APPENDIX J

Giant Garter Snake Assessment

Thomas

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To: Mr. Peter Balfour
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2525 Warren Drive
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Re: Assessments of giant garter snake (*Thamnophis gigas*) habitat and conservation considerations in the Natomas Basin Sutter Pointe Specific Plan Area, Sutter County, California

Dear Mr. Balfour,

This letter is prepared in response to your request for giant garter snake (*Thamnophis gigas*) related consulting services pertaining to the Sutter Pointe Specific Plan ("Plan") area in Sutter County, California. The Plan area resides immediately north of the Sacramento/Sutter County line, north of the City of Sacramento in the Natomas Basin. Services include an assessment of habitat suitability for giant garter snake within the Plan area, with emphasis on historic and current locality records, regional population and distribution trends, adjacent land use, and the importance of linear aquatic habitat especially as it pertains to regional habitat connectivity and the function of the Natomas Basin Conservancy's interconnected reserve system. Although the bulk of this assessment is qualitative (i.e., descriptive), a portion of the linear habitat (i.e., ditch and drain) assessment includes a quantitative, GIS-based assessment prepared annually to monitor habitat connectivity throughout the Natomas Basin. Together, these data incorporate existing information needed to place the Plan area in a perspective consistent with the goals and objectives of the Natomas Basin Habitat Conservation Plan.

Regional Background

The Natomas Basin supports one of the 13 extant giant garter snake subpopulations recognized by USFWS (U.S. Fish and Wildlife Service 1999). USFWS states that protection of the giant garter snake population in Natomas Basin is a *Priority 1* recovery task, defined as "an action, which must be taken to prevent extinction or to prevent a species from declining irreversibly" (U.S. Fish and Wildlife Service 1999).

Giant garter snakes are well documented within the Plan area, although the majority of records are limited to the Plan area's southern portion from the Sacramento/Sutter County

line north to Riego Road (CNDDB 2006; Jones and Stokes 2005, 2006)(Figure 1). The paucity of records north of Riego Road, however, does not necessarily indicate that giant garter snakes occur in the Plan area with lesser frequency than they do elsewhere in the Basin. Mostly due to restricted access, methodical sampling is lacking in the region east of State Route 99/70 and north of the Sacramento/Sutter County line (Jones and Stokes 2005, 2006; Wylie *et al.* 2000, 2001, 2002, 2003, 2004). As a result, data within this region is limited. Recently, visual encounter surveys have documented individual giant garter snakes in features continuous with the V Drain at the project's northern boundary and within the roadside ditch (R3 Drain) at Sankey Road east of State Route 99/70, verifying species presence in this portion of the Plan area (Jones and Stokes 2006; Peter Balfour, ECORP, pers. comm.).

Dominated by rice agriculture, land use within the Plan area includes a mixture of agricultural, rural and light industrial uses. Land cover includes both grazed and ungrazed irrigated and annual grasslands, fallow and active rice agriculture, seasonal wetland, riparian scrub, and rural and light industrial uses. The southern portion of the Plan area consists primarily of active rice agriculture from the Sacramento/Sutter County boundary north to Riego Road. North of Riego Road, agriculture gives way to mixed industrial use along the Pacific Road corridor to Sankey Road. Homestead, grazed grassland, and fallow rice fields characterize land north east of the junction of Pacific and Sankey Roads. The entirety of the Plan area is interspersed with irrigation and drainage facilities managed by Reclamation District No. 1000 and Natomas Mutual Water Company, respectively (Figure 1). Though drainage facilities play a significant role in regional flood protection, during the summer and fall they primarily serve and drain the Natomas Basin's widespread rice lands in conjunction with the Natomas Mutual Water Company's delivery facilities.

Significance of Rice as Habitat

In the Central Valley, rice fields have become important habitat for giant garter snakes. Irrigation water typically enters the rice lands during April and May along canals and ditches. Giant garter snakes use these canals and their banks as permanent habitat both for spring and summer active behavior and for winter aestivation. Where these canals are not regularly maintained, lush aquatic, emergent, and streamside vegetation develops prior to the snakes' spring emergence. This vegetation, in combination with cracks and holes in the soil, provides much-needed cover during spring emergence and throughout the remainder of the summer active period.

Rice is planted during the spring after the winter fallow fields have been cultivated and flooded with several inches of standing water. In some cases, giant garter snakes move from the canals and ditches into these rice fields soon after the rice plants emerge above the water's surface, and continue to use the fields until the water is drained during late summer or fall (G. Hansen and J. Brode 1993). The majority of giant garter snakes move back into the canals and ditches as the rice fields are drained, although a few may

overwinter in the fallow fields where they hibernate in burrows in the small berms separating the rice checks (G. Hansen 1998; E. Hansen 2003, 2004).

While in the rice fields, the snakes forage in the shallow warm water for small fish and larvae of bullfrogs and treefrogs. For shelter and basking sites, giant garter snakes utilize the rice plants; small, vegetated berms dividing the rice checks; and vegetated field margins. Gravid (pregnant) females may be observed in the rice fields during the summer; and at least some giant garter snakes are born there (G. Hansen and J. Brode 1993; G. Hansen 1998).

Water is drained from the fields during late summer or fall by a network of drainage ditches. These ditches are sometimes routed alongside irrigation canals, and are often separated from the irrigation canals by narrow vegetated berms that may provide additional shelter. Remnants of old sloughs may be present in rice-growing regions, where they serve as drains or irrigation canals. Giant garter snakes may use vegetated areas along any of these waterways as permanent habitat.

Connectivity

Changing agricultural regimes, development, and other shifts in land use create an ever-changing mosaic of available habitat within the Natomas Basin (Basin). Giant garter snakes move around in response to these changes in order to find suitable sources of food, cover, and prey. Connectivity between regions is therefore extremely important for providing access to available habitat and for genetic interchange. As an aquatic species, the giant garter snake relies largely upon the interconnected network of canals and ditches that provide irrigation and drainage throughout the Basin to provide this connectivity. The canals and ditches within the Plan area serve an important role in Basin-wide giant garter snake movement, providing both suitable habitat and potential connectivity from north to south and, potentially, from east to west. The importance of these connective corridors was explicitly recognized in the NBHCP, which calls for an assessment of connective corridors throughout the Basin (Chapter VI, Section E [2][a][5] of the 2003 NBHCP).

The most significant corridors spanning the Basin from north to south are the primary drainages managed by Reclamation District 1000; these include the North Drainage Canal, East Drainage Canal, West Drainage Canal (including Fisherman's Lake), and Main Drainage Canal, all of which the NBHCP has identified as most likely to remain during the permit term (Figures 2, 3). The Plan area encompasses portions of the North Drainage Canal and East Drain.

The Basin is subdivided by major highways into three regions; 1) south and west of Interstate 5, 2) north and east of Interstate 5 and east of State Route 99/70, and 3) north of Interstate 5 and west of State Route 99/70. The Plan area is an integral part of the existing migration corridors between and amongst regions 2 and 3. Within the Plan area, at least three culverts large enough for giant garter snakes to pass through link Region 3 across State Route 99/70 to Region 2. From east to west, these connections occur; 1) at

the RD 1000 V Drain culvert crossing, 2) at the RD 1000 R Drain culvert crossing, and 3) at the East Drainage Canal. Each of these connects to a series of ditches, drains, and canals in their respective regions, which, in turn, provide critical linkages among Natomas Basin Conservancy reserves.

The Natomas Basin Conservancy's reserve system is divided into the Fisherman's Lake, Central Basin, and North Basin Units (Figure 2). These units roughly correspond to HCP Areas 1,2, and 3, respectively, although the Central Basin Unit is divided between Areas 2 and 3. All of the Central Unit is within Sacramento County, while all of the Northern Unit is within Sutter County. The Plan area either resides adjacent to, near to, or encompasses irrigation or drainages facilities shared with the North Basin and Central Basin Units. The North Basin Unit, which will eventually contain most or all of the 2,500-acre reserve system required by the NBHCP, currently includes the Atkinson, Bennett North, Bennett South, Bolen North, Bolen South, Bolen West, Frazer, Huffman East, Huffman West, Lucich North, Lucich South, Nestor, Ruby Ranch and Vestal Reserves, comprising a total of 2,384.11 acres. The Central Unit currently includes the Betts, Bianchi West, Elsie, Frazer South, Kismat, Sills, Silva, and Tufts Reserves, comprising a total of 1,494.32 acres. Of these, Betts, Kismet, Ruby Ranch, Sills, and Silva share a boundary with the Plan area. Though many of the reserves directly abut one another, each relies on the Basin's irrigation and drainage facilities to connect them.

In addition to the Natomas Basin Conservancy reserve system, there is also a set of reserves planned by the Sacramento County Airport System. In various stages of the design process, these reserves are not yet constructed. When constructed, two of these reserves will integrate with the Natomas Basin Conservancy's 2,500 contiguous acre reserve system in the North Basin Unit: the two reserves are the Prichard Lake Wetland Restoration Area and Willey Reserve. The Willey Reserve is situated southwest of the intersection of the North Drainage Canal and Sankey Road, west of State Route 99/70. Adjacent to the south side of the North Drainage Canal between Garden Highway and Powerline Road, Prichard Lake connects to the Natomas Basin Conservancy's Atkinson, Ruby Ranch, Lucich South, Because of its location next to the Flume, Prichard Lake is also connected to habitat north of Metro Air Park east of Powerline Road, eventually connecting to the Natomas Basin Conservancy's Sills reserve.

The North Drainage Canal, which passes through the western portion of the Plan area, constitutes the primary linkage between reserves in the Conservancy's North Basin Unit and between the Sacramento County Airport System's Willey and Prichard Lake reserves. Giant garter snakes are present throughout the North Drainage Canal and were documented in densities ranging from 39 (95% C.I. 28-73) to 63 (± 22.81) snakes per linear kilometer from 2000 to 2003 (CNDDB 2006; G. Hansen 1980; Jones and Stokes 2005, 2006; Wylie *et al.* 2000, 2001, 2004). The North Drainage Canal also provides the linkage to the V Drain, R Drain, and East Drainage Canal, each of which flows via culvert under State Route 99/70 to the Northern Main canal. The Northern Main, in turn, provides critical linkages to the Betts, Kismat, and Silva Reserves, and to the region referred to as "Snake Alley", which has long been recognized as an important area for giant garter snakes (G. Hansen and J. Brode 1992; Jones and Stokes 2005, 2006; Wylie *et al.* 2000, 2001, 2004).

Removal or disruption of these features within the Plan area, or any action that results in a reduction of habitat quality within them could seriously limit the ability for snakes to move throughout the Basin's system of reserves. If aquatic connectivity is lost or degraded, the system of reserve lands could become isolated patches of habitat containing small, discrete snake populations.

The negative impacts of small population size and isolation have been well documented; these include, among others, increased probability of extinction from random, catastrophic events and loss of genetic variation resulting in snakes that are less fit to survive. Genetic divergence can potentially occur in a short time and may result from seemingly simple impacts, such as widened roads. Genetic research conducted by Melanie Paquin at California State University San Francisco in conjunction with USGS indicates that variation of this kind may have already occurred to some extent in giant garter snakes in areas separated by the major highways that transect the Basin (Paquin 2001).

Connectivity Assessment (Quantitative)

The quantitative assessment of connective corridors was accomplished by evaluating the habitat suitability of the linear water conveyance structures that occur throughout the Plan area. Potential connective corridors were identified by reference to aerial photographs and topographic and hydrographic maps and were then assessed directly by driving along canals, ditches, or drains. Potential corridors that could not be accessed directly were identified from adjacent roadways through binoculars and photographed using a digital camera with a telephoto lens. If a corridor could be viewed from one or both ends, but could not be viewed along its entirety, it was assumed that observed conditions were continuous throughout.

Segments were defined along all ditches and drains on the basis of habitat conditions. Each segment was scored using several habitat variables; the total scores were used to quantitatively assess habitat suitability according to a hierarchical classification of known giant garter snake habitat correlates. Minimum segment length was approximately 61 meters (200 feet). An exception to the minimum segment length was made where culverts or other features more than 6 meters long (approximately 20 feet) that could impede giant garter snake movement were identified; such areas were recorded as distinct segments. Habitat scoring criteria were drawn mainly from the *Draft Recovery Plan for the Giant Garter Snake* (U.S. Fish and Wildlife Service 1999) and adapted for use in GIS analysis. The location of each segment was digitized on screen to create a GIS layer, which was then attributed with the segment's habitat scores. The results of this analysis were used to identify potential dispersal corridors for giant garter snakes (Figure 1).

Preliminary classification values are based on factors discussed in both published and unpublished literature, as well as the personal experience of the biologists involved in the current effort (G. Hansen and J. Brode 1980; Brode 1988; G. Hansen 1988; U.S. Fish and Wildlife Service 1999; E. Hansen 2001a, 2001b, 2002, 2003a, 2003b; Wylie and Casazza

2001, 2003). The preliminary habitat valuation categories are defined below. Point breaks between the valuation categories are based on generalized giant garter snake habitat and ecological requirements and are, consequently, somewhat arbitrary.

Suitable habitat is characterized by all the features necessary to support permanent populations of giant garter snakes, including: 1) Sufficient water during the active summer season to supply cover and food such as small fish and amphibians; emergent, herbaceous aquatic vegetation; and vegetated banks to provide basking and foraging habitat; 2) bankside burrows, holes, and crevices to provide short-term aestivation sites; 3) High ground or upland habitat above the annual high water mark to provide cover and refugia from floodwaters during the dormant winter season (G. Hansen and J. Brode 1980; G. Hansen 1988.)

Marginal habitat is characterized by any combination of those features listed above needed to support transient giant garter snakes on a temporary basis, or to act as connective corridors between areas of more stable or desirable habitat. This habitat need only possess the water, vegetation, and refugia required to provide minimal coverage for dispersing snakes. Marginal habitat is incapable of supporting permanent populations of giant garter snakes and is typically ephemeral, providing no permanent source of prey.

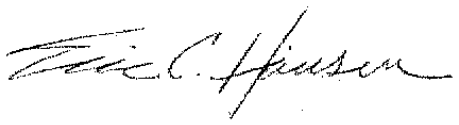
Unsuitable habitat is devoid of the water, vegetation, and/or refugia necessary to support giant garter snakes for any extended time. Such habitat is generally composed of small roadside ditches, gunite drains, or temporary swales that contain no water during the active spring and summer seasons. Unsuitable habitat corridors are no more likely to support giant garter snakes than any non-aquatic environment; if giant garter snakes are present in such habitats, it is only by chance.

The point range assigned to each valuation category is shown below.

Habitat Value	Point Range
Unsuitable	0–7
Marginal	8–12
Suitable	13–21

This concludes this assessment of giant garter snake habitat for the Sutter Pointe Specific Plan Area in the Natomas Basin, Sutter County, California. This document focuses on identifying primary impacts to the giant garter snake as they to the Plan, but does not provide specific recommendations for ameliorating these concerns. If either recommendations or further detail with respect to discrete habitat features are desired, I will gladly provide them.

Sincerely,



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Enclosures:

ArcView files - Sutter_Point_GGS_Hab_2006 (UTM Zone 10 North, North American Datum 1927)
oct05- ggs points 10_83 (UTM Zone 10 North, North American Datum 1983)

References

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Brode, J., and G. Hansen. 1992. *Status and Future Management of the Giant Garter Snake (*Thamnophis gigas*) within the southern American Basin, Sacramento and Sutter Counties, California*. California Department of Fish and Game, Inland Fisheries Division.

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Hansen, E.C. 2001. Year 2001 investigations of the giant garter snake (*Thamnophis gigas)* in the greater American Basin: Sutter County, California. Report prepared for the Sacramento Area Flood Control Agency, January 30, 2002. Contract No. 381. Unpublished. 18 pp. plus figures.

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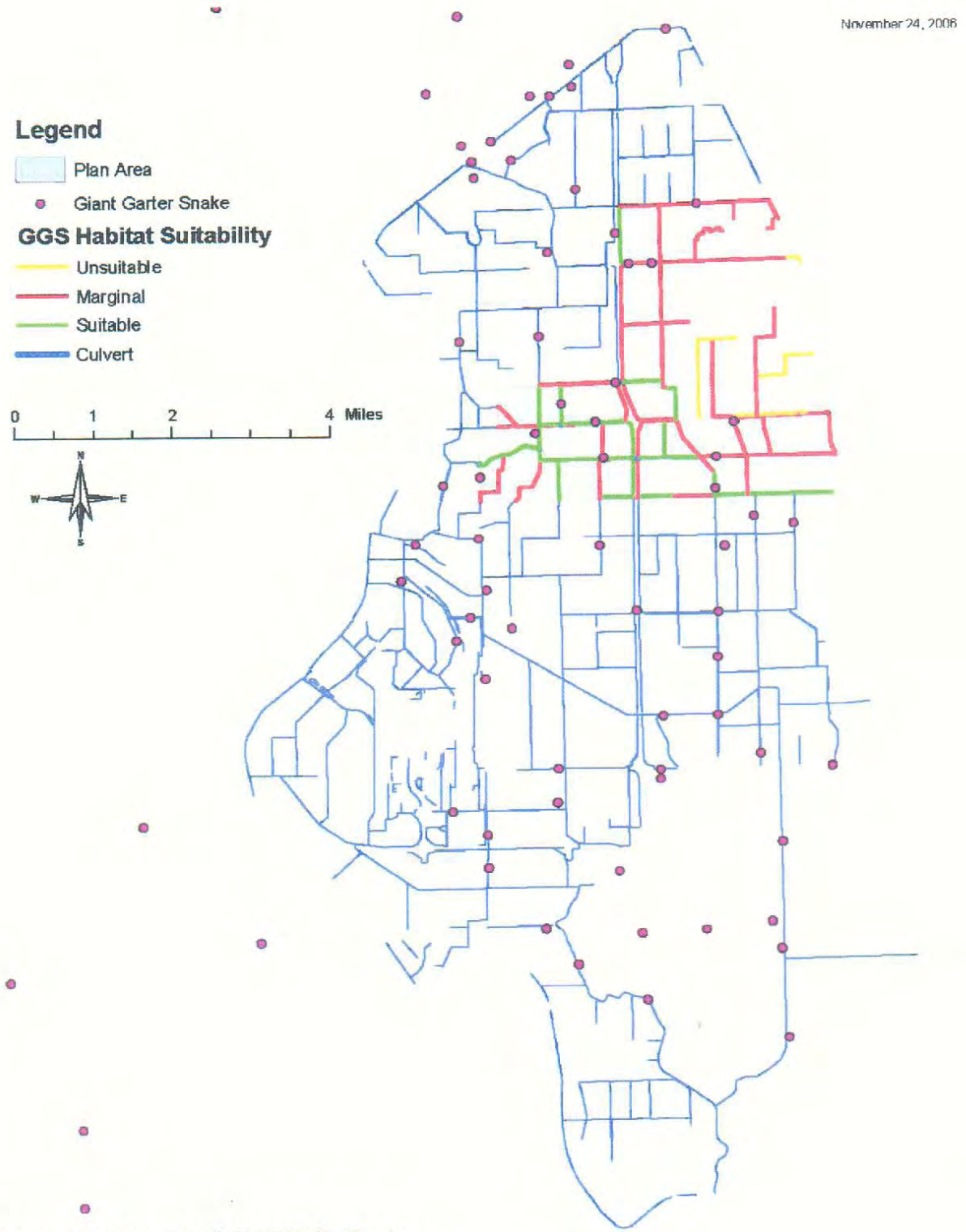

Figure 1. Suitability of Aquatic Habitat in the Plan Area

Sources: CNDDB 2006; ECORP; E. Hansen, Jones and Stokes 2006

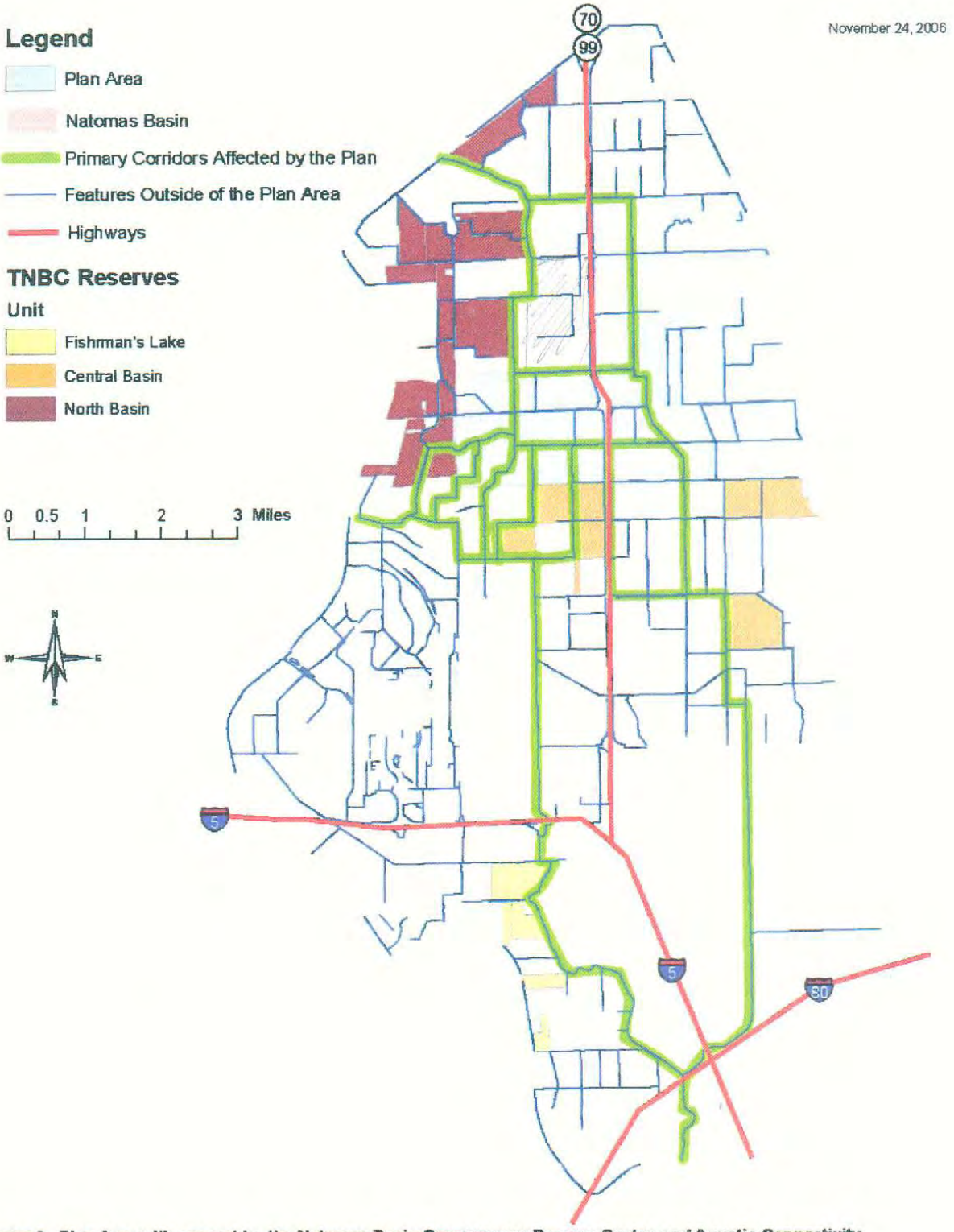

Figure 2. Plan Area with respect to the Natomas Basin Conservancy Reserve Systen and Aquatic Connectivity

Sources: CNDDB 2006; ECORP; E. Hansen; Jones and Stokes 2006

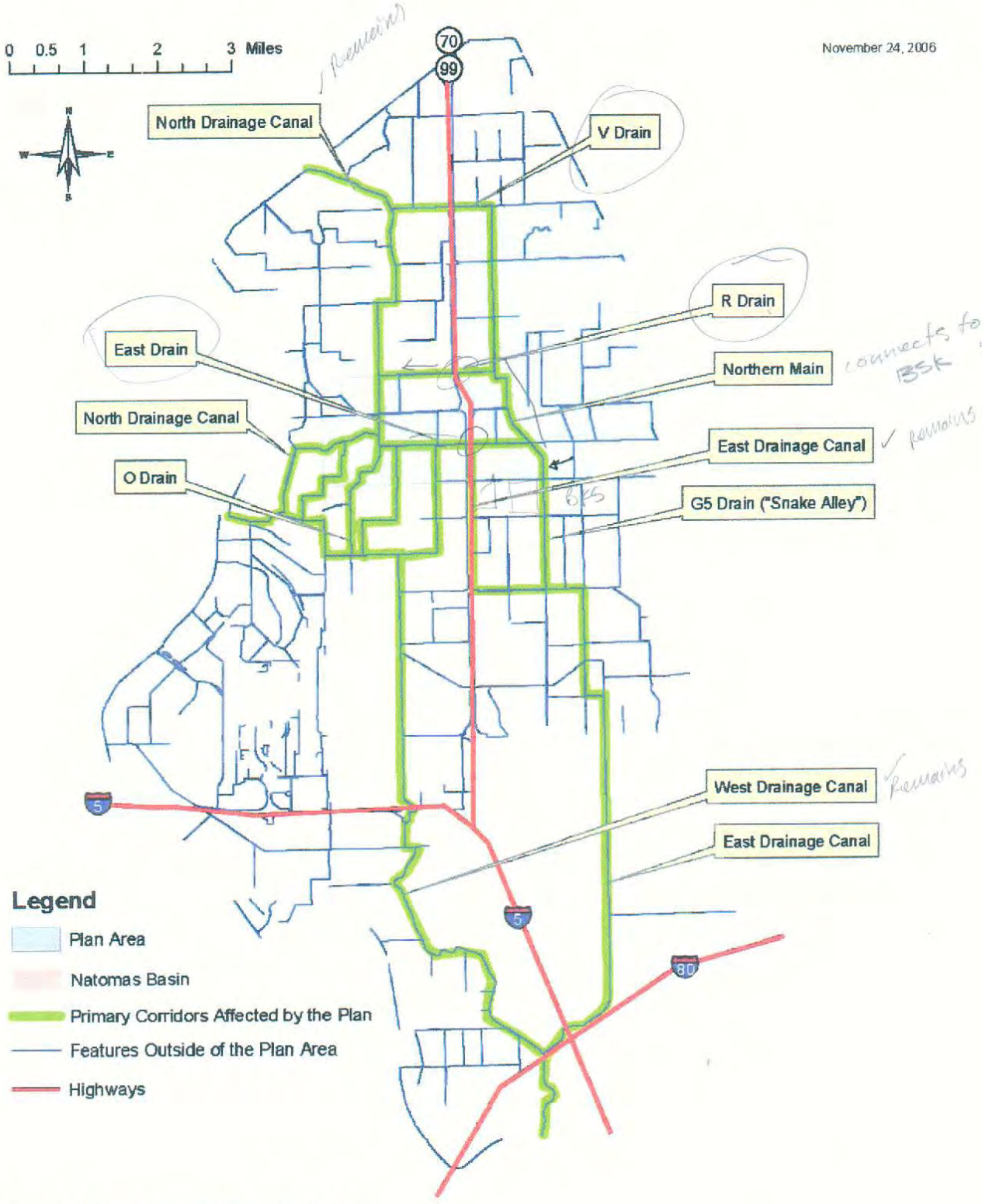

Figure 3. Features relevant to the Plan Area