UNITED STATES DEPARMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814-4700

January 9, 2014

In response refer to:
WCR FERC P-2100 HEA/HEP

Director Hydro Licensing, Power Generation
Pacific Gas and Electric Company
P.O. Box 770000
San Francisco, California 94177

Chief, Division of Environmental Generation
Department of Water Resources
P.O. Box 942836
Sacramento, California 94236

Subject: Response of NOAA's National Marine Fisheries Service to the Final Habitat Expansion Plan submitted by the California Department of Water Resources and Pacific Gas and Electric Company in November 2010.

Dear Licensees:

Thank you for providing NOAA's National Marine Fisheries Service (NMFS) with your Final Habitat Expansion Plan (HEP 2010). The California Department of Water Resources and Pacific Gas and Electric Company (Licensees) prepared and submitted the HEP (2010) to NMFS for approval in November 2010. Pursuant to the *Amended Habitat Expansion Agreement for Central Valley Spring-Run Chinook Salmon and California Central Valley Steelhead,* March 2011 (Amended HEA), and subject to additional procedures described in Amended HEA (2011) Sections 4.2.5 through 4.2.7, NMFS provides in Enclosure A its comments and determinations regarding how the habitat expansion actions recommended in the HEP (2010) do not meet the following NMFS Approval Criteria in Amended HEA (2011) Section 4.2.3:

*(a) estimated to meet the Habitat Expansion Threshold;*
*(b) assures necessary testing, operation and maintenance;*
*(c) supports establishing a geographically separate, self-sustaining population of Spring-run; and*
*(d) supports segregating spring-run habitat from Central Valley fall-run Chinook salmon.*

In addition, NMFS outlines the next steps pertaining to the HEP (2010) pursuant to the Amended HEA (2011). If you have questions about NMFS' response, please contact Steve Edmondson, at 707-575-6052.

Sincerely,

William W. Stelle, Jr.
Regional Administrator

Enclosure

cc: HEA Signatory Parties

**Enclosure A**

# Response of NOAA's National Marine Fisheries Service to the Final Habitat Expansion Plan submitted by The California Department of Water Resources and The Pacific Gas and Electric Company

## 1.0 Introduction

Pursuant to the *Amended Habitat Expansion Agreement for Central Valley Spring-Run Chinook Salmon and California Central Valley Steelhead,* March 2011 (Amended HEA 2011), NOAA's National Marine Fisheries Service (NMFS) provides its determination on whether the habitat expansion actions recommended in the Final Habitat Expansion Plan (HEP 2010) submitted by the California Department of Water Resources and Pacific Gas and Electric Company (Licensees) meet the NMFS Approval Criteria in Amended HEA (2011) Section 4.2.3. This determination is subject to additional procedures described in Amended HEA (2011) Sections 4.2.5 through 4.2.7. The Amended HEA (2011) relates to two anadromous fish species, the evolutionarily significant unit (ESU) of Central Valley (CV) spring-run Chinook salmon (*Oncorhynchus tshawytscha*) (70 FR 37160, June 28, 2005; 70 FR 52488, September 2, 2005) and the distinct population segment of California CV steelhead (*O. mykiss*) (71 FR 834, January 5, 2006; 70 FR 52488, September 2, 2005).[1] Both of these species are listed as threatened and have critical habitat designated under the Endangered Species Act. In addition, the Amended HEA (2011) refers to the ESU of CV fall-/late fall-run ("fall-run") Chinook salmon. NMFS

[1]Amended HEA (2011) Section 1.1 provides, in relevant part, "spring-run" shall mean Central Valley spring-run Chinook salmon (O. *tshawytscha*)." In addition, this section provides, in relevant part, "steelhead" shall mean California Central Valley steelhead (*O. mykiss*)." In this response, "spring-run" and "steelhead" have meanings consistent with Amended HEA (2011) Section 1.1.

includes the ESU of fall-run Chinook salmon on its Species of Concern List (71 FR 61022, October 17, 2006).

## 2.0 Background and Review History of Habitat Expansion Plan

The Licensees issued a Draft Habitat Expansion Plan in November 2009 (Draft HEP 2009) pursuant to the *Habitat Expansion Agreement for Central Valley Spring-Run Chinook Salmon and California Central Valley Steelhead* (HEA 2007). In February 2010, NMFS provided extensive written review comments to the Licensees on the Draft HEP (2009) (NMFS 2010a). NMFS also provided recommendations for moving toward a successful resolution of its concerns with the Draft HEP (2009) noting significant areas of concern that had to be reconciled before the Draft HEP (2009) could be approved under the requirements of the HEA (2007). The Licensees then requested a six-month time extension to submit the HEP to NMFS for approval. NMFS (2010b) granted the request stating,

> *"Good cause exists for the requested extension under the circumstances that [the licensees] described in [their] letter, including the need for additional time to: (1) address significant concerns expressed by NMFS, other parties to the HEA, and directly affected third parties in comments on the Draft HEP; (2) further develop the habitat expansion actions that the Licensees recommended in the Draft HEP in response to comments received on the Draft HEP and new information obtained since issuance of the Draft HEP; and (3) evaluate new information on and re-evaluate a habitat expansion action proposed by NMFS in the Upper Yuba River watershed."*

In November 2010, the Licensees submitted the HEP (2010) to NMFS for approval pursuant to the HEA (2007). The HEP (2010) recommends the following three actions to meet the requirements of the HEA (2007), collectively referred to as "the Lower Yuba River Actions":

- Expansion of spawning habitat at Sinoro Bar in the Englebright Dam Reach above the Deer Creek confluence;
- Expansion of spawning habitat at Narrows Gateway in the Narrows Reach below the Deer Creek confluence; and

- The option of planning for and installing a seasonally operated segregation weir on the Yuba River below the outlet of the Narrows Pool to segregate spring-run and fall-run Chinook salmon, if deemed necessary by the resource agencies.

From late 2010 to early 2011, the parties considered various issues concerning consistency between the Federal Energy Regulatory Commission's (FERC) Oroville Project (P-2100) Settlement Agreement, the HEA/HEP process, and the development of the State Water Resources Control Board's Clean Water Act Section 401 Water Quality Certification for the P-2100 project. In March of 2011, they a reached a resolution of these differences that was incorporated in the Amended HEA, (Amended HEA 2011).

From late 2010 through early 2012, NMFS received additional reports and reviews from interested parties. In particular, NMFS received reports submitted by Dr. Gregory Pasternack, working in a consulting capacity for the licensees (Pasternack 2010a; 2010c). Dr. Pasternack's reports were extensively cited and relied upon in the final HEP (2010). To assist in analyzing Dr. Pasternack's reports, NMFS hired Dr. Carl Mesick, an expert on Central Valley Chinook habitat restoration and life history, to provide an independent review (Mesick 2010). In addition, NMFS Hydraulic Engineer, Dr. David Crowder, prepared a separate review and analysis (Crowder 2012). Dr. Pasternack, subsequently responded to these reviews, providing additional clarification (Pasternack 2012).

In late February 2012, pursuant to Section 4.2.2 of the Amended HEA (2011), NMFS initiated the 60-day consultation period with all Parties, the State Water Resources Control Board and directly affected and responsive third parties, in which NMFS is required to "*give due consideration to any comment received,*" "*specifically address any comment by a Party or other commenter alleging the habitat expansion action(s) recommended by the Licensees are Existing Requirements and Commitments,*" and consult with USFWS and CDFG "*to consider the*

*recommended habitat expansion action(s)' potential benefits and impacts on resident fish at the location of the actions(s).*"

By July 2012, NMFS had received comments from the Licensees, stakeholders, and responsive parties (including three landowners along the lower Yuba River). NMFS also consulted with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW, formerly known as the California Department of Fish and Game) in late February 2012.

Regarding the question of potential impacts to resident fish, the USFWS did not express concerns or provide written comments on the effects of the proposed HEP (2010) on resident fish (see Amended HEA Section 4.2.2). The CDFW provided oral feedback, but did not provide any written comments on the HEP (2010).

Regarding the question of whether actions contemplated under the HEP represent existing requirements and commitments, the USFWS communicated its written comments on the HEP (2010) by letter dated April 27, 2012 (USFWS 2012). Among other technical and scientific issues, USFWS raised a concern regarding whether the habitat expansion action(s) recommended by the Licensees are Existing Requirements and Commitments. The USFWS (2012) concluded:

> *"The proposed actions, if implemented as described in the [HEP], are not likely to achieve the HEA goal of expanding the amount of spawning, rearing, and adult holding habitat for spring-run and steelhead in the Sacramento River Basin. As described above, the [HEP] is not consistent with the HEA, because it: (1) overestimates contribution to the HET; (2) does not have adequate testing, operation, and maintenance; (3) is not likely to contribute to a separate, self-sustaining population of spring-run; (4) presents a segregation action that is limited in scope, overly constrained, and may put undue pressure on the local fall-run population; (5) overlaps significantly with the regulatory requirements of other parties; and (6) does not give adequate consideration to in-kind mitigation."* (p. 8)

The Licensees requested and NMFS agreed to a meeting, which was held on October 11, 2012, to address specific technical questions about the HEP (2010) vis-à-vis the requirements of the HEA. Based on the outcome from that meeting, and in anticipation of a second meeting proposed by the Licensees to focus on eligibility issues, NMFS staff continued to evaluate the HEP (2010) from October 2012 to May 2013. In May 2013, the Licensees withdrew their request for a second meeting focusing on eligibility issues. Accordingly, NMFS now communicates its determinations regarding whether the HEP (2010) meets the NMFS Approval Criteria in Amended HEA (2011) Section 4.2.3.

## 3.0 Application of NMFS' Approval Criteria, Amended HEA (2011) Section 4.2.3, to the HEP (2010)

This section focuses on NMFS' Approval Criteria listed in Amended HEA (2011) Section 4.2.3, which states:

> "*In determining whether to approve the Final Habitat Expansion Plan, NMFS shall review information submitted by the Licensees, comments by other Parties and directly affected and responsive third parties, and any other relevant information, and consider the extent to which the habitat expansion action(s) recommended in the Plan meet the following Approval Criteria:*
>
> *(a) estimated to meet the Habitat Expansion Threshold;*
>
> *(b) assures necessary testing, operation and maintenance;*
>
> *(c) supports establishing a geographically separate, self-sustaining population of Spring-run;*
>
> *(d) supports segregating spring-run habitat from Central Valley fall-run Chinook salmon;*
>
> *(e) meets the requirements for eligible habitat expansion action(s) pursuant to Section 3 of this Agreement; and*
>
> *(f) expected to be implemented within a reasonable period of time."*

### 3.1 Approval Criteria: (a) "*estimated to meet the Habitat Expansion Threshold*"

The amended HEA Section 1.1 defines ***"Habitat Expansion Threshold*** *as "the expansion of spawning, rearing and adult holding habitat as set forth in Section 2.2 of this Agreement."* Section 2.2 describes the Habitat Expansion Threshold (HET) as follows:

> *"**The specific goal of the Agreement is** to expand **spawning, rearing and adult holding habitat** sufficiently to **accommodate an estimated net increase** of 2,000 to 3,000 Spring-run for spawning ('Habitat Expansion Threshold') in the Sacramento River Basin, **as compared to the habitat available under any relevant Existing Requirements or Commitments**. The Habitat Expansion Threshold is focused on Spring-run as the priority species, as expansion of habitat for spring-run typically accommodates steelhead as well."* [emphasis added]

In making its determination under this approval criterion, NMFS notes several points regarding elements of Amended HEA (2011) Section 2.2, which are emphasized in bold above. The specific goal is to expand **three** types of habitats, *i.e.* adult spawning, adult holding, and juvenile rearing. This is supported by the definition of "Habitat Expansion Threshold" in Amended HEA (2011) Section 1.1 ("***Habitat Expansion Threshold*** *shall mean the expansion of spawning, rearing and adult holding habitat as set forth in Section 2.2 of this Agreement.*"). However, the HEP (2010) does not elaborate on the attributes of adult holding pools, cover habitat, or any additional juvenile rearing habitat that will be provided during the creation of spawning habitat. Mesick (2010) notes that most successful restoration projects that were highly used by Chinook salmon spawners had natural refugia, such as pools at least four feet deep, surface turbulence, shade, and/or large woody debris for cover in the vicinity of the spawning beds. In addition, no details were provided regarding juvenile rearing habitat (HEP 2010). Mesick (2010) and USFWS (2012) both note that the proposed design is very vague as to habitat details (other than spawning gravel).

In addition, the specific goal of the HEA calls for a habitat expansion action sufficient to meet or exceed the numerical threshold, *i.e.-"...an estimated **net increase** of 2,000 to 3,000 spring-run **for spawning**..."* [emphasis added]. In other words, the numerical standard of the HET refers to the adult spring-run estimated to return to spawn ("escapement") where they were produced as the result of habitat expansion action(s). This is consistent with the long-standing practice of measuring salmon abundance trends by monitoring the annual adult escapement to a river. It also implies that the habitat action must involve a stream where sufficient adult holding and rearing habitat (in addition to spawning habitat) can be (1) successfully restored to accommodate the addition of the HET, or (2) shown to intrinsically exist (in a currently unoccupied stream) over and above the existing conditions accessible to both species.

This specific goal provides for establishing an existing or baseline condition, against which the "estimated net increase" due to habitat expansion is compared. The existing or baseline condition consists of, among other things, any relevant 'Existing Requirements or Commitments' as described in Amended HEA (2011) Section 3.2 (see discussion below at Section 2.5). Furthermore, in order for there to be an increase of 2,000-3,000 spring-run for spawning, there must be sufficient habitat for these spawning fish to complete their entire life-cycle from egg to adult. Simply adding enough physical habitat to accommodate 2,000-3,000 fish for spawning does not guarantee that there is sufficient holding and rearing habitat to accommodate this increase. While habitat conditions in the ocean and estuarine phase of the salmonid life cycle were considered beyond the scope of this agreement, incorporating three kinds of fresh water habitat – adult spawning, adult holding, and juvenile rearing – were specifically articulated in the construction of the HEA's goal statement.

The USFWS (2012) notes that the Yuba River spring-run population has low abundance, low productivity, and limited spatial structure, and that only about nine percent of the Chinook salmon that spawned in the lower Yuba River originated from there (citing Barnett-Johnson *et al.* 2011). The USFWS (2012) also notes that the Yuba River population of spring-run is a population sink for other nearby spring-run populations (citing Schick and Lindley 2007) and is affected by additional limiting factors that the HEP (2010) does not consider. These additional limiting factors include poor juvenile rearing and outmigration conditions due to entrainment, predation, low prey availability, inadequate stream cover, limited shaded riverine habitat, and poor connection to the floodplain. The USFWS (2012) notes that although the HEP (2010) contains a discussion of limiting factors a more robust list can now be compiled using recent documents, such as the NMFS' 2011 status reviews for spring-run (NMFS 2011a) and steelhead (NMFS 2011b) and NMFS (2012a).

USFWS (2012) also notes additional limiting factors expected to occur in the future that could impact spring-run and the success of the habitat expansion actions recommended in the HEP (2010). These future limiting factors include increased water diversions from the Yuba River, global warming and increasingly variable climatic conditions, and increased anthropogenic urbanization and growth (USFWS 2012, p. 6). The combination of all limiting factors – including these additional limiting factors not considered in the HEP (2010) - results in substantial uncertainty, and casts significant doubt on whether the Licensees' estimate of the Lower Yuba River Actions' contribution to the HET is adequately supported.

The additional factors limiting a robust spring-run population have not been adequately considered by the Licensees, particularly with respect to holding and rearing habitat. NMFS agrees with other reviewers that the final HEP (2010) does not evaluate specific habitat attributes

of holding pools, cover habitat, or juvenile rearing habitat that will be provided during the creation of spawning habitat. In the October 2012 technical meeting, the Licensees clarified that the HEP (2010) proposes to "optimize" the existing mix of habitats within each restoration area by expanding spawning habitat (an action that would likely reduce existing pool habitats) and states that some undetermined amount of rearing habitat will naturally occur due to the nature of the restoration. NMFS is concerned that an inordinate amount of focus in the HEP (2010) is dedicated to restoring spawning habitat, while not adequately considering the importance, availability (or lack thereof), and spatial proximity of other habitat types that salmonids require to successfully complete their life cycle. The HEP (2010, p. 3-10) acknowledges that juvenile rearing habitat may be an important limiting factor in the lower Yuba, yet the Plan does not propose to sufficiently improve or expand it. The HEP (2010), Appendices M and L, present plans for restoring juvenile rearing, riparian, and floodplain habitats, but these are not included as part of the HEP's (2010) recommended habitat expansion actions.

In addition, NMFS disagrees with the redd density values presented in the HEP (2010), which are critical in calculating whether the actions meet the HET. The procedure for estimating redd densities described in Pasternack (2010a; 2010c) takes the proposed total spawnable area created (40,738 $m^2$) and divides it by an estimate of redd size (11.1 $m^2$) to achieve an estimate of 3,670 redds. This estimate assumes that an average redd size (5.5 $m^2$) has an *equal unoccupied area* for a total redd density of 11.1 $m^2$/redd in the Project area. Given the importance of these numbers to the calculation of the HET, NMFS performed additional review and research to assess this aspect more thoroughly. The result is that NMFS cannot find sufficient scientific support, in the HEP or any of its supporting documents, for the formula of determining theoretical redd density by adding an equal unoccupied area to redd size.

There is an important distinction between redd size and redd density. In general, spring-run Chinook salmon redd density (measured in terms of $m^2$/redd) reflects the total amount of space between redds that is normally exhibited by the pattern of adult spawners in a given stream. This spatial requirement includes not only the physical dimensions of the redds themselves, but also an envelope of defensible space that spawning adults generally exert while mating and protecting their territory. Thus, in addition to accounting for the typical, physical dimensions of the redds themselves it is important to incorporate an accurate representation of the behavioral component of redd-building - and defending - in a natural (non-hatchery), riverine environment. Furthermore, actual redd density can be quite different from theoretical redd density because actual redd density is limited by river stage at particular river discharges. River stage can fluctuate considerably during the months of spawning and egg incubation. At lower discharges, a significant amount of theoretical redd space can become unusable - by virtue of the fact that areas at the margins become too shallow (or dewatered) when the water level decreases. At higher discharges, redds can be damaged or destroyed by the hydraulic energy imparted during flood flows. These stage-discharge factors are not analyzed on a site-specific basis in the formulation of the HET calculation.

NMFS research identified a range of reported spring-run redd sizes from 3.3 $m^2$ - 9.5 $m^2$ (Stillwater 2012, p. 39). The HEP's (2010) chosen redd size of 5.5 $m^2$ is within this range. However, it is the computation of redd density (size of redds and unoccupied area in a given habitat unit) that lacks scientific support. During the October 2012 technical conference, Dr. Pasternack cited Stillwater (2012) as support for using his chosen values. Although Stillwater (2012) uses 5.4 $m^2$ as a redd size, the redd density is much lower (i.e. higher $m^2$/redd value) as only a maximum of 3.2% of total habitat unit is "usable" as spawning habitat, with the rest being

unoccupied (Stillwater 2012, p. F-3). NMFS did not locate scientific evidence supporting adding an equal unoccupied area around each redd as an accurate calculation of redd density. No citations or reasons for this choice are provided in Pasternack (2010a; 2010c) or in the HEP (2010). During the October 2012 technical meeting, Dr. Pasternack did not explain whether this assumption was derived from observed values or by professional judgment. To date, NMFS has not received any clarifying information from Dr. Pasternack since the October 2012 technical conference.

NMFS finds many other observations that support a lower redd density (i.e. a higher $m^2$/redd value). Pasternack 2010a (citing Pasternack 2008) reports 322 redds observed in 8.64 hectares (86,400 $m^2$) of riffle area (Table 2, p. 16) which equals a redd density of 268.32 $m^2$/redd. While it is unlikely that all of the riffle areas used in these calculations have suitable depth, velocity, and substrate spawning criteria, the calculations illustrate that in the most highly utilized spawning area on the Yuba River, Chinook salmon are spawning at densities 20 to 30 times lower than the 11.1 $m^2$/redd density used in the HEP.

As a second check, NMFS reviewed data collected from over three years of monitoring to assess a similar gravel rehabilitation project on the American River (Cramer Fish Sciences 2010). The data reveal an average redd density of 93.1 $m^2$/redd. Furthermore, observed redd densities reported in Pasternack (2010a; 2010c) at the Mokelumne River site (18.3 $m^2$/redd) represent fall-run congregating below an impassable barrier during a year of high escapement when hatchery operations were changed to allow a large percentage of fall-run to remain in the river to spawn.

The USFWS (2012) notes two problems with the Licensees' use of data from the Mokelumne River. First, the area in the Mokelumne River from which the data were derived has certain

favorable habitat conditions and is adjacent to a fish hatchery that is likely to be supplementing the number of the wild fall-run spawners as a result of hatchery fall-run production. In contrast, the lower Yuba River area, where the Licensees are recommending habitat expansion actions in the HEP (2010), does not have the same favorable habitat conditions and is not adjacent to a hatchery weir. USFWS (2012) describes the relatively different habitat conditions between the Mokelumne and Yuba rivers as follows:

> "*The selected area on the Mokelumne River has a verdant riparian edge, a hardwood riparian overstory, good connection to the floodplain, is 0.1 mile downstream of the hatchery weir, and is adjacent to a fish hatchery . . . the lower Yuba River sites have depauperate riparian edges, minimal and scrubby overstory, poor connection to the floodplain, poor local reproduction to supplement the population, and are not adjacent to a hatchery weir.*" (USFWS 2012, p. 4)

Second, USFWS (2012) notes that the high fall-run returns to the Mokelumne River Hatchery in 2005 are expected to increase crowding downstream of a hatchery weir, resulting in a bias in the calculated mean redd density. USFWS (2012) believes the HEP (2010) overestimates the HET because the HEP (2010) uses an abnormally small redd density value.

There have also been many attempts to determine the theoretical redd densities in a given habitat area. Theoretical estimates of redd density tend to be higher (i.e. smaller $m^2$/redd value) than observed values because theoretical estimates usually assume optimal conditions. Groves and Chandler (2003) uses a theoretical redd density of 45.8 $m^2$/redd including unoccupied area:

> "*To assess redd capacity we required a value to describe the area needed for a female to successfully build a redd. Literature values were available but varied considerably, ranging from approximately 17 $m^2$ (Chapman et al. 1986) to 75 $m^2$ per redd (Swan 1989)... Certainly 70 to 75 $m^2$ would be conservative (erring significantly on the side of the fish), and 17 $m^2$ seems liberal (resulting in an overestimate of capacity). The value developed for this study, 45.8 $m^2$ per redd, was consistent within high-use area of both the Columbia and Snake Rivers...*" (p. 20).

Jager *et al.* (1997) uses a theoretical "average defended redd area" of approximately 20 $m^2$ which equates to four times the actual redd area, as cited in Burner (1951).

Based on these comparisons, NMFS concludes that the 11.1 $m^2$/redd density estimate used in the HEP (2010) is not scientifically supported and the 18.3 $m^2$/redd density estimate reported in Pasternack (2010a; 2010c) at the Mokelumne River site is on the extreme lower end of observed values. Using the 3-year average of observed redd density from the American River gravel rehabilitation project of 93.1 $m^2$/redd will yield an estimated 438 redds (40,738 $m^2$ / 93.1 $m^2$) in the proposed restoration area. Using a theoretical redd density like the one used in Groves and Chandler (2003) (45.8 $m^2$/redd) yields an estimate of 889 redds (40,738 $m^2$ /45.8 $m^2$) in the proposed restoration area. Both estimates are far fewer than the 3,670 redds estimated in Pasternack (2010a, 2010c) and drastically reduce the "reference potential" abundance in the HET calculation. If the observed redd densities in Timbuctoo Bend (as cited in Pasternack 2008) are used by comparison, the projected number of redds falls further below the HET threshold. Further, in its comments on the HEP (2010), the USFWS (2012) states:

> *"The USFWS has carefully reviewed the [HEP] estimated contribution to the HET and finds the assumptions used to make the calculations are not based upon the most relevant scientific information. The [HEP] uses fall-run Chinook salmon (fall-run) spawning densities (from Mokelumne River data) as a metric, rather than the measured spring-run response to gravel augmentation in the lower Yuba River; consequently, the [HEP] overestimates the potential HET contribution of the spawning habitat enhancement actions."* (USFWS 2012, pp. 3-4).

NMFS agrees with the USFWS that the Licensees should have used observational data from the Yuba River, *e.g.*, from the USFWS' Anadromous Fish Restoration Program reports (USFWS 2010) or the Yuba River Management Team data, or elsewhere, as a check on predictive estimates of spawning habitat accommodation. Using a more realistic redd density indicates

there is insufficient expansion of even one type of habitat (adult spawning) to accommodate an estimated net increase of 2,000 to 3,000 spring-run for spawning.

The Licensees' analysis of how the Lower Yuba River Actions are estimated to meet the HET includes an area-based estimate of spawnable substrate and average redd densities that will accommodate a certain number of fish. This area/fish numbers estimate is then reduced to account for qualitatively described habitat limitations in the HEP's (2010) action area (HEP 2010, p. 4-8 to 4-9 and Appendix N). In doing so, the Licensees assume a baseline habitat potential of 200 spring-run spawners in the HEP's (2010) action area. No explanation is provided as to how that baseline number was derived or what the proportions of fall-run and spring-run would be (HEP 2010, p. 4-8 and Appendix N, p. N-2). Nor is there an adequate analysis of the potential unintended consequences that might result from further superimposition of redds, and segregation and fragmentation of habitats downstream of Englebright Dam, specifically as it pertains to populations of fall-run Chinook, green sturgeon, steelhead/rainbow trout and other fishes that utilize the same river reaches.

NMFS notes that the HEP's (2010) procedures to develop HET results are extremely sensitive to the assumptions about "reference potential' input. Prior to the development complex of Narrows I and II hydroelectric facilities and Englebright Dam, there is little support for the "reference potential" estimate of 3,670 redds and 7,340 spawning adults in the subject reach. Pasternack (2010a; 2010c) describes transformation of the point-bar morphology in the Englebright Dam Reach (EDR) at Sinoro Bar into expanded spawning riffle habitat and 1-2 adult holding pools. Pasternack (2010a, p.2) cites the presence of "multiple gravel-bedded riffles" in historical photos from 1909 as evidence that "physical processes and morphologies" in the EDR are suitable to support spring-run spawning habitat. This argument is flawed because the 1909

photos represent the "pre-dam era" when this reach was inundated with huge sediment loads transported downstream as a result of extensive hydraulic mining in the upper watershed. This wave of sediment overwhelmed the transport capacity of the river, producing alluvial features unlikely to exist under typical natural conditions. NMFS does not believe that these conditions are achievable and/or sustainable at the same magnitude as observed in the 1909 photo because of the unnatural nature of sediment transport conditions produced during the era of intensive hydraulic mining, coupled with the fact that Englebright Dam and modern flow regimes have virtually eliminated all sediment supply and altered depositional patterns. Unless a decision is taken to remove Englebright Dam, the more relevant geomorphology regime for purposes of habitat potential and sustainability of this project proposal is that of the post-dam era, not that which existed in 1909.

Although Pasternack (2010a, 2012) maintains that mid-20$^{th}$ century gold mining is the primary reason for degraded habitat, there is no convincing evidence provided in the HEP or Pasternack (2010). No aerial photographs of Sinoro Bar are in evidence between 1952 and 1986, when most of the significant morphological change took place. Although bulldozers were photographed on the ground in 1960, four large floods occurred during this time period, including two of the three largest floods on record, which dramatically changed the morphology of Sinoro Bar. After the 1997 flood, former mining pits filled with 6-8 meters of sediment, riffles became armored, and shot rock was deposited (Pasternack 2010, p.75). There is no evidence of mechanized gold mining after the 1997 flood. While mining activities may have temporarily altered the localized morphology of Sinoro Bar in the past, the current driver of degraded habitat is the 77,000 tons of gravel that is trapped by Englebright Dam on average each year,[2] combined

[2] calculated by 404,000 t/yr. total sediment multiplied by 19% gravel [Snyder 2004]

with shot rock deposited during high flows in the lower Yuba River that erode canyon walls adjacent to Englebright Dam.

In the HET procedure described in HEP (2010) Appendix N, the Licensees apply a number of adjustment factors to the "reference potential" abundance to reach a final estimate of spawning adults. To support their argument, the Licensees provide spreadsheets with the HEP (2010) entitled: *Habitat Expansion Threshold (HET) Evaluation Tool, Final Version, November 1, 2010.* The HET procedure estimates a net benefit of 4,182 spring-run due to the Lower Yuba River Actions, based on estimates in Pasternack (2010a; 2010c) and subsequent HET calculation. In addition to the "reference potential" number, NMFS also questions the adjustment factors used in the HET calculation. The only source cited for various adjustment factors in these spreadsheets is "HEA Technical Committee's Best Professional Judgment." Therefore, it is unclear how these adjustment factors were derived and whether there is any scientific support for these adjustment factors.

In Appendix N, the HEP mentions that a second qualifier on the estimated contribution to the HET relates to the use of the expanded habitat by both spring and fall-run Chinook salmon (HEP at p. N-14). In this context, HEP Appendix N mentions the *"action of constructing a weir to mechanically separate fall-run and Spring-run, if deemed necessary by the resource agencies (NMFS, USFWS, and [CDFW])"* (HEP at p. N-14). Therefore, the HEP, Appendix N, recognizes that both spring-run and fall-run will use the proposed expanded habitat (HEP at p. N-14). However, the methodology for estimating the contribution of the recommended actions to the HET does not address this recognized limitation. It assumes that all proposed expanded habitat will contribute to spawning habitat for spring-run. Appendix N of the HEP mentions the segregation weir, but the segregation weir is optional and any contribution that it may have to the

estimated HET is speculative because the HEP relies on the resource agencies to install, operate, and maintain the weir. However, the resource agencies are under no obligation to do so, nor are they committed to do so. Finally, even if such a segregation weir concept were employed, the Plan fails to recognize the unintended consequences that could be incurred relative to the management of habitat productivity for other species such as fall-run Chinook salmon, green sturgeon, and *O. mykiss* (resident and anadromous trout).

Thus using a more realistic redd density value (alone) will clearly reduce the estimated abundance to below that of the HET threshold of 2,000-3,000 adults. If the ambiguities associated with the adjustment factors and the contribution of a segregation weir are added to the assessment; combined with the uncertainties associated with the preliminary nature of the conceptual design, and the speculative prospects for long term operations and maintenance are considered (see discussions below); then the potential of the HEP to achieve the Habitat Expansion Threshold becomes more dubious.

In concluding this section, NMFS makes clear that it is <u>not</u> taking the position that habitat restoration actions in the Englebright Dam and Narrows Gateway Reaches are untenable propositions. Some of the elements and general approaches proposed for creation of enhanced spawning and holding habitat have merit; and they should be considered in future design processes. However, NMFS does not agree with the magnitude and intensity of the approach which seeks to achieve an unnaturally high level of biological performance - using engineering techniques and predictions that rely too heavily on restraining, modifying, or altering the river's natural tendencies and capacities. The Licensees do not provide sufficient support to conclude that the Habitat Expansion Plan's proposed methods, which help form the basis of the Licensees'

Habitat Expansion Threshold estimate, can achieve the intended results and hence the requirements of the HEA. [3]

For the reasons listed above, NMFS finds that the habitat expansion actions recommended in the HEP (2010) do **not** meet approval criterion (a) of section 4.2.3 of the Amended HEA (2011).

### 3.2 Approval Criteria: (b) "*assures necessary testing, operation and maintenance*"

In order for the HEP to be approved under criterion (b), it must assure necessary testing, operation, and maintenance. The proposed spawning habitat expansion actions in the EDR and Narrows Reach (Sinoro Bar and Narrows Gateway) aim to create very specific depths, slopes, and velocities in a very dynamic and unstable environment. NMFS, as well as other commenters, find no assurance in the HEP (2010) that the proposed actions can or will be maintained to operate as designed. Lack of detail about the proposed actions casts further doubts on whether the proposed actions are even achievable. The Licensees do not address this criterion in HEP (2010) Chapter 4, where they compare the Lower Yuba River Actions to NMFS' Approval Criteria under the Amended HEA (2011) and other factors.

The Licensees have not provided adequate assurance that the proposed Sinoro Bar and Narrows Gateway rehabilitations, will operate as suitable spawning habitat or can be maintained over the license term. Although the Yuba River has many impoundments that alter flow, the lower Yuba River retains a dynamic flood regime. Peak flows downstream of Englebright Dam frequently exceed 20,000 cfs and occasionally exceed 100,000 cfs; the January 1997 flood peaked at 154,000 cfs. Peak flows of such high magnitudes scour, fill, and drive major geomorphologic changes as shown by the aerial photography in Pasternack (2010). There is no mention in the HEP (2010) of how the Lower Yuba River Actions will maintain long expanses of

[3] See further discussion of this issue on pp. 19-24.

spawning riffles with specific depths and velocities during and after such flow events. Dr. Pasternack commented during the October 2012 meeting that he believes the proposed rehabilitations would be stable at flows up to 30,000 cfs, which corresponds to an event with a 10-year recurrence interval; but no hydraulic analysis was provided to support this opinion. There is no mention in the HEP (2010) of the cost of construction and maintenance every ten years and whether the original design specifications will or can be recreated after such high magnitude flow events as the 1997 flood.

Smaller floods from 5,000 cfs - 30,000 cfs are also of concern to NMFS. Although these events may not cause as much morphological change as larger floods, they still may have the capacity to transport spawning sized gravel in the habitat rehabilitation area. There is no mention in the HEP (2010) about plans for detection of geomorphological alteration/destabilization events that affect the distribution and integrity of available spawning substrate; nor is there identification of a threshold of change which would trigger maintenance or repair of the Lower Yuba gravel enhancement actions following high flow events. While it may be clear after a flood greater than 30,000 cfs that the rehabilitation is not performing as designed, smaller floods may alter gravel hydraulics in more subtle ways as well, causing reduced spawning habitat suitability in the following years. Since the HEP (2010) does not include any monitoring plan in the Lower Yuba River Actions to ensure that the Lower Yuba River Actions are built and perform as designed, there is no way to tell when maintenance is required.

Pasternack (2010a; 2010c, 2012) points out that riffles in the upper half of the EDR are not sustainable because canyon width undulations are in phase with bedrock bed undulations, but that "flow convergence routing" can be used manipulatively to ensure riffle-pool sustainability near Sinoro Bar. This opinion relies on the thinking that gravel depositional areas would be

maintained because they would occur where channel width increases (within the perimeter of the valley) and stream velocity decreases. Although this reasoning may explain why Sinoro Bar has persisted as a depositional point bar, it does not support creation and long term maintenance of long riffle expanses (1,650 ft.) of homogenous depth and velocity that look nothing like the current channel morphology. The proposed fabricated habitats will contain triple the length of riffle habitat vs. pool habitat (1,650 ft. vs. 520 ft. respectively, Pasternack 2010a, p.9). This is in stark contrast to the rest of the lower Yuba River, which has approximately equal areas of riffles and pools (18.4 % riffle area, 20.2 % pool area, Pasternack 2012, p.8). One can expect a greater percentage of pool area in the narrower bedrock canyon of the EDR. NMFS doubts that such expansive depositional features, such as the proposed spawning riffles (covering 60 to 75% of the Project area at Sinoro Bar depending on areas allotted to other habitat types and 80% of the Project area at Narrows Gateway), can be maintained at the proposed scale where scour processes currently dominate. Even if the entire rehabilitation area is engineered to have the desired hydraulics, the current flow (regular occurrence of high flows) and sediment (natural supply eliminated) regime will continually produce erosion and deposition that pushes the lower EDR towards its current deep pool and high point bar morphology, potentially rendering portions of the reach (where a high percent is hypothesized as becoming spawning habitat) as unsuitable, or highly compromised, for spawning. NMFS notes that a restoration design that includes a far greater diversity of habitats with a much smaller fraction as suitable spawning depth, velocity, and substrate would likely be far more feasible and sustainable in the high energy EDR and Narrows reaches.

Pasternack (2010a, 2012) states that "flow convergence routing" is the primary mechanism that controls pool-riffle location and persistence in the EDR and that it can be built into the

channel rehabilitation to sustain new spawning riffles. However, there is no mention of how this "flow convergence routing" will be changed from its current state (controlled by undulating canyon walls), nor is there sufficient scientific support showing it will be effective under the circumstances. The scientific studies cited in Pasternack (2010a) (i.e. Elkins *et al.* 2007, Wheaton *et al.* 2010) to support the stability of the Lower Yuba River Actions come from the Mokelumne River, which has a maximum possible discharge of only 5,000 cfs, a magnitude that is much less than high flood flows that have occurred over time in the lower Yuba River. The "flow convergence routing" cited by Pasternack (2010a, 2012) is typically produced by the relatively immutable constrictions of the valley walls and there is no proposal in the HEP (2010) to alter them. Although not stated in the HEP (2010), one might assume that the "flow convergence routing" would be attempted through placement of boulder and LWD structures; however, without any hydraulic modeling or evidence to support the success of this approach, there is significant doubt that such structures would produce "flow convergence routing" different than what the narrow canyons walls cause in the EDR at flood flows typical in the Yuba (e.g., 30,000 to 100,000 cfs), let alone withstand the hydraulic forces and not get blown out. Thus, it is highly questionable whether the use of engineered hydraulic control features can be effectively employed to override the forces of periodic flood flows. Instead, it is more than likely that these forces will inevitably alter the hydraulic conditions that would need to prevail in order to consistently promote 'exceptionally functional spawning grounds' (i.e., conclusions that 60 to 75% of the proposed Project area at Sinoro Bar and 80% of the area at Narrows Gateway will have suitable depth, velocity, and substrate spawning criteria) as envisioned by Pasternack, 2010a and 2012. Failure to consider this likelihood represents a flaw in the Licensees' projections, and illustrates one of the mechanisms of how this project proposal might fail to

sustain its initial spawning habitat characteristics over the long run. NMFS finds no assurance that this "process based" approach will sustain anything other than the deep pool and point bar morphology Sinoro Bar currently displays.

As previously mentioned, Pasternack (2010a and 2010c) postulated that a very high percentage of the proposed Project Area (60 to 75% at Sinoro Bar and 80% Narrows Gateway) located in a high energy, bedrock dominated canyon will continually function through time as high quality spawning riffles with suitable depths, velocities, and substrate size. NMFS has not been provided the necessary assurance that this high estimate of spawning area is testable, maintainable, and sustainable. Furthermore, for the Sinoro Bar Project Area, a significant portion of the proposed area to be converted to spawning riffle encompasses the high elevation point or is perched above the normal water surface point bar (i.e., the actual Sinoro Bar). The proposed Project proposes to eliminate entirely this current high elevation point by scalping it down to the bed elevation of the restoration design. Analysis of the 1909 photo of Sinoro Bar clearly indicates a similar point bar morphologic feature at Sinoro Bar - also perched above the water surface (likely during a low flow). This indicates that the point bar feature at Sinoro Bar is a persistent feature, potentially perpetuated by "flow convergence routing" by the undulating canyon walls. While NMFS does not question whether this point bar feature could be scalped down to the bed elevation, NMFS believes there is significant reason to believe that the hydraulic conditions created by the canyon bedrock walls would continue to promote deposition and build-up on the Sinoro Bar area, and has not been provided evidence to show otherwise. While the continued deposition and rebuilding of the point bar would be the natural physical process, it also would substantially reduce or eliminate much of the projected suitable spawning habitat as the area would no longer be inundated during the highly regulated spawning season flows. Once

again, the Licensees have not provided the necessary assurance that the entire footprint of the point bar at Sinoro Bar could be converted and maintained as spawning habitat at low flows.

In its comments, USFWS (2012) notes that the HEP (2010) does not address the risk of bed shifting and concludes, "*The [HEP] lacks the start-up testing, operation and maintenance to address project failure or to sustain the habitat expansion over time*" (USFWS 2012, p. 7). The Licensees could have provided assurance by modeling and evaluating the HEP's (2010) recommended habitat expansion actions; including testing, operation, and maintenance in the recommended habitat expansion actions; or some combination of these measures. However, the HEP (2010) does not include any detailed post-project hydraulic modeling or any kind of assurance that the proposed actions will be sustainable. Hydraulic modeling of a rehabilitated Sinoro Bar and Narrows Gateway has not been performed to assess how it would be rehabilitated and how the resulting configuration would persist under flows that would likely recur over the license term. The HEP (2010) cites the 2D modeling done on existing morphology, but that modeling is not relevant to the artificially constructed morphology that will be created post-project.

Crowder's (2012) comments also conclude that the HEP (2010) does not provide sufficient modeling to address how the proposed amounts and sizes of sediments will interact with the existing channel bathymetry, hydrologic regime, and any proposed habitat features over time. Crowder (2012) goes on to say,

> "*...[A]nswering these questions is problematic as channel bed evolution models particularly at the spatial scales needed to evaluate this project are difficult to calibrate and validate, would require many hydrologic events and series of events to be modeled, and have considerable uncertainty.*"

The existing supply of shot rock near Englebright Dam, the potential for future shot rock generation upstream of these rehabilitation sites, and the potential for future transport of shot

rock onto Sinoro Bar and Narrows Gateway sites have not been evaluated in the HEP (2010) to determine the potential to negatively impact the rehabilitated habitat at these two proposed sites. Pasternack (2010a) states:

> *"Based on historical events, if no action is taken to mitigate shot rock generation at Englebright Dam and if no design elements account for the backwater effect of Deer Creek, then rehabilitated conditions at Sinoro Bar could be short-lived."* (p. 11).

Given this statement, it is surprising that the final HEP (2010) has no plan to control generation of shot rock or to remove it from the proposed rehabilitation areas in the future. Similarly, the backwater effect of Deer Creek has not been adequately considered.

Finally, the Licensees have not provided assurance of operation and maintenance of the proposed segregation weir. Although the Licensees stated at the October 2012 meeting that they would fund a weir, the Licensees assume that the "resource agencies" would determine at some point in the future whether the segregation weir is necessary, and if they determine it is necessary, they would install, operate, and adaptively manage the weir (HEP 2010, p. 3-27). However, the resource agencies are not obligated to perform these actions, and the Licensees have not obtained any commitment from the resource agencies to support these assumptions.

For the reasons discussed above, NMFS finds that the habitat expansion actions recommended in the HEP (2010) do **not** meet approval criterion (b) of section 4.2.3 of the Amended HEA (2011).

### 3.3 Approval Criteria: (c) *"supports establishing a geographically separate, self-sustaining population of spring-run"*

The HEP (2010) accurately describes the importance of this criterion in NMFS' approval of a habitat expansion action(s) under the Amended HEA (2011):

*Presently, the only remaining independent, self-sustaining populations in the Central Valley spring-run Chinook salmon ESU occur in Mill, Deer, and Butte Creeks (Lindley et al. 2004). The lack of spatial diversity within the ESU impedes recovery of spring- run Chinook salmon and increases the risk of extirpation of the ESU. For this reason, development of new populations of spring-run Chinook salmon in the Central Valley is a high priority in the Public Draft Recovery Plan (NMFS 2009).* (HEP 2010, p. 4-11).

From the plain text in the Amended HEA (2011), it appears that "geographically separate" refers to development of an additional, self-sustaining population of spring-run. In other words, the habitat expansion action(s) in the HEP (2010) needs to support establishment of a self-sustaining population of spring-run that is geographically separate from other self-sustaining populations of spring-run. In addition, to be consistent with other management objectives, the HEA action(s) must not conflict with, or compromise habitat management strategies for other species. The Amended HEA (2011) does not define or describe what "self-sustaining population" means, but the HEP (2010) appears to equate this term with the "viable population" concept (McElhany *et al.* 2000; Lindley *et al.* 2007). NMFS agrees that a geographically separate, self-sustaining population of spring-run should generally meet the criteria that NMFS has developed to assess the viability of salmonid populations. However, the Habitat Expansion Agreement does not call on the action to necessarily meet a specific criterion for an "independent population." While this biological attribute is generally considered as a desirable goal to seek and develop over the long-run, it may not be practical to achieve independent populations in all recovery actions, especially during the initial stages of anadromous fish reintroduction. Therefore, NMFS reserves the right to determine whether, and to what degree this aspect is needed to satisfy management objectives within the context of the Habitat Expansion Agreement.

NMFS defines a "viable salmonid population" as an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame (McElhany *et al.* 2000). The following four parameters form the key to evaluating population viability status: abundance, productivity, spatial structure, and diversity. The NMFS' Central Valley Technical Recovery Team (TRT) established criteria to evaluate risk of extinction for salmon populations (Lindley *et al.* 2007). Lindley *et al.* (2007) characterize CV Chinook salmon populations with a low risk of extinction (less than 5% chance of extinction in 100 years) as (1) those with a minimum total escapement of 2,500 spawners over three consecutive years (mean abundance of 833 fish per year), (2) no apparent decline in escapement, (3) no catastrophic declines occurring within the last ten years, and (4) a low hatchery influence. Although Lindley *et al.* (2007) concludes that data are insufficient to assess the risk of extinction for the spring-run population in the Yuba River, Mesick (2010) postulates that a naturally produced spring-run population in the Yuba River would initially be characterized as being at a moderate risk of extinction (5% to 20% chance of extinction within 20 years). This characterization was based on 2005-2007 total spring-run escapement of 1,501 fish, where only about 450 fish were naturally produced. (The rest were fin-clipped Feather River Hatchery Spring-run.) Thus, for naturally produced spring-run to reach a low risk of extinction, the 3-year escapement (baseline abundance) would have to increase over five times the current level of predicted natural abundance (from 450 to 2,500 natural spring-run fish).

The HEP (2010) discusses only one of the viability criteria (abundance). It ignores the remaining viability criteria (*i.e.,* productivity, spatial structure, and genetic diversity). Even in

the discussion of abundance, the HEP (2010) does not specifically describe the abundance that will result from the recommended habitat expansion actions:

> *The Licensees have not attempted to make any conclusions regarding the actual abundance of fish that might return to the Yuba River as a result of the recommended actions. However, given the amount of habitat provided by the recommended actions, there is considerable reason to believe that an independent population of spring-run Chinook salmon can develop in the HEA action area, especially in conjunction with the optional use of a segregation weir and other management actions by the resource agencies and other stakeholders in the Lower Yuba River.* (HEP 2010, p. 4-12).

In addition to the problems with relying on the optional use of a segregation weir discussed in under Sections 2.2, 2.4, and 2.5, this conclusion in the HEP (2010) is based on the following unsupported assumptions.

First, the HEP (2010) states that the predicted number of fish/redd (at least two fish) and the estimated number of redds (based on redd area per spawning habitat area) support a conclusion that the recommended habitat expansion actions will result in an effective population size that exceeds the abundance criterion developed by the TRT to evaluate risk of extinction for salmon populations. However, based on HEA terms, computing escapement and population abundance should not be based upon an estimation of the number of redds that could be constructed in a spawning habitat area and/or a prediction of the number of fish/redd. Even if the estimated number of redds is correct, the number of redds alone does not necessarily mean that each or any of those redds will result in <u>sustained, successful reproduction (i.e., self-sustaining population).</u> This is particularly the case if the constructed redds are created using engineering approaches to artificially manipulate stream reaches in an attempt to support the intensive spawning capacity predicted by the HEP 2010. Furthermore, properly functioning habitats must offer more than just ample spawning area to promote the early life stages of a healthy salmonid population. Specifically, satisfactory habitat expansion actions must include (but are not limited to) the

following characteristics: (1) offer adequate holding pools for adults; (2) accommodate spawning fish; (3) incubate healthy eggs; (4) enable sufficient fry to hatch out; and (5) then those fry must be able to successfully rear and emigrate to complete their life cycle. If these elements are achieved, there is reason to expect a sustainable percentage of the progeny (of the spawning adults) will come back to the Yuba River (escapement). Therefore, the HET evaluation should not focus so narrowly on the potential numbers of fish that may be able to spawn per redd in a given area. Rather, the evaluation of the HET in this case should be based on a broader limiting factors analysis focusing on all habitats necessary to support the riverine components of the anadromous fish life cycle. Specifically, this should include the amount of additional adult *spawning*, adult *holding*, and juvenile *rearing* habitats provided as a result of the action(s), with a commensurate estimate of the escapement of returning fish. In the HEP (2010), as well as the October 2012 technical meeting, the Licensees focused mainly on spawning habitat; they did not adequately address issues associated with the expansion of suitable adult holding and juvenile rearing habitats. Juvenile rearing habitat (quality and quantity) is a vital component for the successful growth and development of healthy fry, smolts, and adult anadromous fish – enabling much better survival prospects throughout their life cycle. It is difficult to determine how any viability criteria can be met, because the analyses of the habitat expansion actions recommended in the HEP (2010) are based primarily on the potential numbers of available redds; it is unclear whether (and how) the habitat expansion actions recommended in the HEP (2010) would enhance valuable adult holding and juvenile rearing habitats.

Second, the HEP (2010) indicates that spatial structure and genetic diversity aspects of viability criteria would be met; but the Plan does not clearly address this issue. Instead, the Plan's success in this arena is dependent upon segregating fall-run and spring-run Chinook into

designated spawning areas downstream of Englebright Dam. These designated areas are limited in total area and functionally adjacent to each other. The scheme is an attempt to intensively manage and spatially regulate the reproductive behaviors of multiple species within a relatively small stream segment. This is complicated by the overlapping runs of Chinook salmon, steelhead/rainbow trout, green sturgeon, and other species that occupy the lower Yuba River. Although the HEP (2010) does mention that Feather River spring-run can stray into the Yuba River, the HEP (2010) does not fully discuss the true cause of this: the flow discontinuity between the Feather and Yuba rivers when flows in the Feather River are lower and/or warmer than flows in the Yuba River (USFWS 2012). This flow disconnect attracts adult spring-run, native to the Feather River, and Feather River Fish Hatchery spring-run into the Yuba River to spawn. In turn, this attraction of Feather River spring-run fish into the Yuba River results in compromising the genetic integrity of the native Yuba River spring-run. Mesick (2010) postulates that a large percentage of the spring-run that do return to the Yuba River are strays from the Feather River Fish Hatchery:

> "*Unpublished reports suggest that approximately 70% of the spring-run observed in the Daguerre Point Dam ladder with the Vaki Riverwatcher in 2009 had adipose fin clips, which indicates that these fish were hatchery reared .... It is likely that most of these fish were produced at the Feather River hatchery and that a substantial percentage of the Yuba River escapement has consisted of Feather River Hatchery fish ... Feather River Hatchery spring-run that stray to the Yuba River to spawn reflect the survival of the hatchery fish ... as well as the conditions that caused these fish to stray as adults to the Yuba River ...These fish do not represent a self-sustaining population in the Yuba River and should not be considered in an assessment of population viability for the Yuba River.*"

The HEP (2010) recognizes that stray fish from the Feather River Fish Hatchery would limit the ability of the recommended habitat expansion actions to support establishing a

geographically separate, self-sustaining population of spring-run unique to the Yuba River as shown below:

> *It should be noted that a potential limitation for establishment of a new independent population of spring-run Chinook salmon in the Yuba River is the incursion of fish from the Feather River Hatchery into the Yuba River. Mixing of natural and hatchery spring-run fish can impede development of a locally adapted population and lower overall fitness of the population (Lindley et al. 2007). Straying of fish from the Feather River will affect all restoration proposals in the entire Yuba River; it is the result of hatchery practices and conditions that are beyond the scope of the HEA.* (HEP 2010, pp. 4-12 to 4-13).

Regardless of the cause, the incursion of fish from the Feather River Fish Hatchery into the Yuba River is a factor that limits the ability of the HEP action(s) to develop a geographically separate, self-sustaining population of spring-run Chinook salmon.

For the reasons listed above, NMFS finds that the habitat expansion actions recommended in the HEP (2010) do **not** meet approval criterion (c) of section 4.2.3 of the Amended HEA (2011).

### 3.4 Approval Criteria: (d) *"supports segregating Spring-run habitat from Central Valley fall-run Chinook salmon"*

The Licensees put forth two reasons why their recommended habitat expansion actions meet this criterion (HEP 2010, pp. 4-10 to 4-11). First, "*The Licensees expect that some natural segregation of the two runs would occur based on habitat preferences and behavior.*" Second, the Licensees rely on the optional use of the segregation weir.

In its comments, USFWS (2012, p.6) notes that the value of the Licensees' recommended habitat expansion actions "*will depend greatly on the extent to which spring-and fall-run adults remain separated during spawning.*" USFWS (2012) states that recent acoustic tracking data "*suggest substantial spatial and temporal overlap between the two runs, which may lead to genetic introgression.*" In addition, USFWS (2012) notes, "*because fall-run generally spawn later than spring-run, superimposition of spawning could result in lower egg survival for spring*

*run*." Furthermore, the USFWS (2012) notes the spatial and temporal overlap of spring-run and fall-run adults during both the holding and spawning periods, concluding that - due to the low numbers of fall-run - "*it would be inappropriate to use a segregation weir to force spring-run spawning in fall-run habitat*." Finally, the USFWS (2012, p. 6) concludes that use of a segregation weir under these circumstances, "*would not constitute a true expansion of habitat*."

Historically, spring-run and steelhead only migrated through the lower Yuba River to spawn at higher elevations upstream; and even fall-run would have spawned a bit higher than the current impasse at the Englebright-Narrows hydroelectric complex (Yoshiyama *et al.* 1996; 2001). However, both spring-run and fall-run have been confined to the lower reaches of the Yuba River since construction of Englebright Dam. Spring-run are unable to migrate beyond this barrier into the higher elevation reaches they historically occupied. Therefore, spring-run are unable to geographically segregate themselves from fall-run. In a "brief" sent to NMFS after the technical meeting, the Licensees state that some "*natural segregation seems to be occurring in the lower Yuba*" (Licensees 2012b). NMFS cannot verify this anecdotal evidence of spring-run "*tending to occupy areas closer to Englebright Dam and fall-run fish concentrating in the Timbuctoo Bend area downstream.*" Although it may be occurring to some degree because spring-run are naturally seeking to pass further upstream at the Narrows 2 power plant, the evidence presented is insufficient to ascertain that the Licensees' recommended habitat expansion actions meet the approval criterion to support segregating spring-run Chinook salmon habitat from fall-run Chinook salmon. On the contrary, genetic studies have found widespread introgression between spring-run and fall-run in the lower Yuba River (NMFS 2004). This spawning overlap threatens the spring-run population in a variety of ways - including increased competition for spawning grounds, the destruction of redds due to superimposition, and

introgression that leads to a loss of a genetically distinct spring-run population (NMFS 2009a). The Lower Yuba River Actions propose to create new spring-run habitat in low elevation areas that were not historically associated as primary areas of spring-run spawning. This would place spring-run in competition with fall-run for any such "improved habitat." In such situations, the larger and more numerous fall-run Chinook salmon tend to dominate the spawning grounds. Likewise, steelhead would be forced to compete in the lower Yuba River as well, when historically they evolved to occupy higher elevation habitats for spawning and early life stage rearing. The Licensees assert that spring-run will tend to go farther upstream into the Englebright Dam reach than the fall-run, apparently basing this thinking on the current lack of spawning habitat upstream of Narrows Pool (HEP 2010; Licensees 2012b). However, what the Licensees fail to note is that if any new spawning habitat is created in the lower Yuba River below Englebright Dam, then both runs of Chinook salmon and steelhead would try to use it.

Finally, the Licensees propose a segregation weir in the HEP (2010) as "optional" (HEP 2010, p. 3-4). As described above under Section 2.2; they state that the resource agencies should have the responsibility to decide whether a segregation weir is necessary; and if the resource agencies decide it is necessary, then they (resource agencies) will be responsible for installing, operating, and adaptively managing the weir (HEP 2010, p. 3-27). In other words, the Licensees are not actually proposing to install, operate, and manage such a weir themselves, only to "support" it through funding. Even if it were possible to reach the HET through use of a fish weir, there could be no separation between runs of spring and fall-run Chinook salmon and steelhead unless the resource agencies agree to accomplish it by using their own management and staff resources. Yet, the agencies are not under an obligation to do so, nor have they committed to accomplishing such actions. Therefore, the Licensees have proposed an

incomplete action in the HEP (2010) that does not, on its own merits, support the segregation of spring-run habitat from fall-run.

For the reasons listed above, NMFS finds that the habitat expansion actions recommended in the HEP (2010) do **not** meet approval criterion (d) of section 4.2.3 of the Amended HEA (2011).

### 3.5 Approval Criteria: (e) *"meets the requirements for eligible habitat expansion action(s) pursuant to Section 3 of this Agreement"*

Amended HEA (2011) Section 3.1, Scope of Eligible Actions, states in relevant part:

> "*Actions identified in other venues, including unfunded actions, are acceptable for consideration, provided that implementation of this Agreement results in* ***a net expansion of habitat over any Existing Requirements and Commitments****, whether by the Licensees or others.*" [Emphasis added].

Amended HEA (2011) Section 3.2 describes Existing Requirements and Commitments and provides, in relevant part:

> *"Existing Requirements and Commitments may include but are not limited to:*
> * * *
> *(b) legal or regulatory requirements that are the subject of ongoing or imminent administrative or judicial action by an agency or court of competent jurisdiction at the time NMFS approves the habitat expansion action(s);*
> * * *
> *(d) reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions of any final Biological Opinion that has been issued at the time NMFS approves the habitat expansion action(s).*
> * * * * *"

Throughout the HEP's (2010) development process, NMFS raised concerns that the Lower Yuba River Actions recommended by the Licensees might be ineligible under Amended HEA (2011) Section 3, because these actions would not result in a net expansion of habitat over existing requirements under a NMFS Biological Opinion.

In 2009, during the development of the Draft HEP (2009), NMFS provided the Licensees a preliminary review of the HEA Steering Committee's "Working List" of potential habitat expansion actions (NMFS 2009b). NMFS identified several actions that it considered Existing Requirements and Commitments pursuant to the HEA (2007), including one regarding rehabilitation of the Narrows Gateway spawning habitat in the lower Yuba River. NMFS specifically alerted the Licensees to the existing requirements in terms and conditions of NMFS' Biological Opinion issued in November 2007 on the effects of the U.S. Army Corps of Engineers' (Corps) operation of Englebright and Daguerre Point dams on the Yuba River, California (2007 BO; NMFS 2007).

In comments on the Draft HEP (2009), NMFS (2010) states that the spawning habitat rehabilitation action proposed by the Licensees in the lower Yuba River is apparently ineligible under HEA (2007) Section 3.2(d), because it is within the scope of a term and condition in the 2007 BO. The non-discretionary terms and conditions in the 2007 BO include:

> *"1. The Corps shall develop and implement* ***a long-term gravel augmentation program to restore quality spawning habitat below Englebright Dam.***[4]
>
> *(A)* ***The Corps shall utilize the information obtained from the pilot gravel injection project*** *to develop and commence implementation of a long-term gravel augmentation program within three years of the issuance of this biological opinion."* (p. 40). [Emphasis added].

In its comments on the Draft HEP (2009), NMFS (2010) states:

> *"The reasonable and prudent measure and term and condition do not limit the Corps'*

[4] The emphasized text of this term and condition in the 2007 BO is broader than the text of a related term and condition in NMFS' 2002 biological opinion on the effects of the Corps' operation of Englebright and Daguerre Point dams on the Yuba River, California, which provides, in relevant part, " *3. The Corps shall develop and implement* ***a gravel injection program to provide suitable spawning gravel to key areas on the Yuba River which have been deprived of adequate gravel recruitment due to the existence of Englebright Dam.***" (NMFS 2002, p. 39; Emphasis added).

*responsibility simply to gravel injection similar to the pilot project initiated by the Corps in 2007. The Corps' responsibility is to 'restore quality spawning habitat below Englebright Dam.'"* (p. 26).

In addition, NMFS (2010) states:

*"Given that it is the Corps' responsibility to restore quality spawning habitat below Englebright Dam, the Corps must take whatever steps necessary to accomplish this task, including spawning habitat rehabilitation e.g., shot-rock removal. An additional factor supporting that the Corps should be responsible for removing the shot-rock is that one of the primary sources of the shot-rock was rock excavation during the construction of Englebright Dam, which the Corps owns and operates."* (p. 27)

Pasternack (*et. al.* 2010a; 2010b; 2010c) provides additional information that indicates:

- Angular shot rock is impairing spawning habitat below Englebright Dam;
- Shot rock was initially produced by the Corps during Englebright Dam construction;
- Shot rock continues to exist in the vicinity downstream of Englebright Dam; and
- During very high-flow spills (e.g., 1997, 2005, etc.), additional shot rock will likely be torn off the canyon walls near the Englebright Dam and transported to spawning areas downstream, where it will impair quality.

On July 8, 2010, a Federal district court issued an opinion regarding the 2007 BO and held that NMFS acted arbitrarily and capriciously in reaching the BO's no-jeopardy and no adverse modification conclusions and in issuing the incidental take statement in the BO.[5] On April 29, 2011, the court remanded the matter to NMFS to prepare a new Corps BO consistent with the court's July 8, 2010 order.[6] NMFS issued a new BO in 2012 (2012 BO; NMFS 2012a). The 2012 BO includes a reasonable and prudent alternative (RPA) with a suite of actions that the Corps must follow to avoid jeopardizing the continued existence of these listed species: CV spring-run Chinook salmon, CV steelhead, and the Southern DPS of North American green sturgeon.

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[5] *South Yuba River Citizens League v. National Marine Fisheries Service*, 723 F.Supp.2d 1247 (E.D. Cal. 2010).
[6] *South Yuba River Citizens League v. National Marine Fisheries Service*, 2011 WL 1636235 (E.D. Cal. 2011). On December 20, 2011, the court ordered NMFS to file the new biological opinion by February 29, 2012.

Relevant to the actions recommended in the HEP (2010), 2012 BO RPA Action 5 (Channel Restoration Program) includes the following:

*"The Corps shall develop and implement a long-term channel restoration program to restore properly functioning channel morphology and depositional surfaces downstream of Englebright Dam.*

*CR1. The Corp [sic] shall develop a Channel Restoration Plan for the Englebright Dam Reach, and upper portions of the Narrows Reach (extending from Deer Creek confluence to 1,000 feet downstream) of the Lower Yuba River, CA by December 2012. Specific areas to be included in the Channel Restoration Plan include Sinoro Bar, the mid-channel bar adjacent to the downstream end of Sinoro Bar at the Deer Creek confluence, and potentially other suitable depositions areas or surfaces that no longer function properly due to armoring or deposition of shot-rock. The Channel Restoration Plan will include conceptual level plans for design that identify areas where shot-rock needs to be removed, where channel recontouring should occur, locations for installment of potential flow obstructions, identify areas where local/site specific gravel additions are warranted, and identify sources of shot-rock in the vicinity of Englebright Dam that can be stabilized. At a minimum the Channel Restoration Plan will include shot-rock removal at Sinoro Bar and the mid-channel bar at the entrance to Narrows Gateway, recontouring of these bars, addition of at least eight flow obstruction structures that may potentially be part of the large wood augmentation program, and stabilization of shot-rock sources in the vicinity of Englebright Dam Localized gravel augmentation at the recontoured bars and hydraulic structures will also be included, specific amounts will be determined as part of the design process and potentially partially accounted for with the annual gravel augmentation supplied at the top if [sic] the EDR. An implementation schedule will also be part of this plan. The Channel Restoration Plan shall be submitted to NMFS for approval by December 2012.*

* * *

*CR4. The Corps shall complete the measures identified in the Channel Restoration Plan within five years of NMFS approval of the Channel Restoration Plan." (p. 235).*

* * * * *

By comparing the RPA action quoted above to the HEP (2010), it can be seen that the same areas and types of actions recommended in the HEP (2010) for expansion of spawning habitat at

Sinoro Bar and Narrows Gateway are essentially contained in the 2012 BO RPA Action 5 (Channel Restoration Program).

Similar to NMFS' concerns detailed in this section, the USFWS (2012) notes that they requested in their comments on the Draft HEP (2009) a clear accounting to ensure that there would be no overlap between Corps' requirements for gravel augmentation and the development of quality spawning habitat in the lower Yuba River and the habitat expansion action proposed in lower Yuba River in the Draft HEP (2009). The requested accounting was not provided. Based on the requirements of the 2012 BO RPA, the USFWS (2012) reiterated in their comment letter submitted during the Pre-Approval Consultation, "*A very clear accounting must be done to assure that there is no overlap between obligations of the [Corps] and the incremental contributions of [HEP] actions*" (USFWS 2012, p. 3).

In their comments, the Licensees assert that the actions proposed in the HEP (2010) remain eligible under the Amended HEA (2011), both for the reasons given in the HEP (2010) and for the reasons stated in the comments (Licensees 2012, p. 3). In the HEP (2010), the Licensees assert, "*The HEP recommended spawning habitat expansion actions at Sinoro Bar and Narrows Gateway are independent of, and complementary to, the Corps' gravel augmentation program below Englebright Dam*" (HEP 2010, p. 4-19). However, the Licensees' discussion in the HEP (2010) preceded the 2012 BO and RPA. As described above, the Lower Yuba River Actions recommended in the HEP (2010) for expansion of spawning habitat at Sinoro Bar and Narrows Gateway are essentially contained in the 2012 BO RPA Action 5 (Channel Restoration Program).

In their comments, the Licensees assert that the HEP (2010) actions are eligible pursuant to Amended HEA (2011) Section 3.2 because the HEP (2010) actions may be implemented sooner than the relevant actions under the RPA in the 2012 BO (Licensees 2012, p. 4; CDWR 2012, pp.

1-2). The Licensees note that Amended HEA (2011) Section 3.2 provides that Existing Requirements and Commitments are "*...intended to encompass actions expected to occur in a timeframe comparable to implementation of habitat expansion action(s) under the Agreement.*" The Licensees assert that they can implement the HEP (2010) actions in two to four years after NMFS approves the HEP (2010) (this assertion is reiterated in Licensees (2013), p. 2). First, this assertion assumes that NMFS can approve the HEP (2010) pursuant to the criteria of section 4.2.3 of the Amended HEA (2011). As noted throughout this response, NMFS also finds that the HEP (2010) does not meet the criteria of section 4.2.3 (a), (b), (c), and (d) of the Amended HEA (2011). Second, the HEP (2010) does not provide sufficient information to determine how long it would take to implement the proposed actions recommended in the HEP (2010). Therefore, even if NMFS were to determine that the HEP (2010) meets the other approval criteria under section 4.2.3 of the Amended HEA (2011), the Licensees do not provide sufficient information to support the assertion that the HEP (2010) actions would be completed in two to four years after NMFS approves the HEP (2010).

Regarding the current status of the BO, after issuing the 2012 BO, NMFS met with and received comments from the Corps, Yuba County Water Agency (YCWA), and the Pacific Gas and Electric Company (PG&E), as well as other parties (see, e.g., PG&E 2012, with attached comments from PG&E, the Corps, Yuba County Water Agency, and Nevada Irrigation District). After reviewing and considering these comments, NMFS actively explored with the Corps options for addressing outstanding issues associated with the consultation and jointly agreed to reinitiate consultation on the Corp's proposed activities at Englebright and Daguerre Point dams. Accordingly, on February 26, 2013, NMFS received a request from the Corps (2013) to reinitiate this section 7 consultation. The Corps stated that reinitiation of consultation is appropriate in

order for the Corps to provide NMFS with additional information on subjects that include: 1) the scope of the Corps' legal authority and jurisdiction, for purposes both of defining the proposed action and developing any reasonable and prudent alternatives (*see* 50 C.F.R. § 402.02); 2) the scope of the action area and the determination of which other activities are interrelated and interdependent with the proposed action; 3) the nature of the Corps' proposed activities; and (4) scientific and technical information regarding the listed species and effects of the proposed action on the listed species.

On April 11, 2013, NMFS (2013) communicated its agreement to reinitiate formal ESA section 7 consultation once the Corps provided all of the information necessary to evaluate the effects of the action on listed species and critical habitat as described in 50 CFR § 402.14(c). NMFS recommended that the Corps develop an updated biological assessment (BA) to evaluate the potential effects of the action on listed species and designated critical habitat, pursuant to 50 CFR § 402.12. This new information will be considered in the consultation and analyzed in the new biological opinion. This new biological opinion will reflect the best available scientific and technical information, and it will supersede the 2012 BO. Several entities have challenged the 2012 BO in federal district court, and the court ordered stays of these actions that will be automatically lifted upon issuance of a new biological opinion. The Corps must submit to NMFS a final BA by October 22, 2013, and NMFS must issue a final biological opinion by May 12, 2014.[7]

Because the 2012 BO is subject to reinitiation of consultation and a new BA and biological opinion are required by certain dates, and NMFS' final determination regarding whether the habitat expansion actions recommended in the HEP (2010) meet the Approval

[7] *South Yuba River Citizens League v. National Marine Fisheries Service*, 2013 WL 4094777 (E.D. Cal. 2013) (slip opinion dated August 13, 2013).

Criteria in Amended HEA (2011) Section 4.2.3 is subject to further procedures as described in Section 5.0 of this response below, NMFS will not make a determination at this time whether the habitat expansion actions recommended in the HEP (2010) meet approval criterion (e) of section 4.2.3 of the Amended HEA (2011). However, based on the provisions of section 4.2.4 of the Amended HEA (2011) and NMFS' determinations herein regarding whether the habitat expansion actions recommended in the HEP (2010) meet other approval criteria of section 4.2.3 of the Amended HEA (2011), NMFS notes that its determination regarding criterion (e) should not affect NMFS' final decision regarding approval of the HEP (2010).

## 4.0 NMFS Determination Regarding the HEP (2010)

Based on the discussion above, and subject to additional procedures described in Amended HEA (2011) Sections 4.2.5 through 4.2.7, NMFS determines that the habitat expansion actions recommended in the HEP (2010) do not meet the NMFS' Approval Criteria (a), (b), (c), (d) in Amended HEA (2011) Section 4.2.3. However, as described in Section 5.0 below, this determination is not a final decision on whether to approve the habitat expansion actions recommended in the HEP (2010).

## 5.0 Conclusion

Based on NMFS' disagreement with the Licensees about whether the habitat expansion actions recommended in the HEP (2010) are estimated to meet the Habitat Expansion Threshold (Section 2.1 above), NMFS recognizes that Amended HEA (2011) Section 4.2.5 provides the Licensees and NMFS shall select a neutral third party with appropriate expertise to make an independent estimate. According to Amended HEA (2011) Section 4.2.5, NMFS shall give due consideration to the independent estimate before making its final decision on approval of the recommended habitat expansion action(s) for purposes of the Amended HEA (2011). Therefore,

NMFS' determination that the habitat expansion actions recommended in the HEP (2010) do not meet the NMFS Approval Criteria in Amended HEA (2011) Section 4.2.3 is not a final decision on whether to approve habitat expansion actions. However, it should be noted that this provision addresses Approval Criteria: (a) "*estimated to meet the Habitat Expansion Threshold*" only and does not address the other criteria that NMFS has found the Final HEP (2010) does not meet. NMFS will work with the Licensees to select a neutral third party pursuant to Amended HEA (2011) Section 4.2.5.

In addition, under these circumstances, Amended HEA (2011) Section 4.2.6 provides that NMFS shall consult with the Licensees to consider the acceptability of the recommended actions and, at NMFS' discretion, make one of the determinations listed in that section. One of those determinations, Section 4.2.6(b) provides, "*...identify other habitat expansion action(s) mutually acceptable to NMFS and the Licensees that may be approved in accordance with Section 4.2.4 of the Agreement, in which case NMFS may approve the Final Habitat Expansion Plan (as modified to incorporate the mutually acceptable habitat expansion action(s)) after consulting with the other Parties and any directly affected and responsive third parties as described in Section 4.2.2 above...*"

In light of that provision, it is NMFS' view that alternative or modified habitat expansion actions should be developed that will fulfill the purpose, goal, and approval criteria of the Amended HEA (2011). Accordingly, the Licensees are encouraged to work closely with NMFS and other resource agencies and stakeholders to consider how HEA funding for future anadromous fish habitat restoration actions might be programmed to contribute to a more comprehensive and holistic restoration action that satisfies the intent and requirements of the

Habitat Expansion Agreement, as well as contributes significantly to the recovery of anadromous fish of the Sacramento River watershed.

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