1 to 0.2 acres. Turbidity may be temporarily increased above background levels, and juveniles could be injured or killed during excavation work.
10. Protecting banks and structures (by maintaining or repairing existing rock structures or revetments) in the Essex Reach, and in the tailrace outlet and plunge pool downstream of Matthews Dam	Negligible, if any	Several rock structures exist in the Essex reach. Examples of such structures include: revetment which protects the collectors and underground pipelines out to the collectors; a rock jetty (which projects from the north bank just upstream of Station 6), a grade-control weir just downstream of Station 6; and rock slope protection along the banks. Rock slope protection also exists just downstream of Matthews Dam around the plunge pool and tailrace outlets. The District must maintain these structures and make repairs if they are degraded or damaged. Minor, short-term impacts to riparian vegetation could occur, and juveniles could theoretically be killed during the placement of rock. Since this activity is generally in response to storms or other significant events which cause degradation or damage, this work is not expected to occur very frequently.

7. Quantifying Impacts from the District's Covered Activities

On the Mad River, naturally reproducing population estimates for chinook, coho, steelhead, and cutthroat are unknown. Although coho, chinook, and steelhead adult returns have been counted at the Mad River Hatchery since 1971, the hatchery counts represent just a very small fraction of the total salmonid population in the river system.

Quantifying the level of "take" for many of the District's covered activities is not possible. For example, many of the District's activities involve work in the Mad River channel (e.g. dredging/excavation, building the low-flow berm, etc.). Impacts resulting from such work depend on conditions present at the time the work occurs. Quantifying potential impacts associated with work in the channel would require knowing the population of a species, knowing their distribution within the river, and knowing the specific response fish in the area will have to the District's work. Where quantification of take is not possible, the HCP describes the spatial and temporal characteristics of the activity and its potential effects on habitat.

The District's flow management (e.g. releases and diversions) are also covered activities for which "take" is not specifically quantified. There is likely no "take" whatsoever resulting from the District's flow management. In fact, the District's flow releases increase aquatic habitat, especially in the low-flow months, thereby providing a net benefit to aquatic species.

One activity for which quantification is possible is operation of the District's direct diversion facility (Station 6), and more specifically, operation of the fish screens. This quantification is based on the following information gained during prior fishery studies:

- In June 1977, the USFWS California Cooperative Fishery Research Unit, at Humboldt State University, conducted a fish behavior study to evaluate the District's newly installed fish return system. The study consisted of introducing the 2,000 chinook fingerlings into the forebay and running the screens for 30 minutes. "At the end of the 30 minute test no fish had gone through the screen by-pass system. We then observed most of the fish swimming in a school in the forebay area apparently without regard for the small attraction current towards the diversion pumps" (USFWS, 1977). (Refer to Appendix E-2.)

- The District conducted a comprehensive fisheries study in 1998 to quantify the effect of the fish screens at Station 6. The resulting annual capture rates at the screens were very low - 4 coho fry, 18 chinook fry, 15 steelhead, and 0 cutthroat juveniles (Refer to Appendix E-1). These rates are less than 0.2% of the estimated populations in the Mad River. (See Table 7 below.)

- During the District's 1998 fish study, a known number of yearling steelhead was released from the hatchery. Because these fish were marked, biologists could establish the percentages of the released steelhead that were captured by the operation of Station 6. The take of the marked steelhead yearlings was 15 fish of 247,000 released (0.006%).

To quantify the impacts associated with operation of Station 6, and to put this impact in context, capture rates from the 1998 fisheries study were used in conjunction with a conservative estimate of population for each species in the Mad River system (Table 7) . The population estimates are based on a *very* conservative assumption that only 10 redds of each species are present in the entire Mad River system, and data strongly suggests that many more than 10 redds are present.

Table 7. Quantification of Impacts at Station 6

Methodology	Coho	Chinook	Steelhead	Explanation
The average number of eggs per redd is known	1,700 eggs	3,500 eggs	5,000 eggs	Data from Mad River Hatchery
Assume fish build just 10 redds per year in the Mad River and its tributaries	17,000 eggs	35,000 eggs	50,000 eggs	Although Mad River redd surveys have not been formally performed and documented, evidence suggests that many more than just 10 redds would be built (likely hundreds are built per season)
The egg-to-fry survival rates are estimated based on study finding	75% survival	30% survival	75% survival	The 75% survival rate for Coho based on work by Shapovalov and Taft, 1954, and Briggs, 1953. Steelhead egg to fry survival rates assumed to be similar to coho.
The number of fry are then estimated	17,000 x 0.75 = 12,750 fry	35,000 x 0.30 = 10,500 fry	50,000 x 0.75 = 37,500 fry	Multiply number of eggs by survival rate
Annual capture rate by the screens at Station 6 from the 1998 fish study	4 fry per year	18 fry per year	15 fry per year	Annual capture rate by screens based on the monthly capture rate observed during 1998 fish study
Percentage of fish caught by screens, assuming just 10 redds in Mad River	(4 / 12,750) = 0.03%	(18 / 10,500) = 0.17%	(15 / 37,500) = 0.04%	These percentages represent the incidental take from Pump Station 6, operating prior to any mitigation measures or retrofitting.

Based on the foregoing, "take" estimates at Station 6 are less than 0.2% for any of the three HCP species. (Cutthroat trout take could not be quantified because no cutthroat were captured in the 1998 fisheries study.) As noted previously, a conservative assumption in deriving this estimate is that just 10 redds of each species are in the Mad River and its tributaries (second row of Table 7). Surveys conducted by CDFG biologist indicate that many more - perhaps hundreds - of redds are built by fish in the Mad River and its tributaries (Table 8).

Table 8. Average spawning escapement of Mad River chinook female salmon

("Escapement" refers to female salmon "escaping" from the ocean, and returning to the river)

Source And Location	Number Spawning Chinook (either sex)
Mad River Hatchery (1989 to 1994)	136
Mad River Spawning Survey (1994 to 2000)	64
Canon Creek Index Spawning Surveys (1985 to 2001)	128
North Fork Index Spawning Surveys (1985 to 2001)	164
TOTAL/2 (assuming 50% are females)	**492 divided by 2 = 246**

The estimate of spawning female chinook salmon (246) is derived from three sources: 1) limited spawning surveys by CDFG on the Mad River; 2) Mad River Hatchery counts; and 3) spawning surveys by a local biologist on Canon Creek and the North Fork Mad River (personal communication, Larry Preston, CDFG 2002). Assuming only 10 redds results in a conservative estimate of take. If a greater number of redds were assumed, the denominators in the fractions in row 6 of Table 7 would be greater; and therefore, the percentage of fish caught by the screens would be even less.

8. Mitigation Measures and Monitoring

The District's covered activities, by definition, may result in take of the HCP species. However, the level of take can be limited and reduced by mitigation measures. This section describes the mitigation measures that are proposed by the District. To determine the effectiveness of the mitigation measures, the District also proposes monitoring. Finally, in order to compare the monitoring results against some benchmark or standard, biological goals have been developed as follows:

- For activities relating to flow and diversions (Activities 1 through 3), the biological goal is that the river will be watered at all times, and in-stream flows will always be maintained in accordance with the flow and bypass conditions in the District's State Water Rights Permits.

- For activity 4, operating the direct diversion facility, the biological goal is that the level of take at Station 6 not exceed 3% to 5% of the juvenile salmonid population exposed to the screens for a given year class. (See Section 8.2.b for additional details regarding this goal).

- For all other activities (i.e. activities 5 through 10), the biological goal is to minimize the amount and extent of incidental take, and minimize adverse impacts to habitat.

The mitigation measures and monitoring are summarized for each covered activity in Table 9. Sections 8.1 and 8.2, which follow, explain the mitigation and monitoring program for certain activities in greater detail.

Table 9. Mitigation and Monitoring for Covered Activities

District Activity	Potential Impacts, Mitigation and Monitoring
1. Releasing flow at Matthews Dam	Potential Impacts: Take resulting from no flow releases to river, or from rapidly changing flows in a very short time period (e.g. "ramping") Mitigation: Provide flows sufficient to maintain a 5 cfs minimum at all times below the dam. During low-flow times of the year (defined for this purpose as 100 cfs or less), if the District plans to reduce its releases at one time by more than 25%, it shall do so in gradual increments over a 24-hour period to ensure no stranding will result. Monitoring: Daily flow records for releases from Matthews Dam shall be recorded and maintained.
2. Diverting water in the Essex Reach (sub-surface via Ranney collectors and surface via direct diversion facility)	Potential Impacts: Decreasing flow in river below Essex, potentially causing habitat loss Mitigation: The District will provide sufficient flows to maintain habitat, in accordance with requirements in District's State Water Rights Permits. Monitoring: On a daily basis, the District plans and executes its flow releases to satisfy all downstream requirements (e.g. diversion and bypass below Essex). On a daily basis, the District will monitor the actual flow below Essex to ensure its bypass flow requirements are met.
3. Bypass flows below Essex	Potential Impact: Decreasing flow below Essex, potentially causing habitat loss. Mitigation: The District will release sufficient water from Matthews Dam to accommodate its downstream diversion requirements, and to maintain the in-stream flow requirements below Essex in accordance with conditions in the District's State Water Rights Permits. It is important to note that the District could be out of compliance with respect to the downstream flow requirements for up to 72 hours following issuance of a USGS "correction factor" which affects the resulting flow measurement at a USGS gage station on the Mad River (See Section 8.2.a and Appendix C for more details). USGS provides the District with a copy of the gage station correction factor right after they establish one. The District shall immediately increase its release from Matthews if a shortfall in the required bypass flow below Essex occurs following receipt of such correction factor. Monitoring: On a daily basis, the District plans and executes its flow releases to satisfy all downstream requirements (e.g diversion and bypass below Essex). On a daily basis, the District will monitor the actual flow below Essex to ensure its bypass flow requirements are met.
4. Operating the direct diversion facility (Station 6) including the fish screens	Potential Impacts: Take resulting from operation of the fish screens (impingement or removal via the buckets attached to the screen face) Mitigation: The District will be retrofitting the Station 6 screens to minimize take. The retrofit project is described in detail in Section 8.1, which follows. Monitoring: The District will conduct comprehensive monitoring after the Station 6 screens are retrofitted. The monitoring is described in detail in Section 8.2.b, which follows.

District Activity	Table 9 (Continued) Potential Impacts, Mitigation and Monitoring
5. Dredging of forebay at Station 6	Potential Impact: Take could occur if the clamshell bucket or excavator happens to strike or capture fish which happen to be in the forebay at the time of this work. This activity only occurs in the winter when background turbidity in the river is very high, so additional adverse turbidity effects will not occur. Mitigation: To the maximum extent practicable, the District shall conduct excavation activities in a manner that minimizes take of salmonids. To reduce the likelihood of injuring and capturing fish, the operator shall strike the top of the water with the bucket prior to starting dredging, and shall also move the clamshell bucket within the water column in a slow, predictable manner. Monitoring: District personnel will visually monitor as work proceeds.
6. Maintaining adequate water surface elevation to Station 6 during low-flow months and 9. Maintaining adequate flow to Station 6 (by excavating aggraded material in low-flow channel)	Potential Impacts: Take could occur if fish are killed or injured during construction. Turbidity may increase for a short period of time just downstream of Station 6. Mitigation: a) Measures to minimize adverse impacts to habitat: The work will be done such that it occupies the minimum possible area of the low-flow channel. Work will occur in a timely manner to minimize turbidity disturbances (generally less than 6-to-8 hours). The Station 6 pumps will be run as much as possible to draw as much turbidity into the forebay as possible. Any additional techniques known to the District, and suitable for this work, shall be employed to further minimize turbidity effects (e.g. silt screens). The District shall exercise every reasonable precaution to protect the stream from fuel or oil spills. Equipment fueling shall not occur within the bankfull channel. All equipment shall be pressure washed and inspected for leaks prior to entering the river bed. In the event that a spill occurs, a hazardous material spill plan shall be implemented, and details regarding the spill will be reported by the District to NMFS. b) Measures to minimize take: i. To the maximum extent practicable, this work will occur no earlier than required by the District to minimize the likelihood of encountering listed juvenile salmonids. ii. A fisheries biologist shall conduct pre- and post- construction surveys of the action area. The pre-construction survey will occur no earlier than 10 days prior to construction. The post-construction survey will occur no later than 30 days following construction. The District shall prepare a report documenting the findings. The following conditions will be surveyed and reported: ❑ A biological investigation of the abundance and distribution of listed salmonids from the construction area to the Highway 299 Bridge ❑ An investigation of the channel configuration and habitat types of the construction area, that includes quantitative information on the existing substrate, depth, velocity, and in stream cover. ❑ A visual estimate of embeddedness in habitats below the construction to the Highway 299 Bridge to evaluate the percentage of stored fine sediment before and after construction.

iii. At least one week prior to the planned construction work, the District will convene a meeting with NMFS, and other interested agencies, to develop a plan to minimize effects to listed salmonids. The District will provide baseline water quality data collected at Station 6, results of the pre-construction investigations, and a description of the planned construction. Participants of the meeting will develop a plan to include: 1) measures to minimize impacts to fish such as by utilizing fish exclusion fencing prior to and during construction, and 2) measures to rescue and relocate fish, if necessary.

iv. During construction, to the maximum extent practicable, heavy equipment shall be located on the dry river bar. During construction, a biologist shall make every effort to remove and exclude fish from the work area. If gravels from the trenching operation is used for the construction of the berm, gravel will be transported to the berm site in a manner to minimize stream crossings. Prior to any crossings of the wetted channel, a biologist shall make every effort to remove and exclude fish from the proposed crossing.

c) Longer-term Mitigation:
Construction of the gravel berm has been required since 1992 to maintain adequate water surface elevation to Station 6 during the low-flow months (given the long-term bed degradation which has occurred in the Mad River). At this time, there is no reason to believe the bed elevation will aggrade and return to its prior elevation. Therefore, the District will likely have to address low water surface elevations during the low-flow months over the foreseeable future.

The District shall initiate a study to determine if a more permanent solution is feasible to provide the necessary water-surface elevation during the low-flow months. This study shall include an assessment of the geomorphic conditions at the site, engineering considerations, including navigability, and biological considerations, which shall be developed in consultation with NMFS and CDFG. The study shall identify feasible alternatives and shall recommend the preferred alternative. The District shall complete this study within 3 years after obtaining an Incidental Take Permit from NMFS. Via the adaptive management process of this HCP, the District, in consultation with NMFS, shall pursue a more permanent solution if a feasible alternative exists (feasible from engineering, operational and biological perspectives).

Monitoring:
Within 30 days following completion of this work, the District shall provide a monitoring report to NMFS which documents:

i. Pre- and post-construction surveys conducted by the fisheries biologist,
ii. A summary of the construction activities, including pre-and post construction photographs, and
iii. A summary of the fish rescue/relocation reports efforts and whether any injury or mortality occurred.

District Activity	Table 9 (Continued) Potential Impacts, Mitigation and Monitoring
7. Maintaining adequate capacity in tailrace and spillway pools below Matthews Dam	Potential Impact: Take could occur during excavation (if juvenile steelhead are able to navigate the downstream natural barriers and are present in the plunge pool or tailrace outlet at the time when work is being done). Turbidity may increase for a short period of time in the vicinity of the plunge pool or tailrace outlets. Mitigation: a) Measures to minimize adverse impacts to habitat: Work will occur in a timely manner such that turbidity disturbance are minimized. The District shall exercise every reasonable precaution to protect the stream from fuel or oil spills. Equipment fueling shall not occur within the bank full channel. All equipment shall be pressure washed and inspected for leaks prior to entering the wetted channel bed. In the event that a spill occurs, a hazardous material spill plan shall be implemented, and details regarding the spill will be reported by the District to NMFS. b) Measures to minimize take: Prior to commencing work, District personnel shall inspect the area. If fish are present, District personnel will wade the water ahead of heavy equipment to disperse the fish. Monitoring: The District shall monitor work and provide pre- and post-construction photographs.
8. Gaining access to and maintaining Ranney collectors (which may involve building temporary gravel structures in river bed)	Potential Impacts: Take should not result from this activity. Temporary gravel structures are constructed on the dry river bed near the collectors during low-flow conditions (unless an emergency or unforeseen condition otherwise warrants). The river bed is returned to its pre-construction condition. At this time, the District is able to access all collectors from the dry river bed, so channel crossings are not necessary. If channel conditions change over the term of the HCP, the District may need to cross the wetted channel. Mitigation: To the maximum extent practicable, this work will occur during summer low flow conditions and during a dry weather pattern. The District shall exercise every reasonable precaution to protect the stream bed from fuel or oil spills. Equipment fueling shall not occur within the bankfull channel. All equipment shall be pressure washed and inspected for leaks prior to entering the channel bed. In the event that a spill occurs, a hazardous material spill plan shall be implemented, and details regarding the spill will be reported by the District to NMFS. If channel crossings become necessary in the future, temporary crossings shall be installed and removed during the period of June 15th to September 15th. A fisheries biologist shall wade the stream ahead of heavy equipment crossing the wetted channel to disperse any juvenile salmonids that may be present. With respect to construction of a containment berm associated with collector flushing, this work shall be completed prior to September 15th each year. Monitoring: District personnel, or the fisheries biologist, shall monitor work and provide pre- and post- construction photographs.

Table 9 (Continued)	
District Activity	**Potential Impacts, Mitigation and Monitoring**
9. Maintaining adequate flow to Station 6 (by excavating aggraded material in low-flow channel)	Addressed above with Activity No. 6
10. Protecting banks and structures (by maintaining or repairing existing rock structures or revetments)	Potential Impacts: Short-term impacts to riparian vegetation could occur, and juveniles could theoretically be killed during the placement of rock. Since this activity is in response to storms or other significant events which cause damage, this work is not expected to occur at all frequently. Mitigation: a) Measures to minimize adverse impacts to habitat: To the maximum extent practicable, this work will occur during summer low flow conditions and during a dry weather pattern. Placement of rock structures shall be done in such a manner that it occupies the minimum possible area of the low-flow channel, and minimizes adverse impacts to riparian vegetation. Stream bank disturbances during rock/revetment repair activities shall be restored with willow mattresses, geo-textile, and/or pre-existing vegetation cover. The District shall exercise every reasonable precaution to protect the stream from fuel or oil spills. Equipment fueling shall not occur within the bankfull channel. All equipment shall be pressure washed and inspected for leaks prior to entering the river bed. In the event that a spill occurs, a hazardous material spill plan shall be implemented, and details regarding the spill will be reported by the District to NMFS. b) Measures to minimize take: If any rock placement occurs in the wetted channel, District personnel or a fisheries biologist shall be present to disperse fish by wading the river ahead of the heavy equipment which is placing rock. Monitoring: District personnel or the fisheries biologist shall monitor work and provide pre- and post- construction photographs.

8.1 Mitigation for Operation of Direct Diversion Facility (Activity 4)

As discussed previously, the District conducted a comprehensive fishery study at Station 6 in 1998. This study determined that a negligible number of salmonid juveniles were captured at the screens - on an annual basis, just 4 coho salmon fry, 18 chinook fry, 15 steelhead smolts, and zero coastal cutthroat. During the 1998 study, a "mark-recapture" evaluation of hatchery released (247,000) steelhead was also conducted, with just 14 fish (0.006%) being captured in the District's screens. (Refer to Appendix E-1 for a detailed discussion of the 1998 study.)

Despite the favorable results from the 1998 fish study, NMFS staff expressed concern that emerging chinook fry could be caught in the existing vertical traveling screens at Station 6, given that the facility meets most, but not all, of NMFS' new (1997) fish screen criteria. The facility does not meet the following criteria:

- Screen mesh openings are 3/16" rather than 3/32"
- Seals on the screen structure perimeter may exceed 3/32"
- Intake structure does not accommodate sweeping flows across screen face.

NMFS staff requested that the District make this facility "fish tight" and the District responded by proposing a retrofit of Station 6. The retrofit is proposed to occur in two phases. First, 20 new screen panels with 3/32" mesh openings will be installed to prevent entrainment at one of the two identical intake structures of Station 6. Second, the traveling screens will be reprogrammed such that the new screens, when not in operation, will remain submerged during the period of chinook emergence (generally March through May). Third, seals at the bottom and sides of the screen structure will be installed to ensure a minimum opening of less than 3/32" And fourth, the existing troughs on the screens will be removed and replaced with debris "rakes". By removing the troughs, fish will no longer be lifted out of the water, thereby eliminating the need for the fish bypass system. If the retrofit on the first intake structure does not cause any significant problems (operationally or biologically), the District will then complete the same retrofit on the second intake structure.

NMFS and CDFG staff concur with the retrofit project at Station 6. However, due to the lack of sweep velocities, NMFS expressed concern that the decreased screen mesh size could theoretically cause fish impingement at the screens.

The District has addressed this potential issue in two ways. First, the District has computed velocities in accordance with the NMFS' 1997 fish screen criteria. The velocity computations were done using the most conservative assumptions possible (thereby, yielding the highest possible approach velocity). The results are as follows:

> "NMFS has established 0.33 feet per second (fps) as the maximum approach velocity for fry-sized salmonids at a direct diversion facility located on a river, and 0.40 fps for a canal. Approach velocities at the Station 6 screens are below the new criteria established by NMFS. At the maximum design pumping rate of 60 MGD, and under the lowest historical water surface elevation ever experienced (20.7 feet), the approach velocity 3-inches from the screen face is only 0.30 fps. (It should be noted that the lowest possible water surface elevation is now approximately 21.5 feet given the addition of the grade control weir downstream.) The maximum approach velocity at the current pumping rate of 18 MGD is just 0.09 fps. Therefore, under all possible operating conditions, the approach velocities at the Station 6 screens are below the NMFS criteria for both a canal structure and an in-river structure.
>
> Additionally, at the request of NMFS staff, the District computed velocities at other locations in the forebay. At the maximum pumping rate of 60 MGD, and the existing low-flow water stage height of 21.5 feet (lowest possible with downstream grade control weir), the flow velocities at various Station 6 locations are as follows (Table 10)." (John Winzler, District Engineer)

Table 10. Station 6 Approach Velocities

Location at Intake Structure	Estimated Velocity at 60 MGD (fps)	NMFS' Velocity Criterion (fps)
Forebay shear wall (ungated)	0.13	0.4
Forebay shear wall (6 open gates)	0.39	0.4
Trash rack screens	0.34	0.4
Roller gate opening	0.30	0.4
3" in front of screens	0.29	0.4

Second, the District proposes a comprehensive multi-year monitoring program to document the effectiveness of the Station 6 retrofit, and to quantify impingement of juvenile salmonids, if such occurs. (See Section 8.2.b for detailed discussion of the Station 6 monitoring program.)

8.2 Monitoring Program

Table 9 summarized the monitoring proposal for each covered activity. This section describes the monitoring program in greater detail for several activities as follows: 8.2.a) flow release, diversion and bypass (activities 1 through 3), and 8.2.b) Station 6 operation after the retrofit project is completed (activity 4).

8.2.a) Monitoring Associated with Flow Releases and Bypass Activities (Activities 1-3)

The District carefully plans and manages its water releases from Matthews Dam on a daily basis to assure sufficient water is available year round for the District's downstream diversions, and for the minimum bypass flows as required in the District's State Water Rights Permits for the protection and preservation of fish. The District has the ability to accurately predict its diversion requirements based on known customer demands. The District also has the ability to calculate natural flow in the Mad River below Essex using flow data which available at several locations (inflow into Ruth Lake, releases from Matthews Dam into the Mad River below the dam, and flow at the U.S. Geological Survey (USGS) gage station downstream of Essex). Therefore, the District is able to establish the required release to meet both its downstream diversion requirements and the minimum bypass flow requirements below Essex.

In establishing its release requirements, the District uses daily flow data recorded at a particular time of the day. This data is directly measured at Matthews Dam or obtained from USGS for its gage stations on the Mad River. It is important to note that the data published by USGS after-the-fact will invariably differ from the USGS "provisional" data used by the District on a daily basis for its operational planning. First, the USGS published data represents a daily mean flow (versus flow at a particular time of the day which is used for operational planning). Furthermore, the USGS published data may incorporate "corrections" which have been applied retroactively to their original "provisional" data. Because river cross sections change, the USGS periodically establishes a "shift" at a particular station to provide a more accurate representation of the flow. A "shift", if established, is applied to the staff gage reading, and the adjusted gage height reading is then used to determine the discharge from the USGS rating table. USGS' policy is to establish a "shift" (also known as a correction factor) if the discharge measurements taken in the field differ from the rating table results by 6% or more.

If the District receives a correction factor from USGS and determines that the bypass flow downstream of Essex no longer meets the minimum requirements, the District will immediately increase its release from Ruth. It is important to note though that it takes approximately 72 hours for the increased flows to reach Essex and the downstream USGS gage station near the Highway 299 bridge in Arcata. Therefore, the District could be out of compliance with respect to the minimum bypass flows below Essex for a period of up to three days following receipt of a new USGS correction factor. Based on the foregoing, the District cannot be held accountable for lack of compliance of the minimum bypass flows below Essex within the first 72 hours after a new correction factor is received from USGS.

As part of its monitoring program, the District will submit the following data to NMFS (and USFWS if a CCA is pursued):

- Daily discharge data from Matthews Dam
- Daily diversions at Essex;
- Daily calculation of natural flow below Essex;
- Daily discharge data from USGS station downstream of Essex;
- A statement as to whether or not the District satisfied its bypass flow requirements;
- Copies of correction factors received from the USGS, with a statement documenting whether the correction factor affected the District's ability to meet its minimum bypass requirements, and if so, whether the District increased its releases from Ruth Lake.

8.2.b) Monitoring Associated with Direct Diversion Facility, Station 6 (Activity 4)

Section 8.1 described the retrofit project at Station 6 designed to make the facility "fish tight." Following completion of this project, the District will implement a comprehensive monitoring program at Station 6 to evaluate whether juvenile salmonids are impinged on the new screens given the increased velocity through the screens due to the smaller screen

mesh size. Upon completion of the monitoring program, a determination will be made as to whether the retrofitted screens meet the biological goal established for the facility.

Station 6 Monitoring: Issue Discussion

Prior to discussing the specific components of the monitoring program, several important issues need to be addressed. First, how should the biological goal be established to ensure protection of the listed species? Second, how can the level of take which occurs at Station 6 be put into the appropriate context? In particular, how can a determination be made as to whether the biological goal has been achieved given the lack of population data for any of the listed species on the Mad River or in their ESUs?

Federal regulations provide some guidance as to how to address these issues. In 1979, the ESA was amended to reduce the Services substantive obligation under the ESA from insuring that an action "does not jeopardize" listed species or adversely modify critical habitat, to insuring that the action "is not likely to jeopardize" such species or critical habitat. In authorizing this amendment, Congress understood and expressly provided that consultation and the resultant biological opinion be based on the "best scientific and commercial data available." This change was intended to make the process more flexible and establish a reasonable information standard. Federal regulations also state that the Services, in formulating their biological opinion, must provide the "benefit of the doubt" to the species concerned. Based on the regulations, two principles emerge which will guide development of the monitoring program. The guiding principles are as follows:

1) A *conservative* biological goal will be established to ensure the Services' can render a biological opinion which provides the "benefit of the doubt" to the species; and
2) The best *available* scientific and commercial data will be used in the monitoring program and in the evaluation of whether the biological goal has been achieved.

Based on the forgoing principles, a biological goal has been established that the level of take at Station 6 not exceed 3% to 5% of the juvenile salmonid population exposed to the screens for a given year class. Exposure is defined as those fish that enter the forebay and are potentially influenced by the flow approaching the screens (e.g. they could be impinged on the screen face). This goal is a conservative goal that provides the "benefit

of doubt to the species." If achieved, it will ensure that the level of take at Station 6 will not significantly impair the recovery of the Mad River stocks of the listed species, and therefore, "is not likely to pose jeopardy to the listed species."

The biological goal is applicable to all of the juvenile salmonid species covered in this HCP (coho, chinook, and steelhead) [1], and data will be collected for all covered species during the monitoring program. However, young-of-the-year chinook [2] will be used as an "indicator" species to assess whether the retrofitted screens meet the biological goal. Chinook often spawn in the mainstem of the lower Mad River, particularly during low-flow years, and emergent chinook fry generally move downriver immediately. Therefore, they are most vulnerable to impingement if exposed to the Station 6 screens due to their small size. Conversely, coho and steelhead generally rear for a year prior to out-migration, and thus are not as vulnerable to impingement at Station 6 given their larger size. Given the life cycle differences, young-of-the-year chinook (an "indicator" species) will be used to assess if impingement is a problem with the retrofitted screens.

A key challenge in assessing whether the biological goal has been met is determining the juvenile chinook population which is exposed to the Station 6 screens. The young-of the-year chinook population in the lower Mad River is not known, let alone the juvenile population actually exposed to the screens. An estimate of the young-of-the-year population could be derived from spawning data, however, the distribution and abundance of chinook salmon spawning in the lower Mad River is also not known. Furthermore, the distribution and abundance of chinook spawning in the lower Mad River can vary greatly from year to year based on flow conditions and the population of returning spawners. And finally, the number of emergent fry depends on the fecundity of females and the rate of survival from egg to fry.

Normally, chinook begin entering the Mad River in September, with spawning beginning in the mainstem during October. In early winter following storm runoff, another run of chinook may enter the river and move up into the tributaries to spawn in December or

[1] During the monitoring program, data will also be collected on cutthroat trout given their similar life stage cycle
[2] Young-of-the-year refers to salmonids which are less than one year old, which is the age class of greatest concern for impingement.

later. Redd survival in the confined reach near Essex is normally poor due to winter and spring runoff which scours the bed. However, spawning in large numbers can occur in the lower Mad River in years when low flow conditions prevail into the fall combined with a large spawning escapement. These conditions occurred in 2000 when CDFG observed 155 chinook redds between the Mad River Hatchery and the Highway 101 Bridge (Larry Preston, CDFG, personal communication, 2002) . However, in the three-year period 1996 through 1998, no redds were observed in the same area.

Given the inherent uncertainty in the abundance and distribution of young-of-the-year chinook in the lower Mad River, plus the inherent uncertainty in the juvenile chinook population exposed to the screens, the District, in consultation with NMFS, has developed a multi-phase monitoring program, using the best available data, to assess whether the biological goal is achieved. Each phase of the three-phase monitoring program is outlined below. Modifications to this monitoring program may be made, provided that the District and NMFS jointly agree to the proposed changes. Any changes agreed to shall be documented by the District and described in the annual monitoring report submitted to NMFS.

Phase 1 Monitoring

A conservative "threshold" of juvenile take at Station 6 is established during Phase 1 to assess whether the biological goal is achieved. This conservative threshold is that the level of take of juvenile chinook at Station 6 shall not exceed 1% of the juvenile chinook population exposed to the screens for a given year class. During Phase 1, the population exposed to the screens is assumed to be 25% of the juvenile chinook population in the entire Mad River system, given the best available population data which exists for the Mad River at this time. (Note - the 25% assumption is explained later). After the retrofit project has been completed, the District will commence a three-year monitoring study to measure the impingement at the Station 6 screens at the time when young-of-the-year chinook may be present. If the measured impingement is less than the conservative threshold, a finding will be made that the biological goal at Station 6 has been achieved and additional monitoring will not be necessary (unless certain conditions at Station 6 change in the future). However, if the impingement exceeds the conservative threshold, then the District will proceed with Phase 2 of the monitoring program.

The purpose of Phase 1 monitoring is to determine whether take at Station 6 warrants further monitoring and assessment. The conservative threshold is intended to be lower than the biological goal, and if not exceeded, gives confidence that Station 6 is not likely to impair recovery of the listed salmonid populations in the Mad River. If the conservative threshold is exceeded, it only implies that further data collection and assessment is warranted. The Phase 1 program details are outlined below.

- Overview of Methodology to Estimate Population Exposed to the Screens - As noted above, the distribution and abundance of chinook salmon spawning in the Mad River is not known and can vary greatly. Comprehensive spawning surveys of the Mad River and its tributaries have not been conducted. However, since 1985, spawning surveys have consistently been conducted in Canon Creek and in the North Fork of Mad River. Data collected over nearly two decades covers drought and flood periods, and for that reason is useful in illustrating trends in spawning escapement to these tributaries and possibly the Mad River as a whole. Area biologists believe that the populations observed at these two streams are but a fraction of the total population returning to the Mad River. (Personal Communication: Dennis Halligan, NRM, Larry Preston, CDFG, Terry Roelofs, Humboldt State University, and Bill Trush, McBain & Trush/HSU, 2002) Chinook can access at least 45 miles of the mainstem of the Mad River below the confluence with Wilson Creek, and spawning is known to occur in the mainstem.

  At this time, spawning escapement data from Canon Creek and North Fork Mad River is the best available to estimate the total population of adult chinook returning to the Mad River to spawn, and as such, will be used to develop an estimate of the juvenile population exposed to the screens during Phase 1. The spawning escapement data from 1985 through 2002 for Canon and North Fork Mad River is presented in Table 11. This historical data will be used to describe the methodology which will be used to determine whether the conservative threshold established for the Phase 1 monitoring is achieved.

Columns B and C of Table 11 present the annual spawning escapement data collected by CDFG and Simpson Resources on Canon Creek and the North Fork Mad River. According to CDFG, the data are actual survey counts and should be considered the minimum possible escapement from Canon and North Fork, and thus represent a conservative estimate of the actual spawning escapement. An estimate of the number of emergent fry associated with the spawning escapement from Canon and North Fork is presented in column G. This estimate is based on assumptions that half of the fish run is female (column D), fecundity of Mad River chinook is 3,500 eggs (column E), and the egg-to-fry survival rate is 18% (column F). Literature suggests that egg-to-fry survival rates typically range from 5% to 30% (Healy 1991). An 18% egg-to-fry survival rate was chosen as an average rate to derive young-of-the-year abundance. As noted above, the spawning escapement from Canon and North Fork represents only a small fraction of the spawning escapement which occurs in the Mad River system. Canon and North Fork Mad River combined represent 32% of the total watershed area accessible to chinook salmon up to Wilson Creek. Therefore, the spawning escapement data from Canon and North Fork have been extrapolated to the Mad River system where chinook may spawn (column H). The specific assumptions and references used to develop the chinook emergent fry estimates are noted at the end of the table.

As shown in Column H, the average number of emergent fry in the Mad River system between 1985 and 2002, given the assumptions noted above, is 287,766. This represents a reasonable estimate of the young-of-the-year chinook population for the Mad River system over time. It should be noted that the estimate of young-of-the-year chinook population for 2000-01 using the Canon and North Fork data extrapolated to the Mad River system is 266,766; however, CDFG estimated the young-of-the-year chinook population to be 954,027 that year based on their Steelhead Research and Monitoring Program. (Reference: Project 2a3. Juvenile Steelhead Downstream Migration Study in the Mad River, Humboldt County, California – Spring 2001. State of CA Dept. of Fish and Game, Page 52). Therefore, the estimate of the young-of-the-year chinook population in the Mad River using the Canon and North Fork data appears to be extremely conservative, at least for that year.

Given the estimate of the young-of-the-year chinook population in the Mad River system (column H), an estimate of the juvenile chinook population exposed to the Station 6 screens is established. NMFS suggested an assumption that 50% of the young-of-the year chinook population migrate downstream along the edge of the channel, and that 25% of the juvenile population may enter the forebay and are exposed to the Station 6 screens (since half are presumed to migrate on each edge). As shown in Column I, 25% of the average population is 71,941.

As introduced above, a conservative threshold has been established for the monitoring program that take of juvenile salmonids shall be less than 1% of the juvenile salmonid population exposed to the screens for a given year class. This 1% threshold equates to 719 young-of-the year chinook based on the Canon and North Fork spawning escapement data from 1985 to 2002 (column J).

During Phase 1 of the monitoring study, the determination of whether the 1% conservative threshold has been met will be based on an estimate of the young-of-the-year population exposed to the screens, developed in accordance with the methodology above, but utilizing the actual spawning escapement data from Canon and North Fork each year.

Table 11 - Methodology to Determine Take Threshold during Phase 1 Monitoring

(Based on Spawning Escapement Survey Data of Index reaches of Canon Creek and North Fork Mad River)

A	B	C	D	E	F	G	H	I	J	K
	Spawning Escapement				Egg-Fry	Emergent Fry	Emergent Fry	Exposed	1%	3%
Year	Canon	No. Fork	Females	Fecundity	Survival Rate	(Canon & No. Fork)	(Mad River System)	To Screens	Threshold	Threshold
1985-86	514	364	439	3,500	0.18	276,570	864,281	216,070	2,161	6,482
1986-87	90	212	151	3,500	0.18	95,130	297,281	74,320	743	2,230
1987-88	117	200	159	3,500	0.18	99,855	312,047	78,012	780	2,340
1988-89	69	238	154	3,500	0.18	96,705	302,203	75,551	756	2,267
1989-90	9	33	21	3,500	0.18	13,230	41,344	10,336	103	310
1990-91	0	2	1	3,500	0.18	630	1,969	492	5	15
1992-93	57	153	105	3,500	0.18	66,150	206,719	51,680	517	1,550
1993-94	20	22	21	3,500	0.18	13,230	41,344	10,336	103	310
1994-95	32	6	19	3,500	0.18	11,970	37,406	9,352	94	281
1996-97	129	553	341	3,500	0.18	214,830	671,344	167,836	1,678	5,035
1997-98	53	84	69	3,500	0.18	43,155	134,859	33,715	337	1,011
1998-99	66	52	59	3,500	0.18	37,170	116,156	29,039	290	871
1999-00	162	64	113	3,500	0.18	71,190	222,469	55,617	556	1,669
2000-01	79	192	136	3,500	0.18	85,365	266,766	66,691	667	2,001
2001-02	530	283	407	3,500	0.18	256,095	800,297	200,074	2,001	6,002
AVERAGE	**128**	**164**	**146**			**92,085**	**287,766**	**71,941**	**719**	**2,158**

Notes:

(B)&(C) Spawning Escapement data for Canon Creek & No. Fork Mad River from CDFG for 1985-2001 (Larry Preston 2002), and for 2001-02 from Simpson Resource Co. (Brian Michaels 2002). The average spawning escapement observed in index reaches on Canon & No. Fork is a total of 292 fish (128+164).

(D) Estimated number of females assumed to be 50% of the average escapement from Canon and North Fork for a given year.

(E) Estimated fecundity based on average number of eggs per female Chinook returning to Mad River Hatchery through 1994 (CDFG-MRH Heartright, 1999)

(F) Egg-to-fry survival rates vary from 5%-30% per Life History of Chinook Salmon (M.C. Healy, 1991, Pacific Salmon Histories ed. by C.Groot & L.Margolis). The average survival rate of 18% assumed.

(G) Estimate of emergent fry given the estimated females, fecundity rate, and egg-to-fry survival rates (e.g. G=DxExF)

(H) Utilizing a unit area extrapolation (from CALWATER Planning Watershed Units, CA Rivers Assessment, Teale Data Center & CDFG, 1995), the combined watersheds of Canon Creek and North Fork represent 32% of the Mad River watershed up through Wilson Creek, the upper limit of chinook distribution.

(I) Fish exposed to the Station 6 screens assumed to be 25% of estimated fry population (NMFS - Sam Flanagan, 2002)

(J) Resulting calculation of 1% of the assumed population exposed to the screens (e.g. 1% of column I).

(K) Resulting calculation of 3% of the assumed population exposed to the screens (e.g. 3% of column I).

- Station 6 Monitoring - After the screen retrofit project is completed, the District will conduct a monitoring study at Station 6 for three consecutive years throughout the period that the majority of chinook are emerging and migrating (typically from March through May). The monitoring period will begin March 1 and continue through May 31. After May 31, monitoring may end if no juvenile chinook are captured in any consecutive seven day period. The monitoring period may be adjusted by notification from CDFG or NMFS as new information relevant to chinook emergence or out-migration becomes available.

  As in the District's 1998 Station 6 fish study (Appendix E-1), a McBain ramp fish trap will be placed in a bypass trough to capture fish washed from the screens. Fish may either become impinged on the screen face or be collected and lifted from the water by a debris trough, which will be attached to one screen panel. The screens generally run for only 20 minutes every 96 hours. However, during this monitoring study, the screens will be run for 30 minutes every 24 hours to document young-of-the-year chinook mortality. Any young-on-the-year chinook that are impinged on the screen panels, or any "floaters" which may drift into the intake structure, during the previous 24-hour period will be collected when the screens are run.

  During the monitoring study, the District will divert the maximum rate possible from a single intake structure at Station 6. Since each intake structure is identical, the maximum rate from one intake structure will be multiplied by two to establish the total Station 6 flow rate at which the monitoring was conducted. (For example, if the District is able to achieve 22 MGD from one intake, the total rate established for the Station 6 monitoring study will be 44 MGD.)

Phase 1 monitoring shall be reinitiated during the 50-year period covered by the Incidental Take Permit if any of the following conditions occur:

- The District's maximum diversion rate increases beyond that which is achieved during the monitoring study (say from the 44 MGD example above to 50 or 60 MGD), or some other change is made that increases the velocity through the screens; or
- A change occurs in the mainstem channel such that flow is actually directed into the forebay (versus the forebay acting as a backwater pool on the outside of the meander, as is currently the case).

Phase 1 Evaluation - Each year, the District will obtain the spawning escapement data from Canon and North Fork from either CDFG or Simpson Resources Co. From these data, the District will develop an estimate of the young-of-year chinook population exposed to the Station 6 screens in the subsequent year during emergence and migration, in accordance with the methodology outlined above ("Overview of Methodology to Estimate Population Exposed to the Screens" subsection). If CDFG nor Simpson Resources plan to collect chinook spawning escapement data on Canon or North Fork during Phase 1, then the District will make every reasonable effort to collect such data on its own. [3] If for any reason no data are collected in a given year, NMFS and the District will develop an alternative method for estimating population abundance for that year, including using the long-term average spawning escapement data from Canon and North Fork (e.g. 1985 through most current year available).

Phase 1 monitoring is planned to proceed for three years. However, NMFS may allow a continuation of Phase 1 beyond three years if low escapement or

[3] The District's ability to collect spawning escapement data on Canon Creek and North Fork is conditioned upon Simpson Resources granting permission to the District to access said locations.

poor survey conditions exist in the Mad River at any time during Phase 1, or if any other extenuating circumstance warrants an extension.

Upon conclusion of Phase 1 monitoring, a determination will be made as to whether the level of take of juvenile salmonids at Station 6 exceeds on average 1% of the juvenile population exposed to the screens for a given year class, given the chinook spawning escapement data from Canon Creek and North Fork extrapolated to the Mad River system. If the measured rate of impingement is less than the 1% conservative threshold, a finding will be made that the biological goal at Station 6 has been achieved and additional monitoring and mitigation will not be necessary. However, if the measured rate of impingement exceeds the 1% threshold, then the District will proceed with Phase 2 of the monitoring program.

If in any year of Phase 1, the measured impingement is greater than 3% of the estimated population exposed to the screens, then the District shall proceed to Phase 2 of the monitoring program. NMFS may grant an exemption to this requirement based on low escapement, poor survey conditions, or other extenuating circumstances.

Phase 2 Monitoring

- Station 6 Monitoring Study - The District shall continue the monitoring study for three additional years to measure impingement of young-of-the-year chinook at the Station 6 screens. The study will be conducted in the manner described in Phase 1, and the District will continue to report the results of the monitoring study to NMFS on an annual basis.

- Population Data – The District will initiate an effort to establish a better estimate of the young-of-the-year chinook population exposed to the Station 6 screens. To accomplish this objective, the District will compile data from other monitoring efforts that may be underway in the watershed, and/or

initiate its own data collection effort. At a minimum, the District shall compile or collect spawning escapement data on index reaches of Canon Creek, the North Fork Mad River, and the lower reach of the mainstem Mad River. The District may compile or collect additional data, at its discretion, to further improve upon the population estimate. The District may also conduct additional research/studies to improve upon any of the assumptions factoring into the estimate of the juvenile population exposed to the screens.

Following compilation or collection of additional population data, the District shall prepare and submit to NMFS a revised estimate of the young-of-the year chinook population exposed to the Station 6 screens, and the basis upon which the estimate was derived. NMFS will review the submission and make a finding on its completeness and the assumptions used.

- Phase 2 Evaluation - The take threshold in Phase 2 has been established at the lower end of the 3%-5% biological goal (e.g. that take of juvenile salmonids not exceed 3% of the juvenile population exposed to the screens for a given year class). The evaluation as to whether this goal has been met will be based on the improved population data collected each year during Phase 2.

  The Phase 2 monitoring is planned to proceed for three years. However, as in Phase 1, NMFS may allow a continuation of Phase 2 beyond three years if low escapement or poor survey conditions exist in the Mad River at any time during Phase 2, or if any other extenuating circumstance warrants an extension.

  Upon conclusion of Phase 2 monitoring, a determination will be made as to whether the level of take of juvenile salmonids at Station 6 exceeds on average 3% of the juvenile population exposed to the screens for a given year class. If the measured rate of impingement is less than the 3% threshold, a finding will be made that the biological goal at Station 6 has been achieved

and additional monitoring and mitigation will not be necessary. However, if the measured rate of impingement exceeds the 3% threshold, then the District will proceed with Phase 3 of the monitoring program.

If in any year of Phase 2, the measured impingement is greater than 5% of the estimated population exposed to the screens, then the District shall proceed to Phase 3 of the monitoring program. NMFS may grant an exemption to this requirement based on low escapement, poor survey conditions, or other extenuating circumstances.

Phase 3 Monitoring

When Phase 3 is triggered, the District will initiate the adaptive management provision of this HCP for Station 6. Via the adaptive management process, the District will make additional retrofits to Station 6, or changes in its operation, in an effort to meet the biological goal. The following summarizes the process and timetable for Phase 3 actions. Additional actions and timetables may be mutually agreed to by the District and NMFS during the adaptive management process.

The District shall identify and assess alternatives to retrofit or modify the Station 6 facility or its operation, within six months after Phase 3 is initiated. Following completion of this assessment, the District shall submit to NMFS its recommendation for modifying the facility or operations, along with a schedule by which the changes will be implemented. Within three months, NMFS shall provide comments to the District on the recommended changes. Pending concurrence from NMFS, the District shall implement the recommended changes within the agreed upon timeframe. (Note – The implementation schedule may be influenced by regulatory agency approvals, permit acquisition, or CEQA compliance) During Phase 3, monitoring, as outlined in Phase 2, shall continue if NMFS determines that such information is warranted.

Following implementation of the changes at Station 6, the District will implement three successive years of monitoring to assess whether the biological goal is achieved. As provided in Phases 1 and 2, NMFS may allow a continuation of the Phase 3 monitoring beyond three years if low escapement or poor survey conditions exist in the Mad River during Phase 3, or if any other extenuating circumstance warrants an extension.

Upon conclusion of Phase 3 monitoring, a final determination will be made by NMFS as to whether the biological goal has been achieved (e.g. that the level of take at Station 6 not exceed 3% to 5% of the juvenile population exposed to the screens for a given year class.) If the measured rate of impingement is less than the lower-end of the goal (e.g. the 3% threshold), a finding will be made that the biological goal at Station 6 has been achieved, and additional monitoring and mitigation will not be necessary. However, if the measured rate of impingement exceeds the 3% lower-end threshold, the District will continue to modify Station 6 with reasonable alternatives through the process described above, until the take level does not exceed the 3% threshold. If the District has exhausted all identified reasonable alternatives to modify Station 6 in an attempt to meet the 3% threshold, then one of the following outcomes will result:

- NMFS may find the biological goal has been achieved if: 1) the District has implemented all feasible and reasonable facility retrofits/operational modifications, and 2) the District has achieved a level of take of juvenile salmonids less than 5% of the juvenile population exposed to the screens for a given year class (e.g. the upper-end of the biological goal).
- If NMFS determines that the District has not implemented all feasible and reasonable facility retrofits/operational modifications in an attempt to meet the biological goal, or if the level of juvenile take exceeds 5% of the juvenile population exposed to the screens for a given year class, then NMFS shall exercise its authority to suspend incidental take authorization for the Station 6 direct diversion in accordance with Federal Regulations (50 CFR 13.27). NMFS shall only suspend permit authorization relating

to operation of Station 6. All other activities and privileges afforded by the Incidental Take Permit shall remain in effect. This suspension shall remain in effect until such time as an acceptable alternative has been implemented at Station 6 which meets the biological goal.

9. Annual Reporting

The District shall submit an annual report to NMFS by February 28th each year outlining which of the covered activities occurred in the preceding calendar year. The purpose of the report is to document compliance with the terms and conditions of the HCP, and to document if any take occurred. The report shall also address progress made with respect to the Station 6 retrofit project and associated monitoring, and progress on the study to address a more permanent grade control structure in the Essex Reach.

10. Analysis of Alternatives to the District's Activities

Covered activities were listed in Section 5 of this HCP; their impacts and associated mitigation measures, monitoring plans, and goals were described in subsequent sections. The current level of incidental take is low relative to estimates of HCP species' populations. Once mitigation measures are in place, take will be lower still. However, the HCP Handbook suggests that alternatives to the proposed activities be explored, to assure agencies and the public that all reasonable choices were considered. Two alternatives were considered. They were:

Alternative 1. "No-Action" Because the District's current activities already exist and are on-going, "no action" means the District operates as it currently does. For example, fish screens would not be replaced nor other mitigation implemented. This No-Action alternative was dismissed because it does not minimize take of HCP species, and it could expose the District to enforcement actions by federal or state agencies for noncompliance with the ESA.

Alternative 2. Limit Diversion from Ranney Collectors Only. This alternative is infeasible because the Ranney collectors' yields are too low. During the 1960s and 1970s, the District supplied both municipal and industrial water users through the Ranney collectors. However, in the 1970s, the Ranney collectors alone were incapable of delivering the water needed by the industrial and domestic water customers, so the District constructed its surface diversion station. If the District eliminated its Mad River surface diversion station, in favor of the Ranney collectors as sole sources, based on previous experience, the District would be unable to meet the water needs of the Humboldt Bay Region. Therefore, the present use of the Ranney collectors as a sole source of wholesale water is not a feasible alternative.

11. Adaptive Management and this HCP

Section 8 described the biological goals, mitigation and monitoring measures associated with each of the District's covered activities. Adaptive management is an iterative process of evaluating the effectiveness of the mitigation measures. An iterative process is required because how any ecosystem responds to mitigation measures is inherently variable and sometimes unpredictable. An adaptive management process attempts to produce the most effective mitigation measures, given the inherent uncertainty in ecosystems. If over the course of this HCP, the District finds that a mitigation measure is not effective at reaching the biological goal, the District shall pursue alternative mitigation in an attempt to meet the biological goal.

Fortunately, the degree of uncertainty associated with the District's activities and mitigation measures is relatively small. Of the 10 covered activities in which the District is currently engaged, the only ones with inherent uncertainty are Station 6 following the screen retrofit project, and construction of the low-flow berm. If the mitigation measures associated with these activities need to be improved to meet the biological goal, the District, in consultation with NMFS (and other agencies as appropriate) shall pursue additional mitigation measures, as follows:

Activity 4 – Operating the Direct Diversion Facility: The District shall identify and assess alternatives to further retrofit or modify the Station 6 facility or its operation, and shall implement additional changes (per process and schedule outlined in Phase 3 of Station 6 monitoring program, above).

Activity 6 – Maintaining adequate water surface elevation to Station 6 during low-flow months: The District shall initiate a study to determine if a more permanent solution is feasible to provide the necessary water-surface elevation during the low-flow months. This study shall include an assessment of the geomorphic conditions at the site, engineering considerations, including navigability, and biological considerations (which shall be developed in consultation with NMFS and CDFG). The study shall identify feasible alternatives and shall recommend the preferred alternative. If the District recommends an alternative to the gravel berm, NMFS shall make a finding that adverse impacts associated with the proposed alternative are less than the impacts resulting from construction of the gravel berm (and therefore are less than what NMFS' authorized in the Incidental Take Permit). The District shall complete this study within three years of obtaining an Incidental Take Permit from NMFS. The District shall implement a more permanent solution if one is determined to be feasible with less adverse biological impact, and if NMFS makes the finding noted above.

12. Coordination of this HCP with Section 7 of the Federal ESA

The primary purpose of coordinating this HCP with Section 7 of the ESA is to assure that the issuance of an Incidental Take Permit will not jeopardize the existence of any listed species. Section 7(a)(2) of the ESA requires that Federal agencies ensure that their actions will not likely jeopardize the continued existence of any endangered and threatened species, nor result in the destruction or adverse modification of designated critical habitat. ESA Section 7 also requires that the District describe any "jeopardy" through indirect, direct, and cumulative effects on listed species and their critical habitat.

Indirect and cumulative effects are factors to consider when determining whether an activity presents jeopardy to a listed species. Indirect effects may occur in three ways: 1) to HCP species inside the HCP area, 2) to HCP species outside the HCP area, or 3) to non-HCP species inside the HCP area. Cumulative effects are those that occur in an additive or synergistic fashion, over space and time.

One listed species outside of the HCP boundaries, and unlikely impacted by District activities, is the bald eagle, a federally protected species. The bald eagle has been observed nesting near Ruth Lake; however, the District conducts no activities that would disrupt the nest's use, or the bird's forage behavior. Since 1962, the water stage fluctuations of Ruth Lake have not appeared to affect the bald eagle's nesting. Flow augmentation from Matthews Dam has likely increased riparian and aquatic forage area for the eagle, which would be a benefit. Another listed species unlikely impacted by District activities, is the northern spotted owl. The northern spotted owl has not been observed nesting near Matthews Dam or Ruth Lake. In the event that northern spotted owls or bald eagles establish a nesting site within one half mile of Matthews Dam, the District shall not have incidental take authority with respect to such species unless and until the Permit is amended to included such species or other authorization is provided pursuant to the ESA. If a nesting site is established in this area, the District shall seek technical assistance of USFWS, and as appropriate, the USFWS shall provide such assistance to: (i) identify possible measures to avoid take and avoid causing jeopardy to such species; (ii) determine whether incidental take coverage for such species is appropriate and, if so; (iii) identify any modifications to the HCP that may be necessary to provide coverage for the new species and assist the District in determining whether to amend the HCP and the Permit to include these species as a covered species.

Another listed species, the snowy plover, nests in coastal dune areas near the mouth of the Mad River, but the District's activities do not involve or affect coastal dune habitat. Lastly, USFWS has determined that the Tidewater goby, another listed species, does not occur in the Mad River.

One species that occurs inside the HCP boundaries, but is not covered in this HCP, is the Pacific lamprey, which USFWS considers a species of concern. This designation does not confer any special status under the ESA. The USFWS has also accepted a petition to list green sturgeon, which historically may have entered the lower reaches of the HCP area. Consultation with USFWS determined that insufficient data on these species exist to warrant consideration in this HCP. Other protected species present in the plan area are the Northwestern Pond turtle, the Northern Red-legged frog, and the Foothill Yellow-Legged frog. Because these species utilize the aquatic and riparian HCP areas, the District's flow augmentation would likely benefit these species. No federally listed plants are within the HCP boundary.

13. Coordination of this HCP with State Fish and Game Code

In conjunction with this HCP, the District has applied for a Federal Incidental Take Permit for its Mad River operations. The District will also request through Fish and Game Code Section 2080.1, a determination from the State as to whether this Federal Incidental Take Permit is consistent with the State's requirement for take under the California Endangered Species Act as set forth under Fish and Game Code Section 2081. That code states in part that "the impacts of the authorized take shall be minimized and fully mitigated..."

The State Fish and Game Commission received a petition to list coho salmon under the California Endangered Species Act. The Commission determined that listing is warranted. The Department of Fish Game is currently in the process of preparing a recovery plan. Following its completion, the Commission is expected to make the final decision as to whether coho will be listed.

Take of coho resulting from the District's Mad River activities will be very low, and may potentially be non existent. The only activity which is known to have resulted in coho take is operation of the direct diversion facility (Station 6). As previously noted, the annual capture rate at the Station 6 screens during the 1998 fish study was 4 coho, which

is a very low annual take. As previously discussed in this HCP, this facility will be retrofitted such that take of coho should be further minimized, and potentially may be eliminated.

However, to comply with Section 2081 of the Fish and Game code, the District offers the following mitigation measures:

a) Enhancement of Coho Habitat in Mainstem Mad River

The period of critically low runoff in the Mad River is normally from July through October when natural flow in the lower 45 miles, which is the reach accessible to coho salmon, would most often be less than 25 cfs. By July, most Coho salmon fry in the Mad River have emerged from the spawning gravels and will spend the next year rearing in the mainstem and tributaries until they smolt and migrate downriver.

During these low runoff months, the District releases water stored at Ruth Reservoir to provide sufficient flow for its diversion and bypass requirements 75 miles downriver at Essex. Such releases increase the wetted surface width and water depth compared to natural flow, and thereby augment habitat. In the mainstem Mad River accessible to coho, there would be an increase in naturally occurring aquatic habitat of approximately 18 to 42 acres (note - the range is based on varying diversion rates).

Therefore, the District's flow releases from Ruth Reservoir during the critically low runoff months creates aquatic habitat that supports rearing coho salmon juveniles. The number of coho salmon juveniles supported by that much habitat is not known, but the net effect would be to increase the number of juveniles that would survive compared to what otherwise would occur absent the District's flow releases.

With respect to coho in the mainstem, Dennis Halligan (Fisheries Biologist, NRM) reported observing juvenile coho rearing in the mainstem at several locations between the Mad River hatchery and Essex during the summer of 2002. Some schools contained one- to two hundred individuals. This was the first year he reported observing coho rearing in the mainstem during the summer months since gravel extraction-related fisheries monitoring began in 1996. Juvenile coho were observed in a variety of habitats including coldwater alcoves, riprap-lined pools, deep runs with 19-20 degree Celsius water, and cool water seeps less than 10 inches deep. The presence of these coho may have been the product of density-dependent downstream migration out of fully seeded tributary streams. It is likely that augmented flows increased coho habitat availability in the lower river, particularly in the shallow seep locations (Halligan, pers. communication, 2003).

b) Enhancement of Habitat on Coho Rearing Tributaries to the Lower Mad River

The District will participate in one or more projects to further enhance coho habitat in tributaries to the lower Mad River. On a one-time basis, on or before December 31, 2006, the District will commit up to $15,000 to help fund qualified projects that would improve production of coho salmon in the lower Mad River watershed. Qualified projects include those projects, which have been approved by the Department of Fish and Game, which that allow access to previously inaccessible or underutilized spawning and rearing habitat and/or improve existing in stream habitat. Examples of projects that may qualify for funding include, but are not limited to, improving fish passage at the Warren Creek culvert along West End Road, or improving fish passage or in stream habitat rehabilitation on Noisy Creek. The District may disperse these mitigation funds to governmental agencies or non-governmental organizations either as part of a cost-share or to fully fund an approved project.

14. Potential Future Activities in Response to Changed Circumstances

The District may need to pursue additional activities over the course of the HCP planning horizon (e.g. 50 years) due to changed circumstances. Possible future activities could result in adverse impacts to critical habitat and/or incidental take. The possible future activities, that the District has been able to contemplate at this time, include:

11. Restoration of channel capacity below Matthews Dam - On the left bank of the canyon immediately below the dam, an active slide could introduce a sudden load of coarse sediment and large woody debris. If the river then moved toward the right bank, water surface elevation would rise. Backwater flooding of the hydro-plant could occur, which would compromise that facility and potentially the dam. Under such circumstances, the District would need to reduce stage height by excavating the channel where the deposition occurred, and/or increase the channel cross sectional area. Turbidity may be temporarily increased above background levels, and juvenile steelheads (if able to navigate downstream natural barriers and are present) could be injured or killed during dredging/excavation work.

12. Repairing, rehabilitating or replacing water lines or laterals in the riverbed – The District's domestic system has five 24-inch diameter pipelines which run under the river bed connecting each collector to a common header on the south bank of the river. The District's industrial system has a 51-inch diameter pipeline which crosses under the river twice between Station 6 and the Highway 299 bridge. Over the term of this HCP these line may need to be repaired, rehabilitated or replaced. The laterals which project from the collector caissons into the riverbed may also need to be repaired, rehabilitated or replaced over the term of this HCP.

    If the pipelines in the riverbed need to be repaired or replaced, such work would involve excavation (to a depth of approximately 14 to 19 feet) below the gravel surface, installing steel piling under the pipeline (if deemed necessary), encasing the pipe with reinforced concrete, and replacing the excavated material back to original elevation. Where construction could not be performed in an above-ground gravel environment, the river would have to be diverted into a temporary adjacent channel. Work would generally be contained to less than 100 feet of total channel length. The diversion of the wetted channel, if necessary, could be implemented by use of temporary fabri-dams, thereby minimizing turbidity effects. Take could occur if fish are killed or injured during construction. Turbidity would likely increase for a short period of time in the vicinity of construction, and riparian vegetation could be affected.

13. Construction of Additional Grade Control Structures in the Essex Reach - For proper operation of Station 6, the river's water surface elevation must be a minimum of 21 feet msl. The existing grade control weir was constructed in 1991. If river

degradation continues in the Essex reach, the District may need to further stabilize the river's water surface elevation, by constructing a series of weirs down-river. Take could occur if fish are killed or injured during construction. Turbidity would likely increase for a short period of time in the vicinity of construction, and riparian vegetation could be affected.

Although the District has attempted to describe the possible future activities and briefly note their impacts, additional evaluation will be necessary if and when these activities become necessary. One of the following processes will be employed to accomplish this:

If a "changed circumstance" results in a proposed activity which requires a federal action (e.g. an Army Corps of Engineer's permit), the related ESA Section 7 process will be utilized to address the impacts and provide the District incidental take protection. The District will obtain technical assistance regarding such activities from NMFS in advance of the Section 7 consultation to ensure the proposed activity minimizes and mitigates impacts to HCP covered species to the maximum extent practicable.

If a "changed circumstance" results in a proposed activity which does not require a federal action, this HCP and associated Incidental Take Permit will cover the activity contingent upon the following being satisfied:

1. The District has notified NMFS of the changed circumstance.
2. The District has obtained technical assistance from NMFS for the purpose of developing actions to address the changed circumstance.
3. The District has provided NMFS with the following material:
   - a description of the proposed activity;
   - an evaluation of the potential effects of the proposed activity on HCP covered species and critical habitat; and
   - a determination whether HCP covered species or critical habitat are likely to be adversely affected by the proposed activity.
4. NMFS has provided to the District a finding that the proposed activity:

- minimizes and mitigates impacts to HCP covered species and critical habitat to the maximum extent practicable;
- will not appreciably reduce the likelihood of both the survival and recovery of HCP covered species in the wild; and
- will not destroy or adversely modify HCP covered critical habitat.

15. Funding

This section describes the estimated cost and necessary funding to implement the HCP mitigation measures and monitoring plan.

1. Station 6 Retrofit Project - The District has received a grant totaling $64,680 from CDFG's Salmon Recovery Program to fund the Station 6 retrofit project. The District's Board of Directors has already approved the use of matching funds as required by the CDFG grant agreement.

2. Future Monitoring and Mitigation - The District will be conducting a number of monitoring and mitigation activities, especially in the early years of the HCP's term, as follows. For a minimum of three years, the District will be conducting monitoring at Station 6 following the screen retrofit project. The District will commission a hydraulic study to determine if a permanent solution is feasible to maintain necessary water surface elevation at Station 6. If determined feasible (from an engineering, operational and biological perspective) new structure(s) to maintain water surface elevation will be pursued. And finally, monitoring activities associated with in-channel work would continue each year (prior to a new structure being installed, if determined feasible).

   This annual cost of monitoring and mitigation will vary depending on what work occurs each year. A reasonable cost estimate is between $5,000 and $50,000, on average, for the first five years of the HCP. After completion of the Station 6 monitoring, and after a new structure is installed to maintain water surface elevation (if determined feasible), annual monitoring and mitigation costs will decrease significantly and should approach zero. At this time, it is not possible to provide a definitive cost for a new structure in the river to maintain the necessary water surface elevation at Station 6 since the hydraulic study has not yet been completed. However, a reasonable cost estimate for such a structure is $100,000.

The Humboldt Bay Municipal Water District is a public agency formed in 1956 under California's Municipal Water District Act. Division 20 of the California Water Code is the underlying statute which governs the District. Part 5 outlines the powers and purposes of the District, and Section 71616 more specifically addresses rates and revenues. Section 71616 provides that "a district shall fix rates for water in the district, and in each improvement district therein, as will result in revenues which will:

a) Pay the operating expenses of the district and the improvement district.
b) Provide for repairs and depreciation of works.
c) Provide a reasonable surplus for improvements, extensions, and enlargements.
d) Pay the interest on any bonded debt.
e) Provide a sinking fund or other fund for the payment of the principal of such bonded debt as it becomes due."

As noted above, the District clearly has the statutory authority, and does in fact, establish rates and charges to fully recover all operating, capital, and debt costs of the District.

As was briefly discussed in the introduction section, the District provides domestic and industrial water service on a *wholesale* basis to seven Municipal agencies (Cities and Community Service Districts) and one large industrial customer. This service is provided in accordance with a Board-approved Ordinance and companion long-term contracts which specify the rates, charges and conditions of service. The Ordinance and contracts require the District's customers to pay all operating, capital and debt costs of the District.

The District warrants that it has, and will expend, such funds as may be necessary to fulfill its mitigation and monitoring obligations under the HCP. The cost of monitoring and mitigation specified in this HCP will be charged to, and paid by, the District's wholesale customers in accordance with the long-term contracts, and statutory authority provided for in the Municipal Water Code.

16. References

A bibliography of work on the Mad River system was compiled during the research for this HCP (Appendix F). References cited in the HCP report text are listed here.

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J.C. Briggs, 1953. The behavior and reproduction of salmonid fishes in a small coastal stream. California Dept, of Fish and Game, Bulletin 94:62p (Briggs examined 22 California Coho Redds and found that the average egg-to-fry survival was 74.3%)