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In Reply Refer To:
AESO/SE
2-21-98-F-397 April 11, 2000

Ms. Alexis Strauss
Director, Water Management Division
U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105-3901

Dear Ms. Strauss:

This responds to the Environmental Protection Agency's August 25, 1998, letter to the U.S. Fish and Wildlife Service requesting initiation of formal section 7 consultation under the Endangered Species Act. The initiation of consultation concerns the possible effects of your proposed issuance of a National Pollutant Discharge Elimination System (NPDES) permit for the International Wastewater Treatment Plant in Santa Cruz County, Arizona. The species potentially affected by this action is the Gila topminnow (*Poeciliopsis occidentalis occidentalis*) without critical habitat.

Your request for formal consultation on this project was received on August 31, 1998. This document represents the Service's biological opinion on the effects of that action on the above mentioned species in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.).

This biological opinion is based on information provided in the August 25, 1998, biological evaluation, the Fact Sheet and draft NPDES permit, telephone conversations between our staffs, field investigations, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the Gila topminnow. A complete administrative record of this consultation is on file in this office.

It is the Service's biological opinion that the issuance of this NPDES Permit for the Nogales International Wastewater Treatment Plant (NIWTP) is not likely to jeopardize the continued existence of the endangered Gila topminnow.

CONSULTATION HISTORY

Informal consultation on this permit was limited to a preliminary draft permit sent to this office in February 1996. Informal discussions have also occurred with Service employees and the

International Boundary and Water Commission (IBWC), or their consultant CDM, about modifications to the NIWTP. After discussions between the Service and EPA, it was determined that although the two consultations were for the same facility, the project schedules were incompatible since EPA needed to issue the NPDES permit by September 30, 1998, one month after formal consultation was initiated.

Although this did not occur, informal consultation with EPA and IBWC concluded with the Service concurrence with EPA's determination of "may affect, is not likely to adversely affect" for the Gila topminnow in May 1999, regarding the modifications of the NIWTP. The project (Service reference 2-21-97-I-392) included three sections. The first section of the project included the upgrade of the International Wastewater Treatment Plant and addresses only physical changes in the facility. Upgrade of the plant includes modification of the existing site to include the addition of tanks, the placement of new liners, or walls. All renovation will occur within the existing structure and no new habitat loss or modification is expected. The second portion of the project included the replacement of the International Outfall Interceptor (IOI) which will transport the combined flows from both Nogales, Sonora, and Nogales, Arizona. These activities would occur primarily in the urban areas of these two communities. However, a pipeline must be placed under Nogales Wash in three places. As this portion of the project may result in the release of fill materials into waterways, this must be evaluated by the Army Corps of Engineers which regulates this activity under Section 404 of the Clean Water Act. This document did not consider activities associated with a 404 permit. The third section of the project included the rehabilitation of the wastewater collection system in Nogales, Arizona. This involves the repair and replacement of deteriorated pipes which currently exist under city streets. No habitat loss or modification is expected from this activity.

On November 8, 1999, EPA sent a letter to the Service with an Addendum to the Biological Assessment for the Nogales Wastewater Projects. This addendum described a modified project to expand the NIWTP and International Outfall Interceptor to increase the discharge capacity from 17.2 million gallons per day to 22.2 mgd. The Service provided the following conditional concurrence:

> The Service concurs that the expansion of the NIWTP and IOI are not likely to adversely affect the above mentioned species (Gila topminnow). However, the increase in water quantity shall not be executed until adverse impacts to the Gila topminnow from water quality are minimized and water quality standards are met, or until consultation is reinitiated with the Service.

In a separate consultation in 1994, the Service issued a biological opinion on EPA's approval of the Arizona Water Quality standards. In that February 16, 1994, biological opinion, the Service concluded that the following rules were likely to jeopardize the continued existence of listed species in Arizona, including the Gila topminnow: proposed numeric water quality standards rule for toxic pollutants - bioaccumulation, adequacy of aquatic and wildlife warm (A&Ww) criteria for cyanide and phenol, adequacy of A&Ww criteria for cyanide, endrin aldehyde,

naphthalene, phenol, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and toxaphene in aquatic and wildlife effluent dominated waters, and criteria development. The following reasonable and prudent alternative was issued to remove jeopardy to the Gila topminnow in the Santa Cruz River: pursuant to 40 CFR 131.1 &.4, adopt A&Wc (aquatic and wildlife coldwater) criteria for cyanide, endrin aldehyde, napthalene, phenol, 1,2-dichlorobenzene, 1,4-1,2-dichlorobenzene, and toxaphene for the waterbody Santa Cruz River downstream from Nogales to Tubac, where these chemicals are discharged and the Gila topminnow exists. In an April 8, 1994, response from EPA to the Service, EPA disagreed with the reasonable and prudent alternative as stated. This permit does not adopt A&Wc criteria for any parameter in this permit, except ammonia. The basis for the jeopardy determination was that the A&Wc criteria were not protective enough; and the A&Wc criteria are more stringent and, therefore, more protective. The first draft biological opinion for this project, the issuance of the NPDES permit, was issued to EPA on October 2, 1998. A letter from Alexis Strauss, EPA's Water Division, was received on November 2, 1998, with some recommendations for change, and a request to finalize the BO. On December 11, a conversation between Debra Denton, EPA, informed Debra Bills of this office that the permit was being appealed by the IBWC and the City of Nogales. A similar conversation occurred on February 4, 1999. On September 2, 1999, this office was informed that the permit was being re-issued with a new ammonia compliance schedule. On October 22, 1999, Debra Denton called this office to say that Terry Oda, Chief, Permits, wanted a conference call before finalizing the biological opinion. That conference call took place on October 26, 1999. One of the main points of that conference call was to notify the Service that national criteria for ammonia would be completed by 2003. Also, Mr. Oda requested clarification on Term and Condition 2B, which requires an expansion of the Instream Monitoring Program to include fish sampling to determined the overall abundance and incidence of abnormalities. In October 1999, King et al. (1999) report on sampling in the Santa Cruz River was finalized. There was some concern that the draft biological opinion might not be consistent with the findings of this report. Regional Office Service employees met with EPA in November to discuss some of these concerns. It was agreed that additional monitoring work needed to be completed. Numerous telephone calls and emails passed between EPA, IBWC, and the Service regarding the finding in the King et al. report.

On January 20, 2000, a meeting occurred between Kirke King of this office, staff from our Regional Office, EPA, the City of Nogales, ADEQ, and IBWC met to discuss the low numbers or absent fish and invertebrates in samples downstream from the NIWTP. Discussions acknowledged the high ammonia levels coupled with other contaminants could be limiting fish and invertebrate samples. Additional field samples were also collected during the week to conduct toxicity tests. Toxicity was documented and a Toxicity Identification Evaluation concluded possible toxicants to be ammonia, diazinon, chlorpyrifos, and cationic metals.

On January 26, Debra Bills of this office contacted EPA to determine if you were ready to receive the final BO or if you needed to see another version. Another draft was emailed to Terry Oda and Debra Denton on February 8. In turn, EPA sent a revised permit to this office on February 15, 2000.

On March 13, Terry Oda, EPA, sent an email to Debra Bills questioning the need for ambient toxicity testing. Ms. Bills responded with a March 16 email explaining the value of the test in this situation. On March 27 Ms. Bills and Mr. Oda discussed the issue and Mr. Oda agreed to discuss the possibility of ambient monitoring with the dischargers. On April 4, Mr. Oda called Ms. Bills and said that the NIWTP agreed to ambient monitoring at three sites once a year for the life of the permit, and requested that the biological opinion be finalized. It was agreed that the expansion of the Instream Monitoring Program to conduct fish sampling to evaluation overall abundance and the incidence of abnormalities was to be dropped.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The action under consideration is the re-issuance of a National Pollutant Discharge Elimination System permit for the Nogales International Wastewater Treatment Plant. The previous permit expired on December 28, 1996. Effluent limitations and monitoring requirements are described in NPDES Permit No. AZ0020150 and the accompanying Fact Sheet. The NIWTP has a design flow of 17.2 million gallons per day and serves approximately 20,000 people in Nogales, Arizona and 160,000 people in Nogales, Sonora, Mexico. Discharge is from a single outfall into the Santa Cruz River. The project area is the northbound Santa Cruz River at Nogales, Arizona. This portion of the watershed is designated as Aquatic and Wildlife effluent dependent water (A&Wedw). The absence of the discharge from the NIWTP would render this stretch of river ephemeral and likely dry most of the year (Lawson 1995).

STATUS OF THE SPECIES

Gila topminnow

Gila topminnow belongs to a group of live-bearing fishes within the family Poeciliidae that includes the familiar guppy (*Poecilia reticulata*), which is not native to the Gila basin. Males are smaller than females, rarely greater than 25 mm (1 inch), while females are larger, reaching 51 mm (2 inches). Body coloration is tan to olivaceous, darker above, lighter below, often white on the belly. Breeding males are usually blackened, with some golden coloration of the midline, and with orange or yellow at base of the dorsal fin.

Fertilization is internal, and sperm packets are stored which may fertilize subsequent broods. The brood development time is 24 to 28 days. Two to three broods in different stages develop simultaneously in a process known as superfetation. Gila topminnow gives birth to 1-31 young per brood (Schoenherr 1974). Larger females produce more offspring (Minckley 1973). Gila topminnow mature a few weeks to many months after birth, depending on the time of year. They breed primarily from March to August, but some pregnant females occur throughout the year (Schoenherr 1974). Some young are produced in the winter months. Minckley (1973) and

Constantz (1980) reported that Gila topminnow are opportunistic feeders which eat bottom debris, vegetation, amphipods, and insect larvae when available.

Gila topminnow and many other poeciliids can tolerate a variety of physical and chemical conditions. They are good colonizers, in part because of this tolerance, and in part because a single gravid female can start a population (Meffe and Snelson 1989). Minckley (1969a, 1973) described their habitat as edges of shallow aquatic habitats, especially where abundant aquatic vegetation exists. Simms and Simms (1992) found the densities of Gila topminnow in Cienega Creek, Pima County, Arizona, to be greater in pool, glide, and backwater habitats and less dense in marsh, riffle, chute, cascade, and fall habitats. They occurred more frequently over sand substrates than over other categories of substrates. Although Gila topminnow may occupy pools and ponds that are up to 2 m (6 ft) deep, they are normally found in the upper one-third of the water column (Forrest 1992).

Gila topminnow is known to occur in streams fluctuating from 6 to 37°C (51-99° F), pH from 6.6 to 8.9, dissolved oxygen levels of 2.2 to 11 mg/l (2.2-11 ppm), and can tolerate salinities approaching those of sea-water (Meffe et al. 1983). Topminnow can burrow under mud or aquatic vegetation when water levels decline (Deacon and Minckley 1974, Meffe et al. 1983). Sonoran topminnow (including both Gila and Yaqui subspecies) regularly inhabit springheads with high loads of dissolved carbonates and low pH (Minckley et al. 1977, Meffe 1983, Meffe and Snelson 1989). This factor has helped protect small populations of topminnow from mosquitofish (*Gambusia affinis*) that are usually rare or absent under these conditions (Meffe 1983).

The Gila topminnow was listed as endangered in 1967 without critical habitat (USFWS 1967). Only Gila topminnow populations in the United States, and not in Mexico, are listed under the Endangered Species Act. The reasons for decline of this fish include past dewatering of rivers, springs and marshlands, impoundment, channelization, diversion, regulation of flow, land management practices that promote erosion and arroyo formation, and the introduction of predacious and competing nonnative fishes (Miller 1961, Minckley 1985). Other listed fish suffer from the same impacts (Moyle and Williams 1990).

Gila topminnow are highly vulnerable to adverse effects from nonnative aquatic species (Johnson and Hubbs 1989). Predation and competition from nonnative fishes have been a major factor in their decline and continue to be a major threat to the remaining populations (Meffe et al. 1983, Meffe 1985, Brooks 1986, Marsh and Minckley 1990, Stefferud and Stefferud 1994, Weedman and Young 1997). The native fish fauna of the Gila basin, and Colorado basin in general, were naturally depauperate and contained few fish that were predatory on or competitive with Gila topminnow (Carlson and Muth 1989). In the riverine backwater and side-channel habitats that formed the bulk of Gila topminnow natural habitat, predation and competition from other fishes was essentially absent. Thus Gila topminnow did not evolve mechanisms for protection against predation or competition and is naive to predators and competitors. With the introduction of large numbers of predatory and competitive nonnative fish, frogs, crayfish, and other species, Gila topminnow could no longer survive in many of their former habitats or the small pieces of

those habitats that had not been lost to human alteration. Both large (Bestgen and Propst 1989) and small (Meffe et al. 1983) nonnative fish and nonnative crayfish cause problems for Gila topminnow (Fernandez and Rosen 1996) and bullfrogs (*Rana catesbeiana*).

When the Gila topminnow was listed in 1967, it was recognized as *Poeciliopsis occidentalis.* The species was later revised to include two subspecies, *P. o. occidentalis* and *P. o. sonoriensis* (Minckley 1969a, 1973). *P. o. occidentalis* is known as the Gila topminnow, and *P. o. sonoriensis* is known as the Yaqui topminnow. *Poeciliopsis occidentalis*, including both subspecies, is collectively known as the Sonoran topminnow. Both subspecies are protected under the ESA.

Historically, the Gila topminnow was abundant in the Gila River drainage and was one of the most common fishes of the Colorado River basin, particularly in the Santa Cruz system (Hubbs and Miller 1941). They too were reduced to only 15 naturally occurring populations. Presently, only 12 of the 16 recent natural Gila topminnow populations are considered extant (Table 1) (Weedman and Young 1997). Only three (Cienega Creek, Monkey Spring, Cottonwood Spring) have no nonnative fish present and therefore can be considered secure from nonnative fish

Table 1. Status of natural Gila topminnow populations in the US.

Site	Ownership	Extant?[1]	Nonnatives?	Mosquitofish?	Habitat Size[2]	Threats[3]
Bylas Spring[5]	San Carlos	YES	NO[4]	NO[4]	S D	M/ N G
Cienega Creek	BLM	YES	NO	NO	L	M/ R N
Cocio Wash	BLM	NO 1982	UNKNOWN	UNKNOWN	S	H/ M
Cottonwood Spring	Private	YES	NO	NO	S	M/ N
Fresno Canyon	State Parks	YES	YES	NO[4]	M	H/ N G U
Middle Spring[5]	San Carlos	YES	NO[4]	NO[4]	S	H/ N G
Monkey Spring	Private	YES	NO	NO	S	L/ W U
Redrock Canyon	USFS	YES	YES	YES	M D	H/ W R G N
Sabino Canyon	USFS	NO 1943	YES	NO	M	H/ R N
Salt Creek[5]	San Carlos	YES	NO[4]	NO[4]	S	M/ N G
San Pedro River	Private	NO 1976	YES	YES	-	H/ W N G R
Santa Cruz River San Rafael Tumacacori Tucson	Private, State Parks, TNC	 YES[6] YES NO 1943	 YES YES[4] YES	 YES YES NO	L D	H/ W N R G C U
Sharp Spring	State Parks	YES	YES	YES	M	H/ N G U
Sheehy Spring	TNC	NO 1987	YES	YES	S	H/ N G U
Sonoita Creek	Private, TNC, State Parks	YES	YES	YES	L D	H/ W N G

Tonto Creek	Private, USFS	NO 1941	YES	YES	L	H/ N R G W

[1] if no, last year recorded
[2] L = large M= medium S = small D = disjunct
[3] CImmediacy H = high M = moderate L = low
Type W = water withdrawal C = contaminants R = recreation N = nonnatives G = grazing M = mining U = urbanization
[4] none recently, they have been recorded
[5] recently renovated
[6] in Mexico, US in 1993

threats. There have been at least 175 wild sites stocked with Gila topminnow, however, topminnow persists at only 18 of these localities. Of the 18, one site is outside topminnow historic range and four now contain nonnative fish (Weedman and Young 1997). Further, only five of these stocked populations would count toward recovery under the draft revised Gila topminnow recovery plan (Abarca et al. 1994). The Sonoran Topminnow Recovery Plan (USFWS 1984a) established criteria for downlisting and delisting. Criteria for downlisting were met for a short period. However, due to concerns regarding the status of several populations, downlisting was delayed. Subsequently, the number of reintroduced populations dropped below that required for downlisting, where it has remained. The Yaqui topminnow is now included within the Yaqui Fishes Recovery Plan (USFWS 1995). A revised recovery plan for the Gila topminnow is being prepared (Abarca et al. 1994).

The status of the species is poor and declining. Gila topminnow has gone from being one of the most common fishes of the Gila basin to one that exists at only 30 localities (12 natural and 18 stocked). Many of these localities are small and highly threatened. The theory of island biogeography can be applied to these isolated habitat remnants, as they function similarly (Meffe 1983, Laurenson and Hocutt 1985). Species on islands are more prone to extinctions than continental areas that are similar in size (MacArthur and Wilson 1967). Meffe (1983) considered extinction of Gila topminnow populations almost as critical as recognized species extinctions and Moyle and Williams (1990) noted that fish in California that are in trouble tend to be endemic, restricted to a small area, part of fish communities with fewer than five species, and found in isolated springs or streams. Gila topminnow has most of these characteristics.

The highest priority actions in the draft revised Gila topminnow recovery plan are ones that are absolutely essential to prevent extinction in the foreseeable future (Abarca et al. 1994). Federal actions have contributed to the degraded environmental baseline of the Gila topminnow. Federal actions requiring section 7 consultations affecting Redrock Canyon, Cienega Creek, and Sonoita Creek in the Santa Cruz River subbasin and others in the Gila River basin have contributed to the lowered baseline for the Gila topminnow. An indication of the poor environmental baseline of the Gila topminnow is that two formal consultations have resulted in jeopardy opinions. Although the reasonable and prudent alternatives remove jeopardy, other adverse effects are not removed by the reasonable and prudent alternatives. Other Federal actions, as well as non-federal actions that have not undergone section 7 consultation, also have unmitigated adverse effects that contribute to the degraded baseline.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions that are contemporaneous with the consultation process. The environmental baseline defines the status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

The Santa Cruz subbasin's aquatic habitats and fish communities have changed greatly when compared to historic conditions. The same can be said of many river basins in the Southwest (Miller 1961; Minckley and Deacon 1968, 1991; de la Torre 1970; Naiman and Soltz 1981; Miller et al. 1989; Rinne and Minckley 1991). Aquatic habitats in the Santa Cruz River basin have been reduced in quantity spatially and temporally, and in quality (de la Torre 1970, Davis 1982). Spatial habitat quantity has decreased due to diversion, ground water mining, natural and human caused changes in the watershed, flow regulation, and channelization. Habitats have decreased temporally because of these effects, thereby reducing the time that water is present in some stream sections. The physical and biological quality of aquatic habitats has changed with increased temperatures, flow reduction, channel incision and subsequent widening, increased sedimentation, loss of vegetation, loss of native species, and addition of nonnative species. King et al. (1999) documented contaminants from the NIWTP as a major contributor to degraded water quality conditions in the Santa Cruz River.

Habitat destruction obviously reduces the amount of habitat available for a species. It is also apparent that habitat degradation reduces the quantity and quality of the remaining habitat. Degradation of habitats is a well recognized factor in establishment of nonnative species (Courtenay and Stauffer 1984, Arthington et al. 1990, Soule 1990, Aquatic Nuisance Species Task Force 1994). These and other factors may be leading to the collapse of entire western aquatic faunas (Williams et al. 1988, Moyle and Sato 1991, Minckley and Douglas 1991).

The Santa Cruz River basin historically held eight species of native fish. Of these, six still occur and two have been extirpated from the basin. The Monkey Springs pupfish (*Cyprinodon* sp.) is the only fish species in Arizona to become extinct during recent times. Two of the species have been listed under the Endangered Species Act, one as a candidate and four as Arizona "species of concern." Many nonnative fishes have been stocked, both legally and illegally, into the Santa Cruz River basin. According to Arizona Game and Fish Department (AGFD) records, at least 23 species of nonnative fish have been transported into the basin.

Most of the non-native species have been found in waters not deliberately stocked by AGFD. This is particularly true for mosquitofish and some sport fish, such as green sunfish (*Lepomis cyanellus*) and bluegill. One or the other are found in most low-elevation fishing waters, including the Tucson urban lakes. The only stocking by AGFD of these two fish was green sunfish in Arivaca Lake which is outside the upper Santa Cruz River basin. The only Aquatic Stocking Permit for green sunfish was for the lodge at Peña Blanca Lake. Green sunfish are

ubiquitous in southern Arizona waters and found almost anywhere permanent water occurs. Most of the "typical" warm water sport fish are now found in waters where they were not legally stocked.

Aquatic fauna other than fish has been introduced into the Santa Cruz River basin. Bullfrogs and nonnative tiger salamanders (*Ambystoma tigrinum*) are common in the Santa Cruz subbasin and both will prey on native fish and other fauna (Rosen et al. 1995, Hayes and Jennings 1986). Spiny softshell turtles (*Trionyx spiniferus*) and northern crayfish (*Orconectes virilis*) also occur in the Santa Cruz subbasin and prey on fishes (AGFD unpub. data, Marsh 1997). A population of African clawed frogs (*Xenopus laevis*) has been extant at a Tucson golf course pond since the 1970's. These frogs may be spreading in California (W. Hayes, AGFD, pers. comm., 1998). The ghost rams-horn (*Biomphalaria havanensis*), is a nonnative aquatic snail found in the Santa Cruz subbasin in Pena Blanca Lake and vicinity (Bequaert and Miller 1973). It was probably introduced with fish stocked for sport purposes and its effects on native species are unknown. There is little or no information available on fish parasites and diseases of the Santa Cruz subbasin. As will be discussed later, nonnative parasites and diseases are a serious threat to native fishes of the Gila basin.

Aquatic flora have also been introduced into Arizona and the Santa Cruz subbasin. Common water cress (*Rorippa nasturtium aquaticum*) has become a significant ecosystem component in many areas (Minckley 1969b, Lawson 1995). Other nonnative aquatic plants that are already in Arizona and may be in the Santa Cruz River include parrot feather (*Myriophyllum aquaticum*), yellow floating heart (*Nymphoides peltata*), Brazilian waterweed (*Egeria densa*), dotted duckweed (*Spirodela punctata*), and curly pondweed (*Potamageton crispus*) (USGS 1998). Nonnative riparian plants can alter watershed and riparian functioning (Kunzmann and Johnson 1987). There are several nonnative riparian plants that have had significant impacts to the aquatic ecosystem of the Santa Cruz subbasin, such as salt cedar (*Tamarix* sp.), bermuda grass (*Cynodon dactylon*), yellow sweet clover (*Melilotus indicus*), and rabbit's foot grass (*Polypogon monspeliensis*)(Kerpez and Smith 1987).

Southeastern Arizona has been influenced by Europeans for hundreds of years and by Native Americans for much longer (Bahre 1991). The effects of this use, though not always obvious, have been pervasive and widespread. Much of the prehistorical and historical use was concentrated along the Santa Cruz River and its tributaries. The immigration of Europeans into the southwest had a profound impact on local ecosystems (Hastings and Turner 1965, Bahre and Hutchinson 1985). Human impacts in the area include vegetation type conversion, dewatering above- and below-ground aquifers, loss or reduction of native species, introduction and spread of nonnative species, and habitat loss.

Discharge of raw sewage into Nogales Wash from Nogales, Sonora, has entered the Santa Cruz River upstream of the NIWTP. Attempts to chlorinate this discharge to protect human health has been deadly to fish and aquatic insects (Lawson 1995). In March 1997, field investigations coordinated by the Service revealed the absence of Gila topminnows and a decline in other fish species immediately downstream of the NIWTP. In addition, between 5 and 8 percent of all

longfin dace collected were abnormal (skin lesions, deformed facial features). Field investigations also noted an absence of dragonfly larval both above and farther downstream below the NIWTP. It was speculated that the high levels of ammonia, perhaps coupled with other contaminants, appeared to be severely limiting the fish and invertebrate populations (Spiller, written communication; K. King, Service, pers. comm.)

The deteriorated baseline affects the potential for the survival and recovery of the Gila topminnow. Factors contributing to the deteriorated baseline include: loss of natural habitat and competition with nonnative species. Only 12 natural populations are considered extant and reintroduction success is very low. The natural populations are the basis for the recovery of the species (Abarca et al. 1994) and nine of the natural populations are in the Santa Cruz River basin. Because of the poor baseline, survival is a priority of the species. This requires maintenance and protection of the present natural and reintroduced populations. Maintaining the existing populations in the Santa Cruz River basin may be difficult since most of them are on private land. Some of these populations may be lost.

EFFECTS OF THE ACTION

Chronic problems with water quality in the project area adversely affect the Gila topminnow and contribute to the declined condition of the species in the Santa Cruz River. The actual responses to the exposure to a chemical above a species threshold level may vary between inhibiting growth and/or reproduction, to death. Other factors such as variation in environmental conditions including extreme or variable temperatures, and low dissolved oxygen may mask or complicate the effect of the target chemical (Niimi *In* Beyer et al. 1996). From November 1992 until October 1993, monthly sampling occurred along the river by Arizona Department of Environmental Quality (ADEQ) staff and the Friends of the Santa Cruz River (FOSCR) volunteers. A number of parameters were measured including pH, nutrients, chlorine, total metals, other water quality variables and physical parameters (Lawson 1995). Residue levels in fish tissue is a result of exposure directly from water through gill absorption of residues, as well as from their foods. In general, aquatic organisms exhibit greater pesticide bioaccumulation than do terrestrial organisms (summarized by Keith *In* Beyer et al. 1996). Gila topminnow are expected to experience a continuation of chemical exposure throughout this permit.

Nitrogen is an essential element for life processes, but in excess un-ionized ammonia (NH_3) is highly toxic to biological organisms. The NIWTP has had problems with ammonia concentrations being released from the plant which is believed to have severe impacts on the native fish populations in the project area (ADEQ 1996). Background levels include un-ionized ammonia at 0.08 mg/L; nitrite plus nitrate levels were 0.25 mg/L, and total Kjeldahl nitrogen (TKN) the combination of ammonia and organic nitrogen of 0.31 mg/L (Lawson 1995). Service field investigations in May 1997 noted the absence of fish and invertebrates 1.7 miles downstream of the NIWTP associated with un-ionized ammonia levels of 0.49 mg/L. Un-ionized levels were 0.23 mg/L at Rio Rico North, approximately 4.8 miles downstream of the NIWTP. Fish populations did not resemble control locations until ammonia levels declined below 0.03 mg/L, over 9 miles below the NIWTP (King et al. 1999). This NPDES permit will

govern the discharge from the Nogales International Wastewater Treatment Plant for a period of five years. Although the permit specifies a maximum discharge limit of 8.4 mg/L during the life of this permit, the ammonia standard is not expected to be met.

It is not known how high the levels of ammonia will go under this permit, but concentrations will possibly continue at current extraordinarily high levels. A complaince schedule has been developed to meet the ammonia limits. High ammonia levels conflict with the State's narrative water quality standards which require that discharges be free from pollutants in amounts or combinations that are toxic to humans, animals, plants or other organisms. King et al. (1999) reported that 1997 effluent was extremely toxic with 100% mortality of the fathead minnows in 7 of 12 months, when held in effluent in a laboratory setting for 96 hours. In 1998, only 2 of 12 months resulted in 100% mortality under the same test parameters. Information for 1999 is incomplete, but suggests a continual decrease in effluent toxicity. An ammonia study conducted between July 1993 and December 1994 saw the highest levels at the NIWTP reach 29 mg/L total ammonia, but usually ranged around 15 mg/L (undated IBWC files). To accompany the NIWTP's inability to meet the discharge limit of 8.4 mg/L, the permit requires the development of an Instream Monitoring Program to document nutrient impacts and attenuation. Preliminary work by the U.S. Geological Survey's Midwest Science Center concluded 90% mortality at 40 mg/L and 0% mortality at 20 mg/L (J. Dwyer, Midwest Science Center, pers. comm.). This analysis does not consider the effects to growth or reproduction. If the concentrations of ammonia in the discharge is high enough to result in impairment, a toxicity identification evaluation (TIE), designed to characterize and identify contaminants responsible for toxicity in complex mixtures, will identify ammonia over other contaminants. In addition, whole effluent toxicity (WET) testing will be conducted monthly to measure sublethal effects (reduced growth, reproduction) and a toxicity reduction evaluation (TRE) to reduce the constituent causing the toxicity.

Phosphorous is a plant nutrient and essential for life processes of both plants and animals. Excessive phosphorus from human wastes, detergents, agriculture, etc. may result in algal blooms. The background concentration of phosphorus is estimated at 0.117 mg/L. The daily maximum concentration limit established in this permit is 0.260 mg/L. Federal nutrient criteria were established in 40 CFR 131.31 including total phosphate limits for the Santa Cruz River from the international boundary to Sahuarita. A maximum annual mean value of 0.5 mg/L and a maximum annual 90th percentile value of 0.80 mg/L was established.

The Director of ADEQ, with EPA approval, proposes to grant a five year variance for phosphorus. This provision prevents a watershed or waterbody variance which would be equivalent to modifying a water quality standard or removing a designated use. The rule provides a provision for variances if 1) it is not technologically feasible to comply with the water quality standard, and 2) installation and operation of each of the available discharge technologies to achieve compliance with the water quality standard would result in substantial and widespread economic and social impact. The effect to the Gila topminnow is not known, however, in general phosphorus is not limiting in Arizona waters.

A review of Discharge Monitoring Reports from September 1994 through August 1996 also show a few sporadic violations of biological oxygen demand (BOD), fecal coliform, pH, pentachlorophenol, total residual chlorine, mercury, cyanide, and percent removal of BOD. Exceedance of these and other parameters under this permit are possible. It is not known how high or how often these exceedences occurred, or if they resulted in significant impacts to the Gila topminnow. Mercury, a chronic problem for Arizona, effects the survival, growth and reproduction of aquatic species. Metal contamination may result in numerous effects including impaired reproduction, adverse effects on behavior, e.g., swimming, growth. Exceedences of varying amounts and of varying constituents cannot be predicted, and therefore, are not covered under the provisions of this consultation, and should be evaluated separately.

Cyanide was one of the constituents listed in the February 16, 1994, biological opinion, in which the Service issued a jeopardy opinion on the basis that endangered species were similar in responses to salmonids over fathead minnow, and requested the adoption of the A&Wc water standard. The acute standard for the A&Ww and A&Wedw is 41.0 micrograms/liter (ug/L), whereas the A&Wc acute standard is 22.0 ug/L. If the noted exceedence was above the A&Wedw standard, and if cyanide is limiting or contributing to negative impacts to the Gila topminnow, a site specific evaluation of this and other parameters should be reconsidered. The chronic criteria for chlorine is 5 ug/L. The acute standard is 11 ug/L. Water from Nogales Wash is treated with chlorine in Sonora and retains a concentration of 2 mg/L at the IBWC sample site approximately 4,000 feet into the Arizona border. Chlorine is toxic to fish between 0.07 and 0.29 mg/L. This high background level of chlorine is likely contributing to the demise of the Gila topminnow population in the Santa Cruz River. Elevated levels of chlorine between 0.1 and 0.5 mg/L are still noted 7 miles from the Sonora-Arizona border.

During the FOSCR study, the portion of the river was dominated by one fish species, the longfin dace (*Agosia chrysogaster*) with the most severe impacts noted at the Calabasas Road bridge sample site in Rio Rico (reference site SC2) 1.5 miles downstream of the NIWTP, and closest to the NIWTP. Some 35 fish were collected from this site. Fourteen of the fish, or 40 percent, were determined to be in an unhealthy condition (Lawson 1995.) Statistical analyses concluded that these numbers were higher than expected and were likely caused by an environmental stressor which could not be determined at the time of the report. Low D.O., chlorine, and un-ionized ammonia were all suspected. A continuation of similar experiences is expected for the life of this permit.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions unrelated to the proposed action are not considered in this section because they would require separate consultation pursuant to section 7 of the ESA. Additional modification of the NIWTP will be consulted on separately. Future actions are also likely to occur in Sonora, Mexico, which may affect the quality of the water in the project area, but are outside of the scope of this analysis. As much of the Santa Cruz River is private property, a host of non-Federal actions are

expected to occur during this 5-year permit including water management such as diversions, levee maintenance, channel dredging, channel enlargement, flood control projects, installation of pumps, wells, drains; the continued introduction of non-native fish, wildlife; and plants; discharges into surface waters from non-point source runoff and urban development including pesticides, herbicides, fungicides, rodenticides, fertilizers; and other recreational disturbances, vandalism, off-road vehicle use, and chronic disturbance.

CONCLUSION

After reviewing the current status of the Gila topminnow, the environmental baseline for the action area, the effects of the issuance of the NPDES permit and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Gila topminnow. No critical habitat has been designated for this species, therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. EPA has a continuing duty to regulate the activity covered by this incidental take statement. If EPA (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

The Service anticipates incidental take of the Gila topminnow due to the toxic effects of discharges from the Nogales treatment plant. However, the level of take will be difficult to

detect for the following reason(s): Incidental take of actual species numbers may be difficult to detect particularly when the species is wide-ranging and finding a dead or impaired specimen is unlikely following lethal or sublethal exposures; losses may be masked by seasonal fluctuations in numbers or other causes, (e.g., oxygen depletions for aquatic species); sublethal doses of contaminants ingested may adversely affect them by significantly impairing essential behavioral patterns including feeding, sheltering, breeding, or immune response and cannot readily be separated from the lack of adherence to the standards rather than the standards themselves. As a surrogate measure of take, incidental take will be assumed to be exceeded if the reasonable and prudent measure described below is not implemented. Incidental take is expected to be in the form of harm and kill.

If, during the course of the action, the amount or extent of the incidental take anticipated is exceeded, EPA must reinitiate consultation with the Service immediately to avoid violation of section 9. Operations must be stopped in the interim period between the initiation and completion of the new consultation if it is determined that the impact of the additional taking will cause an irreversible and adverse impact on the species, as required by 50 CFR 402.14(i). An explanation of the causes of the taking should be provided to the Service.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat. Although water conditions are expected to negatively impact the Gila topminnow, this 5-year permit requires rigorous monitoring and reporting requirements, and the implementation of a toxicity reduction evaluation (TRE).

REASONABLE AND PRUDENT MEASURE

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize take:

1. Coordinate with IBWC to ensure protection of the Gila topminnow in the Upper Santa Cruz River.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of ESA, EPA must comply with the following terms and conditions which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. Complete all monitoring and reporting requirements as established in the draft permit including the WET testing, and toxicity identification evaluation (TIE) as scheduled in the draft permit.

2. Monitoring of the project area and other areas that could be affected by the proposed action shall be done to ascertain take of individuals of the species and/or of its habitat that causes harm or harassment to the species. This monitoring will be accomplished using the protocol outlined in the Instream Monitoring Program as described in the permit under Section H. Variances.

3. Develop and conduct ambient toxicity testing in the mainstem of the Santa Cruz River to verify instream conditions with annual monitoring at a minimum of three sites to document changes over the life of the permit.

4. Re-evaluate the appropriateness of the adoption of A&Wc criteria for those parameters less stringent than the A&Wedw criteria and known to result in toxicity.

Review requirement: The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measure(s).

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of ESA directs Federal agencies to utilize their authorities to further the purposes of ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

1. Implement the 5 year rotating schedule to evaluate NPDES permits on a watershed basis.

2. Expand the Instream Monitoring Program described in Section H. Variances in the permit, to include fish sampling to determine the overall abundance and incidence of abnormalities in native fishes.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the issuance of a NPDES permit for the NIWTP outlined in the August 25, 1998, biological evaluation. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your continuing efforts to conserve listed species. If we can be of further assistance, please contact Debra Bills (x239) or Tom Gatz (x240). Please refer to consultation number 2-21-98-F-397 in future correspondence concerning this project.

Sincerely,

/s/ David L. Harlow
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque NM (GARD-AZ/NM)

John Kennedy, Arizona Game and Fish Department, Phoenix, AZ
Director, Arizona Department of Environmental Quality (Attn: L. Taunt)
Water Management Division, EPA, San Francisco, CA (Attn: D. Denton)

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AESO/SE
2-21-98-F-397 April 11, 2000

Ms. Alexis Strauss
Director, Water Management Division
U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105-3901

Dear Ms. Strauss:

This responds to the Environmental Protection Agency's August 25, 1998, letter to the U.S. Fish and Wildlife Service requesting initiation of formal section 7 consultation under the Endangered Species Act. The initiation of consultation concerns the possible effects of your proposed issuance of a National Pollutant Discharge Elimination System (NPDES) permit for the International Wastewater Treatment Plant in Santa Cruz County, Arizona. The species potentially affected by this action is the Gila topminnow (*Poeciliopsis occidentalis occidentalis*) without critical habitat.

Your request for formal consultation on this project was received on August 31, 1998. This document represents the Service's biological opinion on the effects of that action on the above mentioned species in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.).

This biological opinion is based on information provided in the August 25, 1998, biological evaluation, the Fact Sheet and draft NPDES permit, telephone conversations between our staffs, field investigations, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the Gila topminnow. A complete administrative record of this consultation is on file in this office.

It is the Service's biological opinion that the issuance of this NPDES Permit for the Nogales International Wastewater Treatment Plant (NIWTP) is not likely to jeopardize the continued existence of the endangered Gila topminnow.

CONSULTATION HISTORY

Informal consultation on this permit was limited to a preliminary draft permit sent to this office in February 1996. Informal discussions have also occurred with Service employees and the International Boundary and Water Commission (IBWC), or their consultant CDM, about modifications to the NIWTP. After discussions between the Service and EPA, it was determined that although the two consultations were for the same facility, the project schedules were

incompatible since EPA needed to issue the NPDES permit by September 30, 1998, one month after formal consultation was initiated.

Although this did not occur, informal consultation with EPA and IBWC concluded with the Service concurrence with EPA's determination of "may affect, is not likely to adversely affect" for the Gila topminnow in May 1999, regarding the modifications of the NIWTP. The project (Service reference 2-21-97-I-392) included three sections. The first section of the project included the upgrade of the International Wastewater Treatment Plant and addresses only physical changes in the facility. Upgrade of the plant includes modification of the existing site to include the addition of tanks, the placement of new liners, or walls. All renovation will occur within the existing structure and no new habitat loss or modification is expected. The second portion of the project included the replacement of the International Outfall Interceptor (IOI) which will transport the combined flows from both Nogales, Sonora, and Nogales, Arizona. These activities would occur primarily in the urban areas of these two communities. However, a pipeline must be placed under Nogales Wash in three places. As this portion of the project may result in the release of fill materials into waterways, this must be evaluated by the Army Corps of Engineers which regulates this activity under Section 404 of the Clean Water Act. This document did not consider activities associated with a 404 permit. The third section of the project included the rehabilitation of the wastewater collection system in Nogales, Arizona. This involves the repair and replacement of deteriorated pipes which currently exist under city streets. No habitat loss or modification is expected from this activity.

On November 8, 1999, EPA sent a letter to the Service with an Addendum to the Biological Assessment for the Nogales Wastewater Projects. This addendum described a modified project to expand the NIWTP and International Outfall Interceptor to increase the discharge capacity from 17.2 million gallons per day to 22.2 mgd. The Service provided the following conditional concurrence:

> The Service concurs that the expansion of the NIWTP and IOI are not likely to adversely affect the above mentioned species (Gila topminnow). However, the increase in water quantity shall not be executed until adverse impacts to the Gila topminnow from water quality are minimized and water quality standards are met, or until consultation is reinitiated with the Service.

In a separate consultation in 1994, the Service issued a biological opinion on EPA's approval of the Arizona Water Quality standards. In that February 16, 1994, biological opinion, the Service concluded that the following rules were likely to jeopardize the continued existence of listed species in Arizona, including the Gila topminnow: proposed numeric water quality standards rule for toxic pollutants - bioaccumulation, adequacy of aquatic and wildlife warm (A&Ww) criteria for cyanide and phenol, adequacy of A&Ww criteria for cyanide, endrin aldehyde, naphthalene, phenol, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and toxaphene in aquatic and wildlife effluent dominated waters, and criteria development. The following reasonable and prudent alternative was issued to remove jeopardy to the Gila topminnow in the Santa Cruz River: pursuant to 40 CFR 131.1 &.4, adopt A&Wc (aquatic and wildlife coldwater) criteria for

cyanide, endrin aldehyde, napthalene, phenol, 1,2-dichlorobenzene, 1,4-1,2-dichlorobenzene, and toxaphene for the waterbody Santa Cruz River downstream from Nogales to Tubac, where these chemicals are discharged and the Gila topminnow exists. In an April 8, 1994, response from EPA to the Service, EPA disagreed with the reasonable and prudent alternative as stated. This permit does not adopt A&Wc criteria for any parameter in this permit, except ammonia. The basis for the jeopardy determination was that the A&Wc criteria were not protective enough; and the A&Wc criteria are more stringent and, therefore, more protective. The first draft biological opinion for this project, the issuance of the NPDES permit, was issued to EPA on October 2, 1998. A letter from Alexis Strauss, EPA's Water Division, was received on November 2, 1998, with some recommendations for change, and a request to finalize the BO. On December 11, a conversation between Debra Denton, EPA, informed Debra Bills of this office that the permit was being appealed by the IBWC and the City of Nogales. A similar conversation occurred on February 4, 1999. On September 2, 1999, this office was informed that the permit was being re-issued with a new ammonia compliance schedule. On October 22, 1999, Debra Denton called this office to say that Terry Oda, Chief, Permits, wanted a conference call before finalizing the biological opinion. That conference call took place on October 26, 1999. One of the main points of that conference call was to notify the Service that national criteria for ammonia would be completed by 2003. Also, Mr. Oda requested clarification on Term and Condition 2B, which requires an expansion of the Instream Monitoring Program to include fish sampling to determined the overall abundance and incidence of abnormalities. In October 1999, King et al. (1999) report on sampling in the Santa Cruz River was finalized. There was some concern that the draft biological opinion might not be consistent with the findings of this report. Regional Office Service employees met with EPA in November to discuss some of these concerns. It was agreed that additional monitoring work needed to be completed. Numerous telephone calls and emails passed between EPA, IBWC, and the Service regarding the finding in the King et al. report.

On January 20, 2000, a meeting occurred between Kirke King of this office, staff from our Regional Office, EPA, the City of Nogales, ADEQ, and IBWC met to discuss the low numbers or absent fish and invertebrates in samples downstream from the NIWTP. Discussions acknowledged the high ammonia levels coupled with other contaminants could be limiting fish and invertebrate samples. Additional field samples were also collected during the week to conduct toxicity tests. Toxicity was documented and a Toxicity Identification Evaluation concluded possible toxicants to be ammonia, diazinon, chlorpyrifos, and cationic metals.

On January 26, Debra Bills of this office contacted EPA to determine if you were ready to receive the final BO or if you needed to see another version. Another draft was emailed to Terry Oda and Debra Denton on February 8. In turn, EPA sent a revised permit to this office on February 15, 2000.

On March 13, Terry Oda, EPA, sent an email to Debra Bills questioning the need for ambient toxicity testing. Ms. Bills responded with a March 16 email explaining the value of the test in this situation. On March 27 Ms. Bills and Mr. Oda discussed the issue and Mr. Oda agreed to discuss the possibility of ambient monitoring with the dischargers. On April 4, Mr. Oda called

Ms. Bills and said that the NIWTP agreed to ambient monitoring at three sites once a year for the life of the permit, and requested that the biological opinion be finalized. It was agreed that the expansion of the Instream Monitoring Program to conduct fish sampling to evaluation overall abundance and the incidence of abnormalities was to be dropped.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The action under consideration is the re-issuance of a National Pollutant Discharge Elimination System permit for the Nogales International Wastewater Treatment Plant. The previous permit expired on December 28, 1996. Effluent limitations and monitoring requirements are described in NPDES Permit No. AZ0020150 and the accompanying Fact Sheet. The NIWTP has a design flow of 17.2 million gallons per day and serves approximately 20,000 people in Nogales, Arizona and 160,000 people in Nogales, Sonora, Mexico. Discharge is from a single outfall into the Santa Cruz River. The project area is the northbound Santa Cruz River at Nogales, Arizona. This portion of the watershed is designated as Aquatic and Wildlife effluent dependent water (A&Wedw). The absence of the discharge from the NIWTP would render this stretch of river ephemeral and likely dry most of the year (Lawson 1995).

STATUS OF THE SPECIES

Gila topminnow

Gila topminnow belongs to a group of live-bearing fishes within the family Poeciliidae that includes the familiar guppy (*Poecilia reticulata*), which is not native to the Gila basin. Males are smaller than females, rarely greater than 25 mm (1 inch), while females are larger, reaching 51 mm (2 inches). Body coloration is tan to olivaceous, darker above, lighter below, often white on the belly. Breeding males are usually blackened, with some golden coloration of the midline, and with orange or yellow at base of the dorsal fin.

Fertilization is internal, and sperm packets are stored which may fertilize subsequent broods. The brood development time is 24 to 28 days. Two to three broods in different stages develop simultaneously in a process known as superfetation. Gila topminnow gives birth to 1-31 young per brood (Schoenherr 1974). Larger females produce more offspring (Minckley 1973). Gila topminnow mature a few weeks to many months after birth, depending on the time of year. They breed primarily from March to August, but some pregnant females occur throughout the year (Schoenherr 1974). Some young are produced in the winter months. Minckley (1973) and Constantz (1980) reported that Gila topminnow are opportunistic feeders which eat bottom debris, vegetation, amphipods, and insect larvae when available.

Gila topminnow and many other poeciliids can tolerate a variety of physical and chemical conditions. They are good colonizers, in part because of this tolerance, and in part because a single gravid female can start a population (Meffe and Snelson 1989). Minckley (1969a, 1973)

described their habitat as edges of shallow aquatic habitats, especially where abundant aquatic vegetation exists. Simms and Simms (1992) found the densities of Gila topminnow in Cienega Creek, Pima County, Arizona, to be greater in pool, glide, and backwater habitats and less dense in marsh, riffle, chute, cascade, and fall habitats. They occurred more frequently over sand substrates than over other categories of substrates. Although Gila topminnow may occupy pools and ponds that are up to 2 m (6 ft) deep, they are normally found in the upper one-third of the water column (Forrest 1992).

Gila topminnow is known to occur in streams fluctuating from 6 to 37°C (51-99° F), pH from 6.6 to 8.9, dissolved oxygen levels of 2.2 to 11 mg/l (2.2-11 ppm), and can tolerate salinities approaching those of sea-water (Meffe et al. 1983). Topminnow can burrow under mud or aquatic vegetation when water levels decline (Deacon and Minckley 1974, Meffe et al. 1983). Sonoran topminnow (including both Gila and Yaqui subspecies) regularly inhabit springheads with high loads of dissolved carbonates and low pH (Minckley et al. 1977, Meffe 1983, Meffe and Snelson 1989). This factor has helped protect small populations of topminnow from mosquitofish (*Gambusia affinis*) that are usually rare or absent under these conditions (Meffe 1983).

The Gila topminnow was listed as endangered in 1967 without critical habitat (USFWS 1967). Only Gila topminnow populations in the United States, and not in Mexico, are listed under the Endangered Species Act. The reasons for decline of this fish include past dewatering of rivers, springs and marshlands, impoundment, channelization, diversion, regulation of flow, land management practices that promote erosion and arroyo formation, and the introduction of predacious and competing nonnative fishes (Miller 1961, Minckley 1985). Other listed fish suffer from the same impacts (Moyle and Williams 1990).

Gila topminnow are highly vulnerable to adverse effects from nonnative aquatic species (Johnson and Hubbs 1989). Predation and competition from nonnative fishes have been a major factor in their decline and continue to be a major threat to the remaining populations (Meffe et al. 1983, Meffe 1985, Brooks 1986, Marsh and Minckley 1990, Stefferud and Stefferud 1994, Weedman and Young 1997). The native fish fauna of the Gila basin, and Colorado basin in general, were naturally depauperate and contained few fish that were predatory on or competitive with Gila topminnow (Carlson and Muth 1989). In the riverine backwater and side-channel habitats that formed the bulk of Gila topminnow natural habitat, predation and competition from other fishes was essentially absent. Thus Gila topminnow did not evolve mechanisms for protection against predation or competition and is naive to predators and competitors. With the introduction of large numbers of predatory and competitive nonnative fish, frogs, crayfish, and other species, Gila topminnow could no longer survive in many of their former habitats or the small pieces of those habitats that had not been lost to human alteration. Both large (Bestgen and Propst 1989) and small (Meffe et al. 1983) nonnative fish and nonnative crayfish cause problems for Gila topminnow (Fernandez and Rosen 1996) and bullfrogs (*Rana catesbeiana*).

When the Gila topminnow was listed in 1967, it was recognized as *Poeciliopsis occidentalis*. The species was later revised to include two subspecies, *P. o. occidentalis* and *P. o. sonoriensis*

(Minckley 1969a, 1973). *P. o. occidentalis* is known as the Gila topminnow, and *P. o. sonoriensis* is known as the Yaqui topminnow. *Poeciliopsis occidentalis*, including both subspecies, is collectively known as the Sonoran topminnow. Both subspecies are protected under the ESA.

Historically, the Gila topminnow was abundant in the Gila River drainage and was one of the most common fishes of the Colorado River basin, particularly in the Santa Cruz system (Hubbs and Miller 1941). They too were reduced to only 15 naturally occurring populations. Presently, only 12 of the 16 recent natural Gila topminnow populations are considered extant (Table 1) (Weedman and Young 1997). Only three (Cienega Creek, Monkey Spring, Cottonwood Spring) have no nonnative fish present and therefore can be considered secure from nonnative fish

Table 1. Status of natural Gila topminnow populations in the US.

Site	Ownership	Extant?[1]	Nonnatives?	Mosquitofish?	Habitat Size[2]	Threats[3]
Bylas Spring[5]	San Carlos	YES	NO[4]	NO[4]	S D	M/ N G
Cienega Creek	BLM	YES	NO	NO	L	M/ R N
Cocio Wash	BLM	NO 1982	UNKNOWN	UNKNOWN	S	H/ M
Cottonwood Spring	Private	YES	NO	NO	S	M/ N
Fresno Canyon	State Parks	YES	YES	NO[4]	M	H/ N G U
Middle Spring[5]	San Carlos	YES	NO[4]	NO[4]	S	H/ N G
Monkey Spring	Private	YES	NO	NO	S	L/ W U
Redrock Canyon	USFS	YES	YES	YES	M D	H/ W R G N
Sabino Canyon	USFS	NO 1943	YES	NO	M	H/ R N
Salt Creek[5]	San Carlos	YES	NO[4]	NO[4]	S	M/ N G
San Pedro River	Private	NO 1976	YES	YES	-	H/ W N G R
Santa Cruz River San Rafael Tumacacori Tucson	Private, State Parks, TNC	 YES[6] YES NO 1943	 YES YES[4] YES	 YES YES NO	L D	H/ W N R G C U
Sharp Spring	State Parks	YES	YES	YES	M	H/ N G U
Sheehy Spring	TNC	NO 1987	YES	YES	S	H/ N G U
Sonoita Creek	Private, TNC, State Parks	YES	YES	YES	L D	H/ W N G
Tonto Creek	Private, USFS	NO 1941	YES	YES	L	H/ N R G W

[1] if no, last year recorded
[2] L = large M= medium S = small D = disjunct
[3] CImmediacy H = high M = moderate L = low
Type W = water withdrawal C = contaminants R = recreation N = nonnatives G = grazing M = mining
U = urbanization
[4] none recently, they have been recorded
[5] recently renovated
[6] in Mexico, US in 1993

threats. There have been at least 175 wild sites stocked with Gila topminnow, however, topminnow persists at only 18 of these localities. Of the 18, one site is outside topminnow historic range and four now contain nonnative fish (Weedman and Young 1997). Further, only five of these stocked populations would count toward recovery under the draft revised Gila topminnow recovery plan (Abarca et al. 1994). The Sonoran Topminnow Recovery Plan (USFWS 1984a) established criteria for downlisting and delisting. Criteria for downlisting were met for a short period. However, due to concerns regarding the status of several populations, downlisting was delayed. Subsequently, the number of reintroduced populations dropped below that required for downlisting, where it has remained. The Yaqui topminnow is now included within the Yaqui Fishes Recovery Plan (USFWS 1995). A revised recovery plan for the Gila topminnow is being prepared (Abarca et al. 1994).

The status of the species is poor and declining. Gila topminnow has gone from being one of the most common fishes of the Gila basin to one that exists at only 30 localities (12 natural and 18 stocked). Many of these localities are small and highly threatened. The theory of island biogeography can be applied to these isolated habitat remnants, as they function similarly (Meffe 1983, Laurenson and Hocutt 1985). Species on islands are more prone to extinctions than continental areas that are similar in size (MacArthur and Wilson 1967). Meffe (1983) considered extinction of Gila topminnow populations almost as critical as recognized species extinctions and Moyle and Williams (1990) noted that fish in California that are in trouble tend to be endemic, restricted to a small area, part of fish communities with fewer than five species, and found in isolated springs or streams. Gila topminnow has most of these characteristics.

The highest priority actions in the draft revised Gila topminnow recovery plan are ones that are absolutely essential to prevent extinction in the foreseeable future (Abarca et al. 1994). Federal actions have contributed to the degraded environmental baseline of the Gila topminnow. Federal actions requiring section 7 consultations affecting Redrock Canyon, Cienega Creek, and Sonoita Creek in the Santa Cruz River subbasin and others in the Gila River basin have contributed to the lowered baseline for the Gila topminnow. An indication of the poor environmental baseline of the Gila topminnow is that two formal consultations have resulted in jeopardy opinions. Although the reasonable and prudent alternatives remove jeopardy, other adverse effects are not removed by the reasonable and prudent alternatives. Other Federal actions, as well as non-federal actions that have not undergone section 7 consultation, also have unmitigated adverse effects that contribute to the degraded baseline.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions that are contemporaneous with the consultation process. The environmental baseline defines the status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

The Santa Cruz subbasin's aquatic habitats and fish communities have changed greatly when compared to historic conditions. The same can be said of many river basins in the Southwest (Miller 1961; Minckley and Deacon 1968, 1991; de la Torre 1970; Naiman and Soltz 1981; Miller et al. 1989; Rinne and Minckley 1991). Aquatic habitats in the Santa Cruz River basin have been reduced in quantity spatially and temporally, and in quality (de la Torre 1970, Davis 1982). Spatial habitat quantity has decreased due to diversion, ground water mining, natural and human caused changes in the watershed, flow regulation, and channelization. Habitats have decreased temporally because of these effects, thereby reducing the time that water is present in some stream sections. The physical and biological quality of aquatic habitats has changed with increased temperatures, flow reduction, channel incision and subsequent widening, increased sedimentation, loss of vegetation, loss of native species, and addition of nonnative species. King et al. (1999) documented contaminants from the NIWTP as a major contributor to degraded water quality conditions in the Santa Cruz River.

Habitat destruction obviously reduces the amount of habitat available for a species. It is also apparent that habitat degradation reduces the quantity and quality of the remaining habitat. Degradation of habitats is a well recognized factor in establishment of nonnative species (Courtenay and Stauffer 1984, Arthington et al. 1990, Soule 1990, Aquatic Nuisance Species Task Force 1994). These and other factors may be leading to the collapse of entire western aquatic faunas (Williams et al. 1988, Moyle and Sato 1991, Minckley and Douglas 1991).

The Santa Cruz River basin historically held eight species of native fish. Of these, six still occur and two have been extirpated from the basin. The Monkey Springs pupfish (*Cyprinodon* sp.) is the only fish species in Arizona to become extinct during recent times. Two of the species have been listed under the Endangered Species Act, one as a candidate and four as Arizona "species of concern." Many nonnative fishes have been stocked, both legally and illegally, into the Santa Cruz River basin. According to Arizona Game and Fish Department (AGFD) records, at least 23 species of nonnative fish have been transported into the basin.

Most of the non-native species have been found in waters not deliberately stocked by AGFD. This is particularly true for mosquitofish and some sport fish, such as green sunfish (*Lepomis cyanellus*) and bluegill. One or the other are found in most low-elevation fishing waters, including the Tucson urban lakes. The only stocking by AGFD of these two fish was green sunfish in Arivaca Lake which is outside the upper Santa Cruz River basin. The only Aquatic Stocking Permit for green sunfish was for the lodge at Peña Blanca Lake. Green sunfish are

ubiquitous in southern Arizona waters and found almost anywhere permanent water occurs. Most of the "typical" warm water sport fish are now found in waters where they were not legally stocked.

Aquatic fauna other than fish has been introduced into the Santa Cruz River basin. Bullfrogs and nonnative tiger salamanders (*Ambystoma tigrinum*) are common in the Santa Cruz subbasin and both will prey on native fish and other fauna (Rosen et al. 1995, Hayes and Jennings 1986). Spiny softshell turtles (*Trionyx spiniferus*) and northern crayfish (*Orconectes virilis*) also occur in the Santa Cruz subbasin and prey on fishes (AGFD unpub. data, Marsh 1997). A population of African clawed frogs (*Xenopus laevis*) has been extant at a Tucson golf course pond since the 1970's. These frogs may be spreading in California (W. Hayes, AGFD, pers. comm., 1998). The ghost rams-horn (*Biomphalaria havanensis*), is a nonnative aquatic snail found in the Santa Cruz subbasin in Pena Blanca Lake and vicinity (Bequaert and Miller 1973). It was probably introduced with fish stocked for sport purposes and its effects on native species are unknown. There is little or no information available on fish parasites and diseases of the Santa Cruz subbasin. As will be discussed later, nonnative parasites and diseases are a serious threat to native fishes of the Gila basin.

Aquatic flora have also been introduced into Arizona and the Santa Cruz subbasin. Common water cress (*Rorippa nasturtium aquaticum*) has become a significant ecosystem component in many areas (Minckley 1969b, Lawson 1995). Other nonnative aquatic plants that are already in Arizona and may be in the Santa Cruz River include parrot feather (*Myriophyllum aquaticum*), yellow floating heart (*Nymphoides peltata*), Brazilian waterweed (*Egeria densa*), dotted duckweed (*Spirodela punctata*), and curly pondweed (*Potamageton crispus*) (USGS 1998). Nonnative riparian plants can alter watershed and riparian functioning (Kunzmann and Johnson 1987). There are several nonnative riparian plants that have had significant impacts to the aquatic ecosystem of the Santa Cruz subbasin, such as salt cedar (*Tamarix* sp.), bermuda grass (*Cynodon dactylon*), yellow sweet clover (*Melilotus indicus*), and rabbit's foot grass (*Polypogon monspeliensis*)(Kerpez and Smith 1987).

Southeastern Arizona has been influenced by Europeans for hundreds of years and by Native Americans for much longer (Bahre 1991). The effects of this use, though not always obvious, have been pervasive and widespread. Much of the prehistorical and historical use was concentrated along the Santa Cruz River and its tributaries. The immigration of Europeans into the southwest had a profound impact on local ecosystems (Hastings and Turner 1965, Bahre and Hutchinson 1985). Human impacts in the area include vegetation type conversion, dewatering above- and below-ground aquifers, loss or reduction of native species, introduction and spread of nonnative species, and habitat loss.

Discharge of raw sewage into Nogales Wash from Nogales, Sonora, has entered the Santa Cruz River upstream of the NIWTP. Attempts to chlorinate this discharge to protect human health has been deadly to fish and aquatic insects (Lawson 1995). In March 1997, field investigations coordinated by the Service revealed the absence of Gila topminnows and a decline in other fish species immediately downstream of the NIWTP. In addition, between 5 and 8 percent of all

longfin dace collected were abnormal (skin lesions, deformed facial features). Field investigations also noted an absence of dragonfly larval both above and farther downstream below the NIWTP. It was speculated that the high levels of ammonia, perhaps coupled with other contaminants, appeared to be severely limiting the fish and invertebrate populations (Spiller, written communication; K. King, Service, pers. comm.)

The deteriorated baseline affects the potential for the survival and recovery of the Gila topminnow. Factors contributing to the deteriorated baseline include: loss of natural habitat and competition with nonnative species. Only 12 natural populations are considered extant and reintroduction success is very low. The natural populations are the basis for the recovery of the species (Abarca et al. 1994) and nine of the natural populations are in the Santa Cruz River basin. Because of the poor baseline, survival is a priority of the species. This requires maintenance and protection of the present natural and reintroduced populations. Maintaining the existing populations in the Santa Cruz River basin may be difficult since most of them are on private land. Some of these populations may be lost.

EFFECTS OF THE ACTION

Chronic problems with water quality in the project area adversely affect the Gila topminnow and contribute to the declined condition of the species in the Santa Cruz River. The actual responses to the exposure to a chemical above a species threshold level may vary between inhibiting growth and/or reproduction, to death. Other factors such as variation in environmental conditions including extreme or variable temperatures, and low dissolved oxygen may mask or complicate the effect of the target chemical (Niimi *In* Beyer et al. 1996). From November 1992 until October 1993, monthly sampling occurred along the river by Arizona Department of Environmental Quality (ADEQ) staff and the Friends of the Santa Cruz River (FOSCR) volunteers. A number of parameters were measured including pH, nutrients, chlorine, total metals, other water quality variables and physical parameters (Lawson 1995). Residue levels in fish tissue is a result of exposure directly from water through gill absorption of residues, as well as from their foods. In general, aquatic organisms exhibit greater pesticide bioaccumulation than do terrestrial organisms (summarized by Keith *In* Beyer et al. 1996). Gila topminnow are expected to experience a continuation of chemical exposure throughout this permit.

Nitrogen is an essential element for life processes, but in excess un-ionized ammonia (NH_3) is highly toxic to biological organisms. The NIWTP has had problems with ammonia concentrations being released from the plant which is believed to have severe impacts on the native fish populations in the project area (ADEQ 1996). Background levels include un-ionized ammonia at 0.08 mg/L; nitrite plus nitrate levels were 0.25 mg/L, and total Kjeldahl nitrogen (TKN) the combination of ammonia and organic nitrogen of 0.31 mg/L (Lawson 1995). Service field investigations in May 1997 noted the absence of fish and invertebrates 1.7 miles downstream of the NIWTP associated with un-ionized ammonia levels of 0.49 mg/L. Un-ionized levels were 0.23 mg/L at Rio Rico North, approximately 4.8 miles downstream of the NIWTP. Fish populations did not resemble control locations until ammonia levels declined below 0.03 mg/L, over 9 miles below the NIWTP (King et al. 1999). This NPDES permit will

govern the discharge from the Nogales International Wastewater Treatment Plant for a period of five years. Although the permit specifies a maximum discharge limit of 8.4 mg/L during the life of this permit, the ammonia standard is not expected to be met.

It is not known how high the levels of ammonia will go under this permit, but concentrations will possibly continue at current extraordinarily high levels. A complaince schedule has been developed to meet the ammonia limits. High ammonia levels conflict with the State's narrative water quality standards which require that discharges be free from pollutants in amounts or combinations that are toxic to humans, animals, plants or other organisms. King et al. (1999) reported that 1997 effluent was extremely toxic with 100% mortality of the fathead minnows in 7 of 12 months, when held in effluent in a laboratory setting for 96 hours. In 1998, only 2 of 12 months resulted in 100% mortality under the same test parameters. Information for 1999 is incomplete, but suggests a continual decrease in effluent toxicity. An ammonia study conducted between July 1993 and December 1994 saw the highest levels at the NIWTP reach 29 mg/L total ammonia, but usually ranged around 15 mg/L (undated IBWC files). To accompany the NIWTP's inability to meet the discharge limit of 8.4 mg/L, the permit requires the development of an Instream Monitoring Program to document nutrient impacts and attenuation. Preliminary work by the U.S. Geological Survey's Midwest Science Center concluded 90% mortality at 40 mg/L and 0% mortality at 20 mg/L (J. Dwyer, Midwest Science Center, pers. comm.). This analysis does not consider the effects to growth or reproduction. If the concentrations of ammonia in the discharge is high enough to result in impairment, a toxicity identification evaluation (TIE), designed to characterize and identify contaminants responsible for toxicity in complex mixtures, will identify ammonia over other contaminants. In addition, whole effluent toxicity (WET) testing will be conducted monthly to measure sublethal effects (reduced growth, reproduction) and a toxicity reduction evaluation (TRE) to reduce the constituent causing the toxicity.

Phosphorous is a plant nutrient and essential for life processes of both plants and animals. Excessive phosphorus from human wastes, detergents, agriculture, etc. may result in algal blooms. The background concentration of phosphorus is estimated at 0.117 mg/L. The daily maximum concentration limit established in this permit is 0.260 mg/L. Federal nutrient criteria were established in 40 CFR 131.31 including total phosphate limits for the Santa Cruz River from the international boundary to Sahuarita. A maximum annual mean value of 0.5 mg/L and a maximum annual 90th percentile value of 0.80 mg/L was established.

The Director of ADEQ, with EPA approval, proposes to grant a five year variance for phosphorus. This provision prevents a watershed or waterbody variance which would be equivalent to modifying a water quality standard or removing a designated use. The rule provides a provision for variances if 1) it is not technologically feasible to comply with the water quality standard, and 2) installation and operation of each of the available discharge technologies to achieve compliance with the water quality standard would result in substantial and widespread economic and social impact. The effect to the Gila topminnow is not known, however, in general phosphorus is not limiting in Arizona waters.

A review of Discharge Monitoring Reports from September 1994 through August 1996 also show a few sporadic violations of biological oxygen demand (BOD), fecal coliform, pH, pentachlorophenol, total residual chlorine, mercury, cyanide, and percent removal of BOD. Exceedance of these and other parameters under this permit are possible. It is not known how high or how often these exceedences occurred, or if they resulted in significant impacts to the Gila topminnow. Mercury, a chronic problem for Arizona, effects the survival, growth and reproduction of aquatic species. Metal contamination may result in numerous effects including impaired reproduction, adverse effects on behavior, e.g., swimming, growth. Exceedences of varying amounts and of varying constituents cannot be predicted, and therefore, are not covered under the provisions of this consultation, and should be evaluated separately.

Cyanide was one of the constituents listed in the February 16, 1994, biological opinion, in which the Service issued a jeopardy opinion on the basis that endangered species were similar in responses to salmonids over fathead minnow, and requested the adoption of the A&Wc water standard. The acute standard for the A&Ww and A&Wedw is 41.0 micrograms/liter (ug/L), whereas the A&Wc acute standard is 22.0 ug/L. If the noted exceedence was above the A&Wedw standard, and if cyanide is limiting or contributing to negative impacts to the Gila topminnow, a site specific evaluation of this and other parameters should be reconsidered. The chronic criteria for chlorine is 5 ug/L. The acute standard is 11 ug/L. Water from Nogales Wash is treated with chlorine in Sonora and retains a concentration of 2 mg/L at the IBWC sample site approximately 4,000 feet into the Arizona border. Chlorine is toxic to fish between 0.07 and 0.29 mg/L. This high background level of chlorine is likely contributing to the demise of the Gila topminnow population in the Santa Cruz River. Elevated levels of chlorine between 0.1 and 0.5 mg/L are still noted 7 miles from the Sonora-Arizona border.

During the FOSCR study, the portion of the river was dominated by one fish species, the longfin dace (*Agosia chrysogaster*) with the most severe impacts noted at the Calabasas Road bridge sample site in Rio Rico (reference site SC2) 1.5 miles downstream of the NIWTP, and closest to the NIWTP. Some 35 fish were collected from this site. Fourteen of the fish, or 40 percent, were determined to be in an unhealthy condition (Lawson 1995.) Statistical analyses concluded that these numbers were higher than expected and were likely caused by an environmental stressor which could not be determined at the time of the report. Low D.O., chlorine, and un-ionized ammonia were all suspected. A continuation of similar experiences is expected for the life of this permit.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions unrelated to the proposed action are not considered in this section because they would require separate consultation pursuant to section 7 of the ESA. Additional modification of the NIWTP will be consulted on separately. Future actions are also likely to occur in Sonora, Mexico, which may affect the quality of the water in the project area, but are outside of the scope of this analysis. As much of the Santa Cruz River is private property, a host of non-Federal actions are

expected to occur during this 5-year permit including water management such as diversions, levee maintenance, channel dredging, channel enlargement, flood control projects, installation of pumps, wells, drains; the continued introduction of non-native fish, wildlife; and plants; discharges into surface waters from non-point source runoff and urban development including pesticides, herbicides, fungicides, rodenticides, fertilizers; and other recreational disturbances, vandalism, off-road vehicle use, and chronic disturbance.

CONCLUSION

After reviewing the current status of the Gila topminnow, the environmental baseline for the action area, the effects of the issuance of the NPDES permit and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Gila topminnow. No critical habitat has been designated for this species, therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. EPA has a continuing duty to regulate the activity covered by this incidental take statement. If EPA (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

The Service anticipates incidental take of the Gila topminnow due to the toxic effects of discharges from the Nogales treatment plant. However, the level of take will be difficult to

detect for the following reason(s): Incidental take of actual species numbers may be difficult to detect particularly when the species is wide-ranging and finding a dead or impaired specimen is unlikely following lethal or sublethal exposures; losses may be masked by seasonal fluctuations in numbers or other causes, (e.g., oxygen depletions for aquatic species); sublethal doses of contaminants ingested may adversely affect them by significantly impairing essential behavioral patterns including feeding, sheltering, breeding, or immune response and cannot readily be separated from the lack of adherence to the standards rather than the standards themselves. As a surrogate measure of take, incidental take will be assumed to be exceeded if the reasonable and prudent measure described below is not implemented. Incidental take is expected to be in the form of harm and kill.

If, during the course of the action, the amount or extent of the incidental take anticipated is exceeded, EPA must reinitiate consultation with the Service immediately to avoid violation of section 9. Operations must be stopped in the interim period between the initiation and completion of the new consultation if it is determined that the impact of the additional taking will cause an irreversible and adverse impact on the species, as required by 50 CFR 402.14(i). An explanation of the causes of the taking should be provided to the Service.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat. Although water conditions are expected to negatively impact the Gila topminnow, this 5-year permit requires rigorous monitoring and reporting requirements, and the implementation of a toxicity reduction evaluation (TRE).

REASONABLE AND PRUDENT MEASURE

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize take:

1. Coordinate with IBWC to ensure protection of the Gila topminnow in the Upper Santa Cruz River.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of ESA, EPA must comply with the following terms and conditions which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. Complete all monitoring and reporting requirements as established in the draft permit including the WET testing, and toxicity identification evaluation (TIE) as scheduled in the draft permit.

2. Monitoring of the project area and other areas that could be affected by the proposed action shall be done to ascertain take of individuals of the species and/or of its habitat that causes harm or harassment to the species. This monitoring will be accomplished using the protocol outlined in the Instream Monitoring Program as described in the permit under Section H. Variances.

3. Develop and conduct ambient toxicity testing in the mainstem of the Santa Cruz River to verify instream conditions with annual monitoring at a minimum of three sites to document changes over the life of the permit.

4. Re-evaluate the appropriateness of the adoption of A&Wc criteria for those parameters less stringent than the A&Wedw criteria and known to result in toxicity.

Review requirement: The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measure(s).

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of ESA directs Federal agencies to utilize their authorities to further the purposes of ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

1. Implement the 5 year rotating schedule to evaluate NPDES permits on a watershed basis.

2. Expand the Instream Monitoring Program described in Section H. Variances in the permit, to include fish sampling to determine the overall abundance and incidence of abnormalities in native fishes.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the issuance of a NPDES permit for the NIWTP outlined in the August 25, 1998, biological evaluation. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your continuing efforts to conserve listed species. If we can be of further assistance, please contact Debra Bills (x239) or Tom Gatz (x240). Please refer to consultation number 2-21-98-F-397 in future correspondence concerning this project.

Sincerely,

David L. Harlow
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque NM (GARD-AZ/NM)

John Kennedy, Arizona Game and Fish Department, Phoenix, AZ
Director, Arizona Department of Environmental Quality (Attn: L. Taunt)
Water Management Division, EPA, San Francisco, CA (Attn: D. Denton)

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