ENVIRONMENTAL LAW FOUNDATION
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Nathaniel Kane, Executive Director · nkane@envirolaw.org

January 13, 2025

Via Electronic Submission

County of San Joaquin Board of Supervisors
44 North San Joaquin Street
Stockton, CA 95202
sjcpubliccomments@sjgov.org

Re: Comment Regarding January 14, 2025 San Joaquin County Board of Supervisors Meeting, 9:00 a.m. Scheduled Public Hearing Item No. 2, Public Hearing to Consider Adopting the 2024 Amended Eastern San Joaquin Subbasin Groundwater Sustainability Plan and Approve the First Periodic Evaluation

Dear Members of the Board of Supervisors:

Environmental Law Foundation (ELF) represents the California Sportfishing Protection Alliance (CSPA) and submits these comments on CSPA's behalf. We provide the following comments opposing the approval of the 2024 Amended Eastern San Joaquin Groundwater Sustainability Plan (2024 ESJ GSP) that is scheduled for consideration at the public hearing on January 14, 2025.

CSPA opposes approval of the 2024 ESJ GSP because as currently constituted, it is not in compliance with the Sustainable Groundwater Management Act (SGMA), Water Code section 17200 et seq.; as well as California Code of Regulations, title 23, section 350 et seq.; the public trust doctrine; and the waste and unreasonable use doctrine. CSPA submitted comments to the Eastern San Joaquin Groundwater Authority on December 10, 2024 opposing the approval of the 2024 GSP, which are attached hereto as Exhibit A and incorporated herein by reference.

The failures of the 2024 ESJ GSP to comply with SGMA are more fully explained in the attached comments of Gregory Kamman, which are attached hereto as Exhibit B and incorporated herein by reference. Summarized, Mr. Kamman's concerns include the 2024 GSP's failure to comply with the regulatory requirements for identifying and defining interconnected surface waters and the Plan's conclusion that depletions of interconnected surface waters under the minimum threshold scenario are not greater than those that occurred in 2015 is contradicted by evidence that those depletions are in fact greater.

These concerns represent failures to comply with SGMA's legal requirements. CSPA therefore urges that the Board of Supervisors vote against the approval of the 2024 ESJ GSP.

Sincerely,

Nathaniel Kane
Executive Director
Environmental Law Foundation

Attachments: A: CSPA's December 10, 2024 Comments
B: Comments of Gregory Kamman

Exhibit A

ENVIRONMENTAL LAW FOUNDATION
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Nathaniel Kane, Executive Director · nkane@envirolaw.org

December 10, 2024

Via E-mail

Fritz Buchman
Eastern San Joaquin Subbasin Plan Manager
Eastern San Joaquin Groundwater Authority
1810 E. Hazelton Avenue
P. O. Box 1810
Stockton, CA 95201
info@esjgroundwater.org

Re: CSPA Comments on Eastern San Joaquin GSP

Dear Mr. Buchman:

California Sportfishing Protection Alliance (CSPA) respectfully offers comments on the final Groundwater Sustainability Plan (GSP) proposed for adoption on December 11, 2024.

We appreciate the significant progress made on the GSP since 2020, and the new analysis and detail included in this most recent iteration. The additional analysis underlying the sustainable management criteria, in particular, aids the public in understanding how those criteria were selected.

That said, we continue to have concerns that the GSP contains violations of SGMA. A non-exhaustive discussion of those violations is included below.

1. Groundwater Dependent Ecosystems

The GSP continues to fail to adequately identify groundwater dependent ecosystems (GDEs). (Cal. Code Regs., tit. 23, §§ 351, def. (m), 354.16, subd. (g); see Wat. Code § 10727.4, subd. (*l*) [1].) The GSP continues to exclude areas "close to managed wetlands, irrigated agriculture, or perennial surface water bodies" from the definition of GDEs because they have access to "alternate water supplies" and thus "would not be dependent on groundwater." (GSP at p. 2-122.) However, this definition potentially excludes GDEs that may require groundwater for survival, despite the presence of other

[1] Further references to California Code of Regulations, title 23, section 350 et seq. are to the "SGMA Regulations." Further unspecified statutory references are to the Water Code.

water at certain times of year. Notably, the SGMA Regulations define GDEs as species or ecological communities that "depend" on groundwater; this definition does not require that the ecosystem be solely supported by groundwater—the question is whether the ecosystem would be healthy without groundwater. (SGMA Regs. § 351, def. (m).)

We note that the GSP now states a commitment to conduct field surveys of GDEs by 2030. While this commitment is welcome, its deadline comes 15 years after SGMA's enactment. And CSPA is concerned that without addressing the definition of GDEs, the field surveys may still miss GDE that SGMA requires to be identified.

2. Sustainable Management Criteria

We appreciate the additional support underlying the sustainable management criteria.

However, the definitions of undesirable results remain flawed. SGMA requires "Measurable objectives, as well as interim milestones in increments of five years, to achieve the sustainability goal in the basin within 20 years of the implementation of the plan." (§ 10727.2, subd. (b)(1).) The regulations add specific requirements to this, including a requirement for "minimum thresholds" that set a numeric value that, if exceeded, "may cause undesirable results." (SGMA Regulations § 354.28, subd. (a).) And if a GSP uses one minimum threshold as a proxy for another—as the ESJ GSP used groundwater levels as a proxy for ISW depletions—it must present "adequate evidence" for the reasonableness of such a proxy. (SGMA Regs. § 354.28, subd. (d).)

And a GSP must define "undesirable results" by specifying the criteria the GSP uses to determine whether an effect becomes "significant and unreasonable," by referencing the effects on beneficial uses and users and a "quantitative description of the combination of minimum threshold exceedances" that would cause such significant and unreasonable effects. (SGMA Regs. § 354.26, subd. (b).)

The GSP still relies, in part, on statements that no undesirable results have occurred in the ESJ basin for interconnected surface waters (ISWs). (E.g., GSP, App. 3-G at pp. 23-24.) However, letters from CSPA, California Department of Fish and Wildlife, and National Marine Fisheries Service have provided evidence that fishery habitat conditions in the basin's interconnected rivers have been poor, including high temperatures and reduced flows.[2] In order to satisfy SGMA's requirement to base GSPs on the best available information, the GSP must grapple with this evidence and not

[2] E.g., Morgan Kilgour, CDFW, Letter to Fritz Buchman, ESJGWA (October 30, 2024), att. B, C (2024 GSP, Appendices at pdf pages pp. 168-245.); Cathy Marcinkevage, National Marine Fisheries Service, Letter to Paul Gosselin, DWR (October 12, 2022), at p. 2, available at https://sgma.water.ca.gov/portal/gsp/comments/47 (accessed December 9, 2024).

simply dismiss it.

Nor can the GSP rely on the SGMA's provision that exempts it from avoiding undesirable results that "occurred before, and have not been corrected by, January 1, 2015." (§ 10727.2, subd. (b)(4).) By requiring two consecutive years of minimum threshold exceedances at 25 percent of wells, and by setting minimum thresholds below 2015 elevations, the GSP will potentially allow significantly worse conditions than were experienced prior to 2015. The analysis presented shows higher stream depletions as a percentage of flow under the minimum threshold scenario than in 2015 in the Stanislaus River. (App. 3-G at p. 48.) And the GSP acknowledges that the minimum threshold scenario has higher depletions by volume in that scenario for the Mokelumne, San Joaquin, and Stanislaus Rivers than in 2015.[3] (App. 3-G at p. 46.)

These facts do not square with the GSP's representation that undesirable results would not occur under the minimum threshold scenario. The Plan fails to analyze the actual in-stream effects of stream depletions, as required by the regulations, resting on promise that the plan will be protective of 2015 levels.[4] But the Plan's numbers show the potential for conditions that are worse than 2015.[5] This violates, inter alia, the requirement that the use of a proxy minimum threshold be supported by adequate

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[3] Depletions were higher in the Calaveras River except in the October-December quarter as well. (App. 3-G at p. 46.)

[4] Additionally, the Plan references other potential undesirable results: maintaining "minimum instream flow requirements and agreements" and chinook salmon populations in 2015. (App. 3-G at pp. 23-24.) These parameters are not mentioned in the definition of undesirable results. (GSP at p. 3-31.) Further, the GSP does not mention that maintaining instream flow requirements may come at significant costs to surface water management, as dam operators must release additional water to compensate for stream losses. And a single year of Chinook escapement is not evidence that depletions were or were not harmful: populations crashed in 2020 and 2021. (See CDFW, California Central Valley Chinook Escapement Database Report (May 20, 2024), at pp 27-28, available at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=84381 (accessed December 10, 2024).)

[5] We are also concerned that the plan's emphasis on maintaining "connectivity" is misplaced. While maintaining sufficiently high groundwater levels is important for both maintaining "connectivity" and for avoiding undesirable results, the GSP at times conflates the two concepts. Further, the GSP fails to support the definition of a stream being "connected." Per DWR guidance, a stream may be connected even if groundwater levels fall below the streambed, so long as a saturated zone exists at "any point." (SGMA Regs. § 351, def. (o); DWR, Depletions of ISW: An Introduction (2024), at p. 5, available at https://data.cnra.ca.gov/dataset/68e0d8b6-a207-4b30-a16b-3daeb659faea/resource/218e3361-c142-400f-a97f-5dfa79cd4997/download/depletionsofisw_paper1_intro_draft.pdf (accessed December 9, 2024). Under DWR's definition, a stream may be connected if it there is a saturated zone at any point. But the GSP excludes significant reaches of streams, especially the Calaveras River, Dry Creek, and Mormon Slough, that appear to meet this definition.

evidence. (SGMA Regs. § 354.28, subd. (d).) And it violates the requirement that a plan spell out the effects of undesirable results on beneficial uses and users.[6] (SGMA Regs. § 354.26(b).)

In addition, many of the proposed new monitoring wells are not near interconnected streams. And few, if any, are near stream gages. It is unclear how the GSAs plan to use these wells to generate information on ISW depletions given the lack of paired wells and stream gages.

The GSP also continues to fail to monitor or address the effects of groundwater depletions on surface water temperatures, in violation of Water Code section 10727.2, subds. (d)(2) and (f).

3. Projects and Management Actions

The Final GSP does not contain adequate projects and management actions (PMAs) to fulfill its obligations to plan for sustainability by 2040.

SGMA requires a basin to achieve the "sustainability goal" within 20 years. (§ 10727.2, subd. (b).) The "sustainability goal" is defined as requiring the basin to operate within its "sustainable yield." (§ 10721, def. (u).)

The GSP identifies a shortfall of 95,000 AF/y between its expected pumping and its sustainable yield in the non-climate change scenario, and 166,000 AF/y in the climate change scenario. (GSP at pp. 2-195, 2-200.) But the Category A PMAs sum up to only 90,200 AF/y of reductions and/or recharge. (GSP at pp. 2-202 to 2-203.)

As a result, the GSP admits that "there is still additional work (e.g., projects and/or management actions) that may need to be done to maintain subbasin sustainability." (GSP at p. 2-212.) In other words, the planned category A PMAs do not achieve the goal of SGMA: to achieve the sustainable yield.[7] This is a facial violation of SGMA.

4. Water Budget

We appreciate the addition of further information on climate change and its

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[6] CSPA's comments on the 2022 amendments still generally apply on this point and are incorporated here by reference. (Nathaniel Kane, Letter to Paul Gosselin, DWR (September 30, 2022) at pp. 4-13, available at https://sgma.water.ca.gov/portal/gsp/comments/47 (accessed December 9, 2024).

[7] Notably, the Category B PMAs will not be implemented unless Category A projects do not fulfill their goals—which are themselves insufficient. (GSP at p. 6-2.)

incorporation into the sustainable yield calculations.

However, the water budgets still fail to include, as required, tabular information with annual inflows and outflows from the basin. (See SGMA Regs. § 354.18(a).) This omission makes evaluation of the water budgets difficult, essentially with reference to evaluating the chosen 2015 benchmark for the ISW SMC.

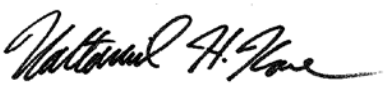
5. Public Trust

As stated in CSPA's previous letters, the ESJ GSP fails to consider depletions of navigable waters that harm public trust resources in violation of the public trust doctrine. This omission has not been addressed.

* * *

Again, CSPA appreciates that significant changes have been made to the GSP. It is still, however, not in compliance with SGMA. CSPA urges that, in light of the legal and factual issues identified above and in previous comments, the ESJGWA not approve the revisions to the GSP until these issues have been addressed.

Sincerely,



Nathaniel Kane
Executive Director
Environmental Law Foundation

Exhibit B

cbec eco engineering

Hydrology | Hydraulics | Geomorphology | Design | Field Services

January 13, 2025
Attorney-Client Work Product

Mr. Nathaniel Kane, Executive Director
Environmental Law Foundation
1222 Preservation Park Way, Suite 200
Oakland, CA 94612

Subject: Review of 2024 GSP Plan Amendment for the Eastern San Joaquin Groundwater Subbasin October 2024

Dear Mr. Kane:

I am a hydrologist with over thirty years of technical and consulting experience in the fields of geology, hydrology, and hydrogeology. I have been providing professional hydrology and geomorphology services throughout California since 1989 and routinely manage and lead projects in the areas of surface- and groundwater hydrology, water supply, water quality assessments, water resources management, and geomorphology. A copy of my resume is attached.

I have reviewed the 2024 Groundwater Sustainability Plan Amendment for the Eastern San Joaquin Groundwater Subbasin, including the revisions proposed for adoption in late 2024 (GSP Amendment). I have the following comments on the GSP Amendment.

The GSP Amendment presents a new approach to identifying which streams in the basin constitute interconnected surface waters (ISWs):[1] "Connected streams were defined as Layer 1 groundwater levels at or above the streambed elevation at least 75 percent of the time."[2] (GSP Amendment at p 2-156.)

[1] The SGMA Regulations define ISW as "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted." (§ 351, def. (*o*).)

[2] Appendix 3-G also states that ISWs are where "the water table and surface water features intersect at the same elevations and locations;" this statement improperly excludes situations where the water table is below the elevation of the streambed, but a saturated zone connects them. (App. 3-G at p. 3.)

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Under this new definition, the GSP includes the Mokelumne River, Stanislaus River, and lower San Joaquin River as "connected," while Dry Creek, Calaveras River, and Mormon Slough are "disconnected." This definition is potentially faulty: the definition of ISW refers to "water that is hydraulically connected at any point." (SGMA Regs. § 351, def. (o).) Connectivity requires a saturated zone between stream and aquifer.[3] Thus a stream may be ISW even though the water table is below the elevation of the riverbed, if this saturated zone exists.[4] As a result, the GSP Amendment's definition of ISWs potentially excludes streams and stream reaches that should be considered ISWs under the regulatory definition. This failure is significant considering the GSP Amendment's emphasis on "keeping connected reaches connected" when arguing that undesirable results have not been experienced with respect to ISWs in the basin: reaches that should be considered "connected" are excluded from this conclusion, throwing the conclusion in doubt.

In addition, Figures 28 and 31 both indicate that PCBL CC MT results in increased depletions over those that occurred in 2015. (Appendix 3-G at pp. 41, 43.) These additional depletions undermine the GSP Amendment's conclusion that the minimum thresholds are protective of depletion levels occurring in 2015.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Greg Kamman, PG, CHG
Senior Ecohydrologist

[3] See DWR, Depletions of ISW: An Introduction (2024), p. 5, available at https://data.cnra.ca.gov/dataset/68e0d8b6-a207-4b30-a16b-3daeb659faea/resource/218e3361-c142-400f-a97f-5dfa79cd4997/download/depletionsofisw_paper1_intro_draft.pdf.

[4] See the graphic on the right in Figure 2-104 on page 2-158 of the GSP, which illustrates a connected losing stream where groundwater levels are lower than the stream stage.

cbec eco engineering

Hydrology | Hydraulics | Geomorphology | Design | Field Services

Greg Kamman, PG, CHG
Senior Ecohydrologist III

Education

MS, 1989, Geology, Sedimentology and Hydrogeology, Miami University, Oxford, OH

BA, 1985, Geology, Miami University, Oxford, OH

Professional Registration

1993, Professional Geologist, California, #5737

1995, Certified Hydrogeologist, California, #360

Professional Experience

cbec, inc., eco-engineering, West Sacramento, CA, Senior Ecohydrologist III, 2020–present

Kamman Hydrology & Engineering, Inc., San Rafael, CA, Principal Hydrologist/Vice President, 1997–2020

Balance Hydrologics, Inc., Berkeley, CA , Sr. Hydrologist/ Vice President, 1994-1997

Geomatrix Consultants, Inc., San Francisco, CA, Project Geologist/Hydrogeologist, 1991-1994

Environ International Corporation, Princeton, NJ, Sr. Staff Geologist/Hydrogeologist, 1989-1991

Miami University, Oxford, OH, Field Camp Instructor and Research Assistant, 1986-1989

Greg Kamman is a professional geologist and certified hydrogeologist with over 30 years of technical and consulting experience in the fields of geology, hydrology, and geomorphology. Mr. Kamman's areas of expertise include characterizing and quantifying changes in hydrologic conditions and the geomorphic response to land use changes in watersheds. He specializes in directing and managing projects in the areas of geomorphology, evaluating the causes of stream channel instability, surface and groundwater hydrology, stream and wetland natural habitat restoration planning and design, water supply and water quality assessments, and water resources management. Mr. Kamman has worked extensively throughout California's coastal rural and urban watersheds and on multiple projects in Oregon and Hawaii.

Mr. Kamman's experience and expertise includes evaluating surface and groundwater resources and their interaction, stream and coastal wetland habitat restoration assessments and design, characterizing and modeling basin-scale hydrologic and geologic processes, assessing watershed hydraulic and geomorphic responses to land-use change, and designing and conducting field investigations characterizing surface and subsurface hydrologic and water quality conditions. Greg commonly works on projects that revolve around sensitive fishery, wetland, wildlife, and/or riparian habitat enhancement within urban and rural environments. Mr. Kamman performs many of these projects in response to local, state (CEQA) and federal statutes (NEPA, ESA), and other regulatory frameworks. Mr. Kamman frequently applies this knowledge to the review and expert testimony on state and federal water operation plan EIR/EIS reports, Groundwater Sustainability Plans, Habitat Conservation Plans, and biological assessments.

Mr. Kamman is accustomed to working multi-objective projects as part of an interdisciplinary team including biologists, engineers, planners, architects, lawyers, and resource and regulatory agency staff. Mr. Kamman is a prime or contributing author to over 360 technical publications and reports in the discipline of hydrology, the majority pertaining to the protection and enhancement of aquatic resources. Mr. Kamman has taught the following courses: hydrology and hydraulic modeling through U.S. Davis Extension (2020–present); stream restoration through U.C. Berkeley Extension (2001–2008); and wetland hydrology through San Francisco State University's Romberg Tiburon Center (2007 and 2012–2014). He has devoted his career to the protection, enhancement and sustainable management of water resources and associated ecosystems.

SELECTED EXPERIENCE

Fluvial Projects

College Lake Hydrologic Monitoring Project, Santa Cruz County, CA
Pajaro Valley Water Management Agency, 2020–present

This project supports the integrated management plan generated for the previous College Lake Improvement and Watershed Management Project, with work performed on behalf of Pajaro Valley Water Management Agency, and working closely with Carollo design engineers. cbec installed, and continues to monitor and maintain, gages at multiple sites upstream and downstream of College Lake to gather water levels and stream flow. Scour analyses were conducted at the proposed diversion/fish-passage weir on Salsipuedes Creek, and two pipeline crossings on Pinto Creek. These analyses necessitated the following tasks: completing topographic and bathymetric surveys at the crossings; collecting sediment samples for laboratory grain-size analysis; updating and running an existing HEC-RAS hydraulic model for variety of design storms; and estimating long-term and contraction scour estimates at each site pursuant to FHWA HEC-18 methods and criteria. Based on the results of this analysis, cbec was able to recommended bed and bank rock size and thickness for channel stability design. Mr. Kamman managed this effort and provided scour calculations technical oversight.

SELECTED EXPERIENCE

Creek Crossing Project, Sacramento County, CA
Sacramento Area Sanitation District, 2021–present

This project builds off the findings of cbec's previous Sewer Crossing Bank Stabilization and Toe Stabilization Design project for the SASD. This evaluation is part of a multi-specialty assessment to ascertain the existing stability and integrity of select stream sewer crossings on numerous creeks in the region. For this phase, cbec teamed with Water Systems Consulting to conduct a geomorphic reconnaissance at 12 stream sewer crossings in Sacramento County. All work performed was in accordance with the project specifications set forth by the United States Army Corps of Engineers, Sacramento County Department of Water Resources, and the State Water Resources Control Board. As part of the multi-specialty team, cbec is completing: geomorphic and fluvial audits at each site; 1-D and 2-D hydrodynamic modeling and scour analyses; and developing creek and bank stabilization design drawings and cost estimates for each of the sites. Deliverables consist of technical memos that provide relevant design assumptions, criteria, and analysis used to support the design. As Project Manager, Mr. Kamman is responsible for coordinating field efforts, overseeing model development, assisting the technical team with alternative development, presentation of findings to SASD staff, internal technical review, client interaction, and project management. Mr. Kamman will also provide technical input in support of project environmental compliance and permitting.

Muir Woods National Monument Bank Stabilization Plan for Conlon Creek, Marin County, CA
Golden Gate National Parks Conservancy (GGNPC), 2018–present

Mr. Kamman developed a grading and drainage plan for the Conlon Avenue Parking Lot, located adjacent to Redwood Creek and sensitive Coho salmon habitat. More recently, he has assisted GGNPC and the NPS in assessing the planning and design for creek bank stabilization and ecological enhancement at a failed culvert on a tributary channel at the project site. This work includes constructing a HEC-RAS model to evaluate: culvert removal and channel design; fish passage; and water quality impacts. Work is currently in development of 100% engineering design.

Hydrology and Hydraulic Assessments for Design of Butte Sink Mitigation Bank Project, Colusa County, CA
WRA, Inc., 2017–2018

Mr. Kamman was retained to provide hydrology and hydraulic modeling support in the development of design and Draft Prospectus for the Butte Sink Mitigation Bank (Bank). This work entailed developing the necessary hydrology information, hydraulic model and documentation to support further design, environmental compliance and agency approvals/permitting of the Bank. The main objective of work was to develop a design that provides the necessary ecological conditions and functions for successful establishment and operation of the Bank.

Lagunitas Creek Salmonid Winter Habitat Enhancement Project, Marin County, CA
Marin Municipal Water District, 2013–2018

Mr. Kamman designed and led a study to evaluate opportunities to enhance winter habitat for coho and other salmonids in Lagunitas Creek and its largest tributary - Olema Creek. This work was done as a two–phase assessment and design effort. The first phase (completed in 2013) included a winter habitat assessment to evaluate existing juvenile salmonid winter habitat in Lagunitas Creek and lower Olema Creek. The results of this assessment were used to prioritize winter habitat needs, and identify opportunities for winter habitat enhancement to increase the winter carrying capacity of coho salmon and steelhead. The second phase (completed in 2017) consisted of a designing winter habitat enhancements. These enhancements focused on restoring floodplain and in-channel habitat structures. Winter habitat enhancement work also needed to consider potential impacts to or benefits for California freshwater shrimp (Syncaris pacifica), a federally endangered species.

This work included field reconnaissance, topographic surveys and the preparation of final design drawings at nine different project sites. An overall self-maintaining design approach was developed to guide individual project plan, with minimal earthwork and disturbance to existing riparian and wetland habitat. Self-sustained, natural evolution of a multi-thread channel within a more active floodplain is a desired outcome of project actions. Design elements and structures are intended to enhance or restore natural hydrologic processes to promote geomorphic evolution of more active high flow (side) channels and floodplain. Design elements include construction of 24 individual log structures.

Lower Miller Creek Management and Channel Maintenance, Marin County, CA
Las Gallinas Valley Sanitary District, 2013–2015

Mr. Kamman was commissioned to formulate and implement a plan for sediment removal and improved flood flow conveyance in the Lower Miller Creek channel. The need for improved flood and sediment conveyance was driven by progressive accumulation of course sediment in the project reach that reduced flow conveyance along Miller Creek and threatened to bury District outfalls. Miller Creek supports a population of federally listed Steelhead, and adjacent wetland areas potentially support other state and federally listed special status species. Permit conditions and cost efficiency required designing a project that minimized the extent and frequency of channel excavation/maintenance that could adversely impact Steelhead, listed wetland species, and wetland and riparian habitat. Mr. Kamman's work on this project included: developing a suite of potential project alternatives and identification of a preferred approach, CEQA compliance (IS/MND) and permitting, managing development of engineered drawings, and assisting in bid document preparation.

Vineyard Creek Channel Enhancement Project, Marin County, CA
Marin County Department of Public Works, 2007–2013

Mr. Kamman managed the preparation of designs and specifications for a flood conveyance and fish habitat and passage improvement project on Vineyard Creek. Creek corridor modifications included replacing the box culvert at the Center Road crossing with a free span bridge or bottomless arch culvert (civil and structural design by others), providing modifications to the bed and bank to eliminate erosion risks to adjacent properties and improve water quality, promoting active channel conveyance of both water and sediment, and providing improved low and highflow fish passage, improved low flow channel form and enhanced in-stream habitat, repairing eroding banks, and expanding/enhancing adjacent channel floodplains. The riparian corridor was replanted to provide a low-density native understory, "soft" bank erosion protection, and increased tree canopy along the tops of banks. Mr. Kamman prepared the JARPA for the project and conducted permit compliance and negotiations with all participating resource agencies. Designs and permitting also address the known presence of Native American artifacts. This work was contracted under an expedited design schedule and phased construction was initiated the summer of 2008 and continued the summer of 2009.

Miller Creek Sanitary Sewer Easement Restoration, Marin County, CA
Las Gallinas Valley Sanitary District, 2010

Working on behalf of the District, Mr. Kamman completed field surveys and technical

SELECTED EXPERIENCE

feasibility studies to develop engineering plans and specifications for a stream bank restoration project to protect an exposed sanitary sewer pipeline, stabilize incised banks, and promote an ecologically healthy stream corridor along an approximately 50 linear foot damaged reach of Miller Creek. The design includes backfill and materials to accommodate construction of a vegetated stabilized slope. The eroded bank repair included design of a 1:1 Envirolok vegetated slope with geogrid reinforced soil lifts extending eight to ten feet back from the slope face. One-quarter-ton rock will be placed in front of the Envirolok wall at the toe of the reconstructed bank to provide added scour protection. In order to perform the work, the project site will be dewatered. An existing felled tree perpendicular to the creek flow will be relocated and secured into the right creek bank with root wad remaining in active channel. All work on the bank and within the creek bed must be completed pursuant to project permits due to presence of steelhead trout.

Bear Valley Creek Watershed and Fish Passage Enhancement Project, Marin County, CA
The National Park Service and Point Reyes National Seashore Association, 2005–2013

Working on behalf of the NPS and PRNSA, Mr. Kamman completed a watershed assessment and fish passage inventory and assessment for Bear Valley Creek. Work included a geomorphic watershed assessment and completing field surveys and hydraulic modeling (including flood simulations) of ten road/trail crossings to identify and prioritize creek and watershed restoration efforts while considering and addressing current flooding problems at Park Headquarters – a major constraint to channel restoration efforts that would likely exacerbate flooding. Mr. Kamman also completed a suite of conceptual restoration designs (Phase 1) including: the replacement of two county road culvert crossings with bridges; channel creation through a ponded freshwater marsh (former tidal marsh); and replacement of 4 trail culverts with prefabricated bridges; and associated in-channel grade control and fishway structures. Engineered drawings and specifications were also developed for some of these sites to assist PORE with emergency culvert replacements after damages sustained during the New Year's Eve flood of 2005. Mr. Kamman also directed geotechnical, structural and civil design of project components.

Two projects were completed in 2006 on emergency repair basis resulting from flood damages suffered during the New Year's Eve storm of 2005. The two most recent projects were constructed in 2013, consisting of a large bank repair and adjacent to main access road/trail and culvert replacement further upstream on same road. The bank repair utilized bioengineering approaches including engineered log revetments and log diversion vanes.

California Coastal Trail Planning and Design at Fitzgerald Marine Reserve, San Mateo County, CA
WRA, Inc., 2008–2009

Mr. Kamman provided hydrology and hydraulics expertise in the planning and design for the 0.25-mile segment of the California Coastal Trail at the Fitzgerald Marine Reserve. The project was overseen by the San Mateo County Parks Department. This segment of Coastal Trail provides improved access from the trailhead to the beach as well as a free span bridge over Vicente Creek. Greg completed the field surveys and hydraulic modeling to assist an interdisciplinary team to design the project. Understanding the hydrology of Vicente Creek and quantifying flood conditions was critical to successfully designing and constructing the free span bridge. He also evaluated how creek hydrology and coastal wave processes interact at the beach outfall in order to identify opportunities and constraints to beach access improvements (which will include crossing the creek on the beach) during both wet and dry season conditions in order to evaluate both permanent and seasonal crossing design alternatives.

Hydrologic Assessment and Conceptual Design for Conservation and Wetland Mitigation Bank Project, Merced County, CA
WRA, Inc., 2009

Working as a subcontractor to WRA, Inc., Mr. Kamman provided hydrology, geomorphology and engineering support for the planning and design for a Conservation and Wetland Mitigation Bank on the San Joaquin River, in the Central Valley near Newman, California. The property is currently owned by the Borba Dairy Farms. The primary objective of the study was to characterize the hydrologic and geomorphic controls on the spatial distribution of habitat types. To meet this objective, Mr. Kamman's assessment included: (1) collecting and synthesizing hydrologic data to characterize existing and historic streamflow, geomorphic and shallow groundwater conditions; (2) filling a data gap by collecting topographic data of hydrologic features; (3) developing a hydraulic model capable of predicting water surface profiles for a range of design flows; and (4) quantifying the linkage between surface water/groundwater conditions and specific vegetation communities and habitat types through implementation of reference site assessments. Mr. Kamman also provided conceptual design and permitting support in evaluating habitat enhancement and creation opportunities on the site.

Redwood Creek Floodplain and Salmonid Habitat Restoration, Marin County, CA
Golden Gate National Recreation Area and Golden Gate Parks Conservancy, 2005–2008

Mr. Kamman lead development of a preferred project alternative and final project design drawings and specifications for a floodplain and creek restoration and riparian corridor enhancement effort on lower Redwood Creek above Muir Beach at the Banducci Site. A primary objectives of the project was to: improve salmonid passage/rearing/refugia habitat; riparian corridor development to host breeding by migratory song birds; and wetland/pond construction to host endangered red-legged frog. The preferred design includes: excavation along the creek banks to create an incised flood terrace; engineered log deflector vanes; removing and setting back (constructing) approximately 400-feet of levee; creating in- and off-channel salmonid rearing and refugia habitat; reconnecting tributary channels to the floodplain; and creating California red-legged frog breeding ponds. Designs were completed in 2007 and the project constructed in the summer of 2007.

Considerable hydraulic modeling was completed to evaluate and develop means to help reduce chronic flood hazards to surrounding roadways and properties. Alternatives that included set-back levees and road raising were developed and evaluated. Detailed and careful hydraulic (force-balance) analyses and computations were completed as part of engineered log deflector designs. These were unique and custom designed structures, building on past project efforts and in consultation with other design professionals.

This project demonstrates Mr. Kamman's ability to work closely with the project stakeholders to develop a preferred restoration alternative in a focused, cost-effective and expedited fashion. This was achieved through close coordination with the NPS and the effective and timely use of design charrette-type meetings to reach consensus with participating stakeholders. Conceptual through full PS&E were completed on-time and on-budget in 2007 and was project constructed in the fall of 2007. Mr. Kamman worked closely with NPS staff to "field fit" the project, by modifying grading plans to protect existing riparian habitat. Mr. Kamman also provided construction management and oversight to floodplain grading and installation of engineered log structures. Based on field observations, the project is performing and functioning as desired.

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Pilarcitos Creek Bank Stabilization Project, San Mateo County, CA
TRC Essex, 2006–2007

Mr. Kamman directed field surveys and technical modeling analyses to develop restoration design alternatives for a Bank Stabilization Project on Pilarcitos Creek in unincorporated San Mateo County, California. This work included hydrology and hydraulic design and preparation of plan sheets and technical specifications as well as a revegetation plan. Due to the importance of protecting an existing gas mainline, the design package will be completed in close coordination with TRC Essex geotechnical staff and revegetation subcontractor and PG&E civil staff. Design feasibility analyses focused on developing hydraulic design criteria for the project, including: estimates of design flood flow magnitudes (2-, 5-, 10-, 25-, 50- and 100-year floods); water surface elevation estimates for a suite of design floods; associated average channel velocities and shear stresses; and estimates for riprap sizing for channel bank toe protection. Plan sheets, technical specifications and cost estimates were provided for review and approval.

Floodplain Management Projects

Hydrologic and Hydraulic Evaluation for Trinity County Bridge Replacement, Trinity County, CA
Trinity County Planning Department, 2002

Mr. Kamman completed technical peer review of peak flow estimates and hydraulic design parameters associated with the replacement of 4 bridges across the upper Trinity River in Trinity County, California. A primary study component was accurately predicting the magnitude and frequency of flood releases from Trinity Dam. Numerous flood frequency analytical approaches were evaluated and used throughout this study.

Flood Reduction, Mitigation Planning, and Design on Yreka Creek, Siskiyou County, CA
City of Yreka as subcontractor to WRA, Inc., 2008–2010

Mr. Kamman completed a series of field and hydraulic model investigations for restoration planning and design along Yreka Creek to reduce flood hazards and potential damage to the City's water treatment plant and disposal field infrastructure. This work also addresses and satisfies dike repair mitigation conditions stipulated by state resource agencies. While achieving these goals, Mr. Kamman tailored analyses and study objectives to assist the City in: enhancing the ecological floodplain restoration along Yreka Creek; providing opportunities for expanded public access and trail planning consistent with the goals of the Yreka Creek Greenway Project; and improving the water quality of Yreka Creek.

Key elements of this work included: review and synthesize existing information; identify and analyze the feasibility for three conceptual alternatives; and conceptual design and report preparation. Funding for implementation of restoration work over such a large area was a significant concern to the City. Therefore, designs identify and define phasing in a fashion that gives the City flexibility in implementation.

West Creek Drainage Improvement Assessment, Marin County, CA
Marin County Flood Control, 2006–2008

Mr. Kamman prepared a study focused on characterizing existing flood conditions and developing and evaluating flood reduction measures along West Creek in Tiburon. The work was completed through the implementation of hydrologic and hydraulic feasibility and design assessments. The conceptual design and analysis of potential flood reduction strategies (alternatives) was completed through the development of a HEC-RAS hydraulic model that simulates historic, existing and proposed project flood conditions. It was intended that the conceptual design developed under this scope of work would be of sufficient detail and quality to initiate project permitting and the environmental compliance process and documentation. Opportunities for riparian corridor and aquatic habitat enhancement were also considered and integrated into the conceptual design. Mr. Kamman also developed and assessed six alternative flood hazard reduction measures. The hydraulic model results for each alternative were compared against baseline conditions in order to evaluate their ability to alleviate flood hazards.

Gallinas Creek Restoration Feasibility Assessment, Marin County, CA
San Francisco Bay Institute, 2003–2005

Mr. Kamman completed a feasibility assessment for restoration of Gallinas Creek in northern San Rafael. Restoration will require removal of a concrete trapezoidal flood control channel and replacement with an earthen channel and floodplain in a "green belt" type corridor. Work included the collection of field data and development of a HEC-RAS hydraulic model to evaluate and compare existing and proposed project conditions. Designs must continue to provide adequate flood protection to the surrounding community. The study also includes and evaluation of existing habitat values, potential habitat values, and restoration opportunities and constraints.

Restoration of Lower Redwood Creek Floodway and Estuary, Humboldt County, CA
California State Coastal Conservancy and Humboldt County DPW, 2002–2003

Mr. Kamman provided technical review for the development of a hydraulic model to evaluate river and estuary restoration alternatives along the lower portions of Redwood Creek between Orrick (Highway 1) and the Pacific Ocean. This work was completed to evaluate the feasibility for creek/estuary restoration alternatives developed by the County, and effects on flood hazards along this flood–prone reach.

In order to better address and evaluate the current flood hazards along the entire floodway and identify potential flood hazard reduction measures, Mr. Kamman was retained to update HEC–2 models previously prepared by the Army Corps, and to evaluate the impacts of vegetation encroachment (increased roughness) and sediment deposition on floodway conveyance. Mr. Kamman expanded the Corps hydraulic model with newly completed channel surveys and channel roughness observations. The impetus for this work was to assist the County in identifying mutually beneficial strategies for ecosystem restoration and flood hazard reduction. Technical work was completed under close coordination and communication with county engineers. Study results and findings were presented at public meetings of local area landowners and stakeholders.

Tembladero Slough Small Community Flood Assessment, Monterey County, CA
Phillip Williams & Associates, Ltd., 1997

Mr. Kamman completed a flood information study of Tembladero Slough near Castroville on behalf of the San Francisco District Corps of Engineers. The purpose of this work was to identify and document local flood risks existing in the community and propose potential floodplain management solutions as part of the Corps 1995/1997-flood recovery process. Work centered on conducting a field reconnaissance, reviewing available historical data, and conducting discussions/interviews with local landowners and agency personnel.

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Watershed Assessments

Lower Sutter Bypass Anadromous Fish Habitat Restoration Planning, Sutter County, CA
River Partners and California Department of Fish and Wildlife, 2020–present

cbec is leading a multi-disciplined technical team in the development of a Management Plan intended to increase the ecological functions of the Lower Sutter Bypass to benefit anadromous fishes and other species of conservation concern, while maintaining agricultural viability and flood conveyance. The cbec team consists of professionals with extensive expertise in fisheries biology and ecology, hydrology and hydraulics, agriculture economics, outreach, and the Structured Decision-Making (SDM) process. The project encompasses 10.5-miles of agricultural and conservation lands within the Lower Sutter Bypass immediately north of the confluence of the Sacramento and Feather Rivers. The Management Plan was developed in coordination with over a dozen local and area-wide management plans and ongoing initiatives that affect the potential to improve habitat conditions in the Lower Sutter Bypass. Development of the Management Plan included synthesizing existing information and utilizing existing hydraulic modeling tools and data to develop and evaluate project alternatives. In addition to hydraulic and flood modeling, the cbec team developed site-specific models to assess ecological habitat benefits, anadromous fish habitat, and agricultural production and economics. Development of project alternatives and the Management Plan progressed through an organized consensus based SDM process via regular Working Group meetings and stakeholder workshops. As project manager, Mr. Kamman is responsible for client and technical team communications, administrative management, and leading Management Plan reporting.

Evaluation of Project Impacts on Oregon Spotted Frog, Klamath County, OR
Oregon Water Watch and Earthjustice, 2016–2019

Mr. Kamman designed a suite of hydrologic, hydraulic and geomorphic studies to evaluate proposed change operations of the Crane Prairie, Wickiup and Crescent Lake dams and reservoirs as related to harm to Oregon spotted frogs. Work began with analyzing impacts associated with proposed water delivery operations and developing a proposed alternative prioritizing protection and enhancement of frog habitat. This work followed with a technical review and critique of the USFWS's Biological Assessment. Work included preparation of four declarations for the clients.

Tennessee Hollow Creek Riparian Corridor Restoration, San Francisco County, CA
Presidio Trust, 2001–present

Mr. Kamman has been leading and assisting the Trust and Golden Gate National Recreation Area (GGNRA) in the planning and design on over a dozen multi-objective riparian corridor restoration and watershed management projects in the Tennessee Hollow/Crissy Marsh watershed since 2001. Specific project objectives include: daylighting creeks; riparian corridor restoration; expanding Crissy Marsh; enhancing recreation, education, archeological, and cultural resource opportunities; improving water quality discharges to San Francisco Bay; and remediation of numerous landfills within the watershed. Typical initial phases of work focus on characterizing surface and groundwater conditions within each project area and identifying opportunities and constraints to restoration of natural wetlands and creek/riparian corridors. Notable challenges of this work include restoring heavily disturbed natural resources in an urban setting while integrating designs with recreation, archeology/cultural resources, education and remediation programs. Mr. Kamman has acted as lead hydrologist and designer on eight separate reaches in the 271-acre Tennessee Hollow Creek watershed and several other projects within and in the vicinity of Mountain Lake.

All task authorizations under these on-call and individual design contracts and included hydrology and water quality assessments and conceptual restoration planning and design. The project areas overlapped both the Presidio Trust and NPS-GGNRA management areas. Preliminary construction cost estimates for project alternatives within the Tennessee Hollow watershed range from $10- to $20- million. Several restoration projects are also tied to providing mitigation for the current San Francisco Airport expansion and Doyle Drive Seismic Improvement projects. Several projects have been constructed since 2012 (Thompson's Reach, El Polin Loop), two projects (East Arm Mtn. Lake and YMCA Reach) were constructed in 2014, and MacArthur Meadow restoration in 2016.

This work illustrates the Mr. Kamman's ability to complete a broad variety of hydrologic analyses, including: multiple years of rigorous and thorough surface water and groundwater hydrologic and water quality monitoring throughout the entire watershed to characterize and quantify existing hydrologic conditions; development of a detailed watershed-scale water budget for existing and proposed land-used conditions (capturing existing and proposed vegetation cover types and land use activities) to calculate groundwater recharge estimates input into the numerical watershed model; preparation of EA sections on water resources and water quality (NEPA compliance) regarding Environmental Conditions, proposed Impacts, and Proposed Mitigations associated with the project; preparing detailed alternative plans; and coordination and preparation of engineered plans/specifications for construction. All work was completed on budget and in a timely fashion.

Mountain Lake Water Budget, San Francisco County, CA
Presidio Trust, 2012–2017

Mr. Kamman was retained to develop a water balance model for Mountain Lake in the Presidio of San Francisco. Through development of a water balance model, the Trust seeks to understand: the major source(s) of inflow to both Mountain Lake; anticipated seasonal (monthly) changes in water level relative to various outflow assumptions; and the relationship of surface and groundwater interaction. This information gained from this study will be used to: 1) better understand and manage lake levels for ecological habitats; 2) identify flood storage capacity of Mountain Lake and fluctuations in lake level under various storm conditions; 3) better understand and maintain wetland habitat in the east arm; and 4) complete mass balance calculations to assess water quality in and feeding into the lake.

To implement this study, Mr. Kamman developed a water budget model to identify and quantify the primary water inputs and outputs to the lake and determine major controls over water storage. Primary water budget variables analyzed includes: precipitation; evaporation/evapotranspiration; groundwater exchange; and surface runoff. This study also included a long-term field investigation completed between 2012 and 2016 to: identify all point source inputs such as culverts and drainage outlets; identify diffused surface runoff inputs from surrounding lands, including a golf course; better characterizing the function and performance of the primary lake outfall structure; monitor groundwater levels surrounding the lake; and continuously monitor lake water level and storage over a mult9i-year period. These data were used to quantify water budget variables used to build the water budget model. Precipitation and barometric pressure data used in the model was provided by the Trust maintained weather station. Model daily evaporation estimates came from a variety of local area gauges maintained by state agencies.

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The water budget model developed for this study is successful in accurately simulating historic water level conditions. The model using a daily time-step appears more accurate than model using a weekly time-step, but both provide reasonable agreement with observed conditions. The model is highly sensitive to groundwater exchange with the lake. The water budget is also a proven useful tool for the design and analysis of improvements to the lake outfall structure and establishing flood storage needs to protect the adjacent highway.

Cordilleras Creek Hydrologic Assessment, San Mateo County, CA
City of Redwood City, 2002–2003

Mr. Kamman assisted the Cordilleras Creek Watershed Coordinator in planning, seeking funding, and implementing a hydrologic and biologic assessment of the Cordilleras Creek watershed. Work completed included completing a full creek reconnaissance and channel stability assessment, preparation of a watershed assessment work plan, presentations at public meetings, and study/review of flooding issues in the watershed. Challenges faced in this predominantly privately owned watershed include removal of numerous fish passage barriers and educating/coordinating property owners.

Capay Valley Hydrologic and Geomorphic Watershed Assessment, Yolo County, CA
Yolo County RCD, 2008–2010

Mr. Kamman designed and supervised a hydrologic, geomorphic watershed assessment, and conceptual restoration design for the Capay Valley segment of Lower Cache Creek . Funding for the project was from a CALFED Watershed Program grant. The Capay Valley reach of Cache Creek experiences considerable stream bank erosion, which contributes to downstream sedimentation. The channel instability also threatens adjacent homes and can negatively impact the riparian habitat along the creek that functions as an important wildlife corridor from the Western Coastal Range to the Yolo Bypass. Additionally, a significant proportion of methylmercury transported into the Bay-Delta originates from the Cache Creek watershed. The main goal of this proposed study is to address both the causes and the aforementioned consequences of bank erosion.

The assessment was designed to evaluate and quantify changes in hydrologic and geomorphic conditions in response to historical changes in land-use and water development (e.g., diversions, reservoir construction, groundwater pumping, etc.). This assessment also evaluated how historic human induced changes in hydrologic and geomorphic conditions affect riparian ecology in terms of the lost or altered floodplain area, character, and inundation frequency. A key product of this assessment was to distinguish between “natural” and “accelerated” bank erosion, and to identify the underlying causes (both natural and anthropogenic) so that appropriate solutions can be developed. Desired outcomes of the study included: reduce bank erosion by developing restoration designs for typical trouble sites; produce a ranking system to prioritize sites for stabilization and restoration; contribute to community education through watershed science education and the Yolo STREAM Project outreach program; improve water quality through reduction in accelerated erosion; and contribute to riparian corridor restoration and support the RCD’s Wildlife Conservation Board funded efforts to remove non-native tamarisk and around from the creek corridor. Work was completed through a broad spectrum of field and analytical investigations that received close review by the RCD, stakeholders, and a Technical Advisory Committee.

Ventura River Unimpaired Flow and Habitat Assessment, Ventura County, CA
City of Buenaventura and Nautilus Environmental, 2006–2007

Mr. Kamman completed a hydrology feasibility assessments as part of evaluating the reuse of Ojai Valley Sanitary District (OVSD) effluent for other beneficial uses. Currently, OVSD discharges treatment plant effluent to the lower Ventura River. The City and OVSD recognize that the reduction in the discharge of treated effluent to the Ventura River could have an environmental effect on sensitive and endangered species. In light of these concerns, this study was conducted to determine if a reuse project is feasible without significant environmental harm.

The assessment included hydrologic and geomorphic field and analytical assessments of past (unimpaired), current and proposed surface and groundwater flow conditions over a wide range of dry- through wet water year-types. The main objective if these analyses was to determine the linkage to water quality and aquatic habitat conditions including: flow durations; extent of gaining vs. losing reaches; low flow inundation/wetted area; and influence on barrier beach dynamics. Mr. Kamman collaborated with a team of other professionals to prepare a facility plan documenting the analyses and conclusions of respective water recycling investigations.

Hydrologic Analysis of FERC Minimum Flows on Conway Ranch Water Rights, Mono County, CA
Law Office of Donald Mooney, 2001–2002

Mr. Kamman completed a hydrologic analysis to evaluate if FERC’s proposed Minimum Flow Plan for Mill Creek would interfere with the exercise of the Conway Ranch’s water rights from Mill Creek. The approach to this analysis was to quantify the duration of time the Conway Water right was met under historic gaged and simulated proposed Minimum Flow Plan conditions. The primary objective of the analysis was to evaluate impacts during the winter period when flows are typically limited due to water storage as snow pack. Minimum Flow Plan conditions were simulated by developing a spreadsheet model that redistributes actual (historic) Lundy Lake releases in a fashion that maintains a minimum flow of 4 cfs to Mill Creek to accommodate the downstream Southern California Edison’s (SCE) power plant. The analysis period for both historic and simulated Minimum Flow Plan conditions consisted of water years (WY) 1990 through 1998 to capture an exceptionally diverse range of wet and dry year-types.

The primary method used to quantify changes in flow between historical and simulated Minimum Flow Plan conditions was to prepare and compare flow duration curves for each condition during both the winter and summer periods during a variety of water year types. Model results were tabulated for each conditions to determine the differences in the percentage of time target flows were equaled or exceeded. Based on these findings, Greg was contracted to complete more in-depth monthly modeling.

Groundwater Management Projects

Sycamore Grove Park Natural Resources Management Plan, Alameda County, CA
Livermore Area Recreation and Park District, 2001–2009

Mr. Kamman worked with a team of ecologists, planners, and cultural resource personnel in the preparation of a long-term natural resource management plan and a Sycamore Grove Recovery Program for the Livermore Area Recreation and Park District’s (LARPD) Sycamore Grove Park. Hydrologic investigations included implementing a surface water-groundwater interaction study of upper Arroyo Valle below Del Valle Reservoir to evaluate the linkage between altered shallow groundwater

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conditions and the health of the Parks Sycamore grove. This study characterized and documented the strong link between Arroyo flow and shallow groundwater conditions. Another important study component involved evaluating the role of flood disturbance (esp. scour) in the regeneration of Sycamore trees and the effect associated with altered flood releases through the Park due to construction of Del Valle Reservoir. The Resource Management Planning effort was followed up with two phases of work to assist LARPD and the Zone 7 with operational actions to promote recovery and sustainability of Sycamore grove.

This project illustrates Mr. Kamman's ability to integrate hydrologic studies with a variety of ecological studies to evaluate and characterize the linkage between physical and biological processes. Specific analyses completed include: field programs and data collection efforts to quantify surface-groundwater interactions; flood frequency analysis; flow duration analysis for periods of time under varying reservoir/water management strategies; geomorphic analyses; water quality analyses; and development of project documentation and correspondence. Mr. Kamman served as author and editor for select technical sections of the Final Recovery Plan for Sycamore Grove Park.

Assessments of Groundwater-Surface Water Interaction, Stanislaus County, CA
The Law Offices of Thomas N. Lippe, APC and California Sportfishing Protection Alliance, 2015–present

Since 2015, Mr. Kamman has been assessing groundwater conditions within Stanislaus County and evaluating potential impacts of groundwater pumping on surface water flow and aquatic habitat of the Stanislaus, Tuolumne and San Joaquin Rivers. Mr. Kamman completed a comprehensive review and synthesis report of available groundwater and interconnected surface water (ISW) reports and data. Using available soils, geology and hydrology information, Mr. Kamman also delineated and mapped subterranean streams and Potential Stream Depletion Areas (PSDAs) to identify stream corridors susceptible to adverse impacts from groundwater pumping. This information is intended to help Groundwater Sustainability Agencies identify potential impacts to ISW.

Most recently, Mr. Kamman has been retained to review and comment on 7 Groundwater Sustainability Plans (GSPs) for critically overdraft groundwater subbasins within or adjacent to Stanislaus County. This review focused on how GSPs address Groundwater Dependent Ecosystems (GDE) and ISW. Comments included recommendations on monitoring and study plans to identify and quantify impacts of groundwater pumping on stream flow rates and associated ecological habitats.

Assessment of Surface Water-Groundwater Interaction, Humboldt County, CA
Friends of the Eel River (FOER), 2020–present

Mr. Kamman is currently providing technical assistance in understanding surface water-groundwater interactions in the Lower Eel River Valley. Work includes reviewing and synthesizing available reports and hydrologic data and providing a science-based opinion on the role groundwater plays in supporting stream flow and aquatic habitats. This analysis addresses conditions and changes associated with seasonal and long-term wet-dry cycles. Data gaps will be identified and documented during the analysis.

This work is being completed to support FOER efforts at protecting aquatic resources within the framework of current water management practices and the public trust doctrine under California law. Additionally, this work includes providing hydrologic and hydrogeologic review, comment and recommendations during development of the basin's Groundwater Sustainability Plan (GSP) under the California Sustainable Groundwater Management Act (SGMA).

Scott Valley Subbasin Technical Hydrogeologist Assistance, Siskiyou County, CA
Klamath Tribal Water Quality Consortium and Quartz Valley Indian Reservation, 2019–present

Mr. Kamman is providing technical review and comment on the groundwater models and associated studies in the Scott Valley groundwater subbasin under the Sustainable Groundwater Management Act (SGMA) process. Work includes: review of groundwater models; synthesis and review of available groundwater quality data; assisting to identify constituents of concern; and review of the planning and technical studies being used to develop a basin Groundwater Sustainability Plan (GSP).

Middle Russian River Valley Shallow Groundwater Storage Enhancement Study, Sonoma County, CA
Friends of the Eel River, 2016

Working on behalf of Friends of the Eel River, Mr. Kamman completed a study to identify and quantify the volume of recoverable aquifer storage along two independent 6-mile reaches within the alluvial fill valley of the Russian River. The approach to this study was to quantify how channel incision has reduced shallow groundwater levels and quantify how much aquifer storage can be increased if channel bed elevations are restored to historic levels. The goal of this investigation was to identify feasible approaches to increase groundwater storage that would off-set losses associated with the termination of out-of-basin diversions from the Eel River. This work was completed through: intensive review and mapping of available groundwater level data; quantification of aquifer hydraulic properties; and calculating the shallow aquifer storage volume. In total, reclaiming the shallow aquifers within these two areas yield a total added storage volume of over 20,000 AF.

Green Gulch Farm (GGF)/Zen Center Water Resources Investigation, Marin County, CA
Green Gulch Farm, 1998–2019

Mr. Kamman completed a multi–phase study to evaluate the short- and long-term water uses and resources at GGF. Work was initiated by developing comprehensive water usage/consumption estimates and assessing available water resources, including spring, surface water, and ground water sources. Water demand estimates included quantifying potable and agricultural water usage/demands. Once reliable water supplies were identified and water usage/demand figures calculated, Mr. Kamman provided recommendation for improvements to water storage and distribution systems, land-use practices, conservation measures, treatment methods, waste disposal, and stream and habitat restoration. The initial phase of work included: in-depth review of available reports and data; review of geology maps and aerial photography; review of water rights and historic land use records; field reconnaissance including year-round spring flow monitoring; mapping and quantifying existing runoff storage ponds; and surface water peak- and base-flow estimates.

The second phase of work included identification of possible groundwater sources and siting and installation of production wells. This included sighting three drilling locations, obtaining County and State well drilling permits for a domestic water supply; coordination and oversight of driller; and directing final well construction. Upon completion of a well, Mr. Kamman directed a well pumping yield test and the collection and analysis of water quality samples (including Title 22) for small water

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supply system use. The final phase of work included assisting GGF with water treatment system options at the well head and integration of the groundwater supply into an existing ultra-violet light treatment system servicing spring water sources. Work was completed in 2000 with a budget of approximately $25,000, including all driller and laboratory subcontracting fees.

Stanford Groundwater Assessments, Santa Clara County, CA
Stanford University Real Estate Division, 2012–2016

Mr. Kamman provided technical hydrogeologic services to evaluate groundwater conditions and drainage requirements associated with the construction of several new facilities on or near Page Mill Road. The main objective of this study is to determine the seasonal depth to groundwater beneath the project site under existing and potential future conditions and provide an opinion on if the project is required to comply with the City of Palo Alto, Public Works Engineering Basement Exterior Drainage Policy (effective October 1, 2006). This work included obtaining and reviewing available technical reports, maps and literature pertaining to groundwater conditions in the project vicinity. Based on this review, we have prepared a letter report of findings and recommendations.

Bodega Bay Wetland Water Supply, Sonoma County, CA
Friends of Bodega Bay, 2007

Mr. Kamman Conducted an evaluation of the groundwater underflow feeding a large coastal wetland in Bodega Bay and recommended mitigation measures for potential losses in supply associated with proposed residential development in recharge areas. Work included: long-term monitoring of ground water quality and supply; monitoring surface water and spring flow and water quality; assessing and characterizing the interaction between surface and subsurface water sources during different seasons and water year-types; developing a detailed water budget for the site to assess impacts to recharge areas; and developing a number of physical solutions to mitigate for recharge losses.

L.A. Department of Water and Power, Groundwater Recharge Facility Operation Study, Los Angeles County, CA
ICF Consulting, 2006

Working as a subcontractor to ICF Consulting of Laguna Niguel, California, Mr. Kamman provided technical assistance in the hydraulic modeling of sediment accumulation in selected spreading ground facilities owned and operated by the Los Angeles Department of Public Works. The object of this work is to evaluate changes in infiltration and groundwater recharge rates over time within the spreading grounds in association with sediment accumulation from turbid waters.

Corde Valle Golf Club Surface-Groundwater Interaction Study, Santa Clara County, CA
LSA Associates, 2004

On behalf of LSA Associates of Pt. Richmond, CA, Mr. Kamman completed a 3rd party independent review of available reports and data sets (boring logs, well water levels, groundwater quality, aquifer pump-test, and surface water monitoring) to evaluate if pumping of the Corde Valle irrigation well is adversely impacting flow in West Llagas Creek. This investigation was implemented in response to a concern expressed by California Department of Fish and Game staff regarding the potential for differential drying of the West Branch of Llagas Creek along Highland Avenue. The analysis was also complicated by the likely effects of pumping from surrounding off-site wells.

Aquifer Testing for Tennessee Hollow Watershed Project, San Francisco County, CA
Presidio Trust, 2002

The Mr. Kamman assisted in the design and implementation of an aquifer test at the Presidio of San Francisco. We prepared an aquifer test work plan and conducted step-drawdown and constant-rate aquifer tests at the site using both manual and electronic data collection methods. This work included interpretation of the aquifer test results using software-based solution methods and prepared a written summary of methods and findings. In addition, Mr. Kamman located, coordinated and managed a drilling effort for the logging and installation of several groundwater monitoring wells in the project area to address identified data gaps.

San Joaquin River Riparian Corridor Restoration Project, San Joaquin Valley, CA
McBain-Trush, 2002

Mr. Kamman completed an assessment of historic and existing shallow groundwater conditions beneath and adjacent to the San Joaquin River between Friant Dam and the Merced River. This work focused on reviewing available reports and flow/groundwater- level data to characterize surface water and groundwater interaction and implications for riparian vegetation, water quality and fishery habitat restoration. Hydrologic analyses were performed to identify the location and seasonal evolution of losing and gaining reaches an implication on future restoration planning and design efforts. The main deliverable for this analysis was a report section focused on describing the historical changes in regional and local groundwater conditions in the San Joaquin Valley and evolution of anthropogenic activities (e.g., groundwater withdrawals, irrigation drainage systems and return flows, development of diversion structures, changes in land-use; and introduction of CVP/State Water Project deliveries) and associated impacts on deep/shallow groundwater levels, surface water flows, and surface and groundwater quality.

Tidal, Estuarine & Coastal Projects

Meadow Creek Lagoon Connection Project, San Luis Obispo County, CA
County of San Luis Obispo Flood Control and Water Conservation District, 2021–present

As part of a technical team, cbec is providing hydraulic modeling support to develop and evaluate alternatives to increase connectivity between Arroyo Grande Creek and Meadow Creek lagoons and to restore approximately 8.3 acres of degraded habitat in Meadow Creek Lagoon in Oceano, California. The purpose of the project is to increase habitat for growth and survival of smolt and rearing juvenile steelhead, as well as to enhance and protect lagoon wildlife and fisheries habitat in general. The lagoons also provide habitat for the California red-legged frog and tidewater goby, also federally listed species. As part of alternatives analysis, cbec developed an integrated numerical hydraulic and sediment transport (HD/ST) model encompassing Meadow and Arroyo Grande Creek channels and lagoons using the U.S. Army Corps of Engineers HEC-RAS one- and two-dimensional unsteady model code. Simulated conditions included a suite of design flow events and lagoon and tidal water levels controlled by varying lagoon inlet geometries. The model was used to evaluate water level and geomorphic response for a pair of levee setback alternatives, including water control structures between Meadow Creek Lagoon and Arroyo Grande Creek. The modeling results were key to understanding the interplay of flood and tidal peak timing from contributing systems on lagoon water levels and associated flood hazards, as well as identifying scour and sediment deposition patterns that affect control structure and channel flow conveyance. As the project manager for this work, Greg coordinated

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and directed hydraulic model development, acted as primary contact with the client, and presented findings during science panel meetings. Greg continues this roll in continued development and evaluation of project alternatives.

Quartermaster Reach Wetland Restoration Project, San Francisco County, CA
Presidio Trust, 2006–present

Mr. Kamman was retained as part of a multi-disciplinary team to develop restoration alternative designs for a 10-acre filled and paved site marking the historic confluence of Tennessee Hollow Creek and Crissy Marsh adjacent to San Francisco Bay. Key project objectives included expanding riparian habitat and creating an integrated system of freshwater streams and freshwater, brackish, and tidal marsh through re-establishing a creek connection to Crissy Marsh. Mr. Kamman provided H&H technical input and consultation to the design team to develop a restoration project consisting of a creek-brackish marsh-salt marsh interface and associated upland habitats. His work included evaluating surface water and groundwater and tidal sources. In addition, he developed both HEC-RAS and MIKE11 hydrodynamic models to inform and guide a preferred project design and analysis, including evaluation of storm surge, road crossing and Tsunami impacts to the project. Mr. Kamman continues to provide technical review of this project with respect to impacts to water resources and associated existing and proposed ecological habitats.

Salt River Ecosystem Restoration Project, Humboldt County, CA
Humboldt County RCD, 2005–2019

Mr. Kamman provided hydrology, engineering and environmental compliance services towards the planning and design of river and tidal wetland restoration on the Salt River (Eel River Delta plain) near Ferndale, California, in Humboldt County. The purpose of the Salt River Ecosystem Restoration Project (SRERP) is to restore historic processes and functions to the Salt River watershed and includes three components: 1) increasing flow conveyance through the lower Salt River and lower Francis Creek from near the Wastewater Treatment Plant downstream for 2.5 miles, 2) restoring 247 acres of wetland estuary habitat in the lower Salt River within the 440-acre former dairy, and 3) reducing sediment inputs from tributary watersheds. The Salt River Project was designed using an “ecosystem approach” to address hydrology, sedimentation, and fish and wildlife habitat.

As part of project feasibility assessment, Mr. Kamman completed a hydrologic and water quality monitoring program, and developed a MIKE11 hydrodynamic model of the lower Salt River and Eel River estuary in Humboldt County, for the Humboldt County RCD. Land use changes in the area have caused significant aggradation and infilling of the Salt River, significantly reducing tidal exchange, fish passage, and exacerbating flooding in upland areas. A primary goal of this study is to evaluate the feasibility of proposed restoration elements intended to increase tidal prism and exchange and in-channel sediment scour and transport. The desired outcome is a sustained increase in river conveyance capacity to improve drainage of surrounding flood–prone lands and improve aquatic, wetland, and riparian habitat.

Western Stege Marsh Restoration Project, Contra Costa County, CA
Tetra Tech, 2008–2010

Mr. Kamman provided technical hydrology and wetland hydraulics support to post–project monitoring of the Western Stege Marsh Restoration Project. His involvement began by providing an independent technical review of previous year’s hydrologic monitoring results to evaluate the proposed monitoring success criteria and the rationale used to develop these criteria. This work entailed reviewing historic monitoring data and available natural slough channel geometry data-sets for San Francisco Bay area marshes. Mr. Kamman’s study approach was to independently develop desired and sustainable channel geometry relationships for natural, healthy San Francisco Bay salt-marshes and compare them to the published success criteria. Greg was also retained to implement the Year 4 post–project hydrologic monitoring, with modifications to aid in better linking hydrologic processes to ecological conditions and function within the restored marsh. This work consisted of completing more targeted water level monitoring and channel geometry surveys in reference marsh areas containing desired physical and ecological attributes. These data were used to develop geomorphic success criteria (target channel geometry) more tailored to the project marsh and augment the criteria provided in available literature. Working closely with the project team of scientists, Mr. Kamman compared these hydrologic monitoring results to available vegetation surveys to better assess the overall success and evolutionary trend of the marsh.

Giacomini Wetland Restoration Project, Marin County, CA
The National Park Service and Point Reyes National Seashore Association, 2003–2012

Mr. Kamman managed a multi-year project for the NPS in the design and feasibility analysis of a tidal wetland, riparian, and freshwater marsh complex, on the 500-acre Giacomini Dairy Ranch at the south end of Tomales Bay. The project included hydraulic, hydrologic, and geomorphic assessments to characterize existing physical conditions, developing restoration alternatives, and completing hydrologic and hydraulic feasibility analyses. Restoration alternatives evaluated creation of a mosaic of subtidal through upland wetland and riparian habitat zones, as well as improvements to salmonid passage, red-legged frog habitat, tidewater goby habitat, and clapper-rail habitat. Emphasis was placed on completing detailed studies to quantify project-induced changes in flood frequency, magnitude and duration, impacts on water quality to local groundwater supply wells, and changes in sediment and water quality conditions in Tomales Bay. Mr. Kamman managed and assisted design engineers, preparing plans, specification, and cost estimates for a three phased construction schedule, that was completed in the summer of 2008.

Critical Dune Habitat Restoration to Protect Threatened and Endangered Species, Marin County, CA
The National Park Service, 2009–2010

Mr. Kamman provided and managed engineering, design, and implementation planning support for the restoration of 300 acres of critical dune habitat at Abbots Lagoon within the NPS Point Reyes National Seashore. He developed engineered drawings, technical specifications and engineer’s cost estimates, and assisted NPS in defining a range of methodologies suitable to local conditions and sensitive flora and fauna. This area of the park supports the best remaining intact dune habitat, including some of the largest remaining expanses of two rare native plant communities: American dune grass (Leymus mollis) foredunes, and beach pea (Lathyrus littoralis). European beach grass and iceplant were removed from the project site using mechanical removal and hand removal techniques. The project goal was to remove these invasive species from approximately 135 acres of prime dune habitat in the 300-acre project site, while not impacting sensitive species and habitats. The intended result was to remobilize this historic dune field and restore their natural form and migratory processes.

This project illustrates Mr. Kamman’s ability to work closely with NPS staff to balance habitat protection and restoration across the landscape. As part of project design, he developed grading plans, and specified work flow, equipment movement and

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access routes which minimize impacts to special status species. Extensive fencing and exclusions zone planning was required to protect existing native habitats, and minimize tracking of plant stock to or through restored sties. In addition work elements had to be structured and prioritized to maximize ground work subject to budgetary constraints and work flow uncertainties. All work has been completed on budget and in a timely fashion, even with repeated expansions to the project boundary and affected area and last minute changes driven by endangered species issues.

Lower Gualala River and Estuary Assessment and Management Plan, Mendocino County, CA
California State Coastal Conservancy and Gualala River Watershed Council, and Sotoyome RCD, 2002–2005

Mr. Kamman worked with fisheries biologists to evaluate the hydrologic and water quality conditions in the lower Gualala River and estuary and identify and evaluate potential impacts to summer rearing habitat for salmonids and other aquatic organisms. This work included: assessing how the impacts of upstream land use (logging and water diversions) have altered water delivery and water quality to the Lower River and estuary over time; characterizing the physical coastal and riverine processes controlling opening and closure of the estuary inlet and lagoon morphology; monitoring and characterizing real-time and seasonal changes in lagoon water level and water quality; and evaluating the sediment transport capacity and geomorphic condition of the lower river and estuary. An important aspect of this work was to integrate physical, water quality, and biological data and information into a coherent and understandable description of the interrelated processes controlling the aquatic ecology of a lagoon system. Mr. Kamman took the lead in developing and editing a management plan for the lagoon, prescribing actions to preserve, protect and enhance ecological habitats (with emphasis on salmonids) within the lagoon and lower Gualala River.

Suisun Bay Tidal Wetland Restoration Design, Contra Costa County, CA
East Bay Regional Park District and LSA Associates, 1999–2005

Mr. Kamman provided hydrologic design services to the restoration of a 55-acre tidal wetland on Suisun Bay. The design will maximize habitat for special status fish species, and (to the extent possible) habitat for other special status animal and plant species. Working with a multi-disciplinary design team, Mr. Kamman assisted in developing a design based on analysis of habitat needs, tidal hydrodynamic and geomorphic processes, sedimentation rates and soil characteristics. Project tasks included: a site analysis defining existing ecological and hydrologic conditions; a hydrologic and biological restoration opportunities and constraints analysis to define restoration and management objectives; and hydrodynamic and sedimentation modeling to evaluate design alternatives. The final restoration and management plan included a grading plan, landscape revegetation plan and monitoring and maintenance plans. This work again illustrates his capabilities in the characterization of physical site conditions, development and feasibility analysis of project alternatives, and preparation of preliminary designs of sufficient detail to allow for environmental compliance through the CEQA/NEPA process.

Santa Clara River Estuary and Lower River Assessment, Ventura County, CA
Nautilus Environmental on behalf of the City of Ventura, Public Works Department, 2003–2004

Mr. Kamman directed a hydrologic and geomorphic assessment of the lower Santa Clara River and estuary. The proposed study entailed characterizing existing and historic hydrologic and physiographic conditions and an assessment of historic changes in inflow to the estuary. Mr. Kamman designed and conducted a multi-year monitoring program of water levels, water quality (temperature, dissolved oxygen, salinity, and pH), and sand-spit morphology in order to evaluate inlet opening/closure frequency and associated changes in aquatic habitat (esp. tidewater goby) and other ecologic communities. Work included a detailed coastal process analysis (including wave power analyses and littoral sand transport), which, considered with the inflow analysis, provides a basis to evaluate the seasonal cycle of barrier beach buildup and destruction. Mr. Kamman also developed a detailed surface-/ground-water and salinity budget model for the estuary to evaluate the impacts of a wide variety of proposed and modified estuary inflow regimes to determine potential future water level and salinity conditions in the lagoon and impact on frequency of inlet breaching.

Eden Landing Ecological Reserve Restoration, Alameda County, CA
East Bay Regional Park District, 2000–2003

Mr. Kamman developed and completed hydraulic modeling assessments for the design of an approximately 1000-acre tidal marsh restoration in former Cargil salt manufacturing ponds, located a mile inland of San Francisco Bay. The restoration goals required balancing the desires to restore tidal marsh conditions to the site, while maintaining and enhancing the open water and salt panne habitats preferred by resident and migratory shorebirds. The project design also addressed and incorporated remediation of high soil salinities resulting from past salt production, subsided ground elevations, dredging of new channels to the bay, existing infrastructure constraints, public access for the San Francisco Bay Trail, and preservation of several important cultural and historical sites. Hydraulic design objectives include maximizing both interior circulation and tidal exchange between the restoration parcel and the bay. A series of one-dimensional unsteady hydrodynamic models (MIKE11) were used to design the channel network, identify high velocity areas requiring erosion protection, and characterize expected habitat conditions. An important component of this design and feasibility assessment was to translate desired ecological habitat conditions identified in the EIR into specific hydrologic design criteria, considering channel velocities, scour, sediment transport, tidal water inundation frequencies and seasonality of ponding. Mr. Kamman worked closely with EBRPD civil engineers, assisting with the translation of hydraulic design criteria into final engineered drawings and specifications.

Eel River Estuary Preserve Ecosystem Enhancement Project, Humboldt County, CA
California Trout and State Coastal Conservancy, 2015–2019

Mr. Kamman led the technical hydrodynamic studies for feasibility alternatives analysis for ecosystem enhancement on the Eel River Estuary Preserve in Ferndale, CA. Construction of levees and tide gates around the project area has severely limited tidal exchange and degraded historic project wetlands, reduced flood drainage and sediment transport, and obstructed fish passage. The goal of the project is to improve geomorphic and ecosystem functions that would enhance habitat for native fisheries and aquatic species, support waterfowl and wildlife species, and benefit agricultural land management by more effectively managing onsite flooding and sedimentation. Other project objectives included: designing and planning for future climate scenarios and sea level rise in relation to agricultural land management, capacity and uses, and vegetative communities; establishment of a sediment management area; and beach dune enhancement. Mr. Kamman developed and evaluated a suite of channel and tidal restoration alternatives through muted tidal exchange with outboard tide waters, either via retrofitting existing tide gates or through new Muted Tide Regulator (MTR) style gates installed through the existing outboard levee. Using available topographic and bathymetric information, Mr. Kamman developed a 1-dimensional model to

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evaluate a suite of proposed project alternatives. Working with the project design team's aquatic ecologist, results of the hydraulic analysis were used to evaluate and characterize the potential benefits and impacts to important species that exist or could colonize the project area, including coho salmon, tidewater goby, coastal cutthroat trout, longfin smelt, lamprey eel, water fowl, shore-birds, eelgrass and other sensitive fish, wildlife and plant species. Mr. Kamman also provided technical support for the siting and design of sediment management areas and completed a planning and technical feasibility study for dune restoration alternatives along three miles of project coastline immediately south of the Eel River mouth.

Design of California Red-Legged Frog Breeding Ponds, San Francisco Bay Area (various), CA
The National Park Service and Golden Gate National Parks Conservancy, 1997–present

Mr. Kamman has lead or provided hydrologic and engineering design assistance to the sighting and design of nearly two dozen breeding ponds for California red-legged frog throughout the San Francisco Bay Area. Work has been completed in Marin, Sonoma, Solano, Contra Costa, Alameda, and Santa Clara Counties under the auspices of numerous federal, state, and local county/city agencies. A common study approach consists of an initial site reconnaissance of watershed conditions and identification of potential sites. The reconnaissance is followed by a surface water hydrologic sufficiency analysis using available meteorologic and stream flow information. An important variable sought during pond sighting is the presence of migration corridors between known breeding areas and/or perennial water sources. Based on in-depth research and post–project monitoring, Mr. Kamman has refined or developed site-specific evapotranspiration estimates, which commonly do not match standard applied values. Accurate evapotranspiration rates are necessary if ponds are intended to periodically dry-down as a means to preclude undesired species such as bullfrog or mosquito fish. In many instances, a seasonal groundwater-monitoring program is implemented in order to better investigate and quantify potential and seasonal groundwater contributions. Other design challenges we commonly experience include: design of impermeable liners for ponds located in upland areas or highly permeable soils; hydraulic analyses and design of outfalls/spillways; sedimentation management/maintenance approaches; and requirements of inoculum and water used to line and fill the pond, respectively.

Hydrologic Feasibility Assessment for Mana Plain Wetland Restoration Project, Kauai, HI
State of Hawaii Department of Land and Natural Resources, 2010–2019

Working on behalf of the Mana Plain Wetland Restoration Partnership, Mr. Kamman completed a hydrologic feasibility assessment for the Mana Plain Wetland Restoration Project proposed by the State of Hawaii Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) on the island of Kauai. The Mana Plain Wetland Restoration Project site is approximately 105 acres of low-lying abandoned sugarcane fields immediately north of the Kawaiele Waterbird Sanctuary and east of the Pacific Missile Range Facility. The purpose of the Mana Plain Wetland Restoration Project is to maximize the area of constructed wetlands within the restoration site. Palustrine emergent wetlands within the project will create habitat for four species of endangered Hawaiian waterbirds and other sensitive species, including: Hawaiian stilts; Hawaiian ducks; Hawaiian coots; Hawaiian moorhen; migratory waterfowl; and migratory shorebirds. The Mana Plain is of vital importance for the recovery of endangered waterbirds species. This restoration project will be designed to provide important breeding and feeding wetland habitats on an island where; 1) wetlands have been severely degraded, and 2) mongoose, an introduced predator, have not been established.

Mr. Kamman's work on this project included technical assessments and development of proposed restoration alternatives. Analyses completed included: a synthesis of the physical site setting (topography, geology, hydrogeology and soil); reviewing available data to characterize site meteorology, surface water drainage, water quality, and groundwater conditions; preparing a detailed water budget to describe the characteristics and processes of surface water and groundwater movement into and through the project area; evaluating project feasibility, water supply alternatives and costs; and completing a flood hazard impact assessment to evaluate potential project benefits and impacts to local area flooding. Working with the project partners, Mr. Kamman developed a preferred project alternative and supported in preparation of the project Environmental Assessment document. Mr. Kamman's firm was also retained by the State of Hawaii to develop engineering designs of the project.

MacArthur Meadow Wetland Restoration, San Francisco County, CA
Presidio Trust, 2013–2016

Mr. Kamman has been working on over a dozen independent wetland and creek restoration planning and design efforts within the Presidio of San Francisco since 2001. Most recently (2016), he developed a wetland restoration grading plan for the MacArthur Meadow Wetland Restoration Project in the central portion of the Tennessee Hollow watershed. As part of the site assessment, Greg characterized and modeled surface and groundwater interactions and identified a unique opportunity to restore 4 acres of mixed meadow, natural wetlands and creek/riparian corridor. This was possible due to the discovery of shallow groundwater conditions beneath this historically disturbed landscape. Various design components were integrated into the grading plan in order to enhance groundwater recharge and storage in the Meadow, while retarding runoff and drainage out of the wetland, including: daylighting storm drain runoff into the Meadow; reconfiguring internal channel alignments to enhance channel habitat and groundwater recharge; creation of wetland depressions to retain and recharge surface water; and removal of fill material to decrease the depth to the water table. Notable challenges of this work include restoring heavily disturbed natural resources in an urban setting while integrating designs with archeology/cultural resources, education and remediation programs.

Dragonfly Creek Restoration Project, San Francisco County, CA
Presidio Trust, 2007–2011

Mr. Kamman designed and managed hydrologic monitoring and analysis studies in support of planning and design for riparian and wetland habitat restoration along approximately 500-linear feet of the Dragonfly Creek corridor near Fort Scott of the Presidio of San Francisco. Work has included completing subsurface investigations including the installation of shallow wells and a sharp-crested weir with recorder to gauge creek flows. Mr. Kamman assisted in the development and selection of a preferred project alternative, considering on-site cultural resource protection, education and resource management issues (including flood control). Mr. Kamman prepared permit applications. Major components of the project included removal of significant fill and building foundations and installation of a new creek road crossing that will maintain the historical alignment, function and architectural character of a culturally significant roadway. Mr. Kamman oversaw development of PS&E for this project, which will create mitigation wetlands for a highway earthquake retrofit project that passes through the Park.

This project illustrates Mr. Kamman's ability to complete a broad variety of hydrologic

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analyses, including: surface water and groundwater hydrologic monitoring to characterize and quantify existing hydrologic conditions; rainfall-runoff modeling; hydraulic modeling of flood and scour conditions (including road crossing); preservation of existing wetland habitat and vegetation communities; integration with other Presidio Trust programs; and contracting flexibility to assist in conceptual planning and environmental compliance without increasing project design costs.

Mori Point Sensitive Species Habitat Enhancement Project, San Mateo County, CA

Golden Gate National Recreation Area and Golden Gate National Parks Conservancy, 2005–2011

Mr. Kamman provided hydrologic analyses, sighting and engineering design (PS&E) for three California red-legged frog breading ponds within the 105-acre Mori Point area. These efforts were completed in association and collaboration with a larger Coastal Trail improvement and ecosystem restoration effort. Quarrying and off-road vehicle use have left this site heavily scarred. The focus of restoration work was to protect the endangered San Francisco garter snake and the threatened red-legged frog. Most of this work will be focused on invasive species removal and enhancing endangered species habitat. As part of species habitat improvement, Mr. Kamman worked with project ecologists to design the ponds to optimize breeding habitat for California red-legged frog.

Work started with an initial site reconnaissance and study of watershed conditions and identification of potential sites. The reconnaissance was followed by a surface water hydrologic sufficiency analysis using available meteorological and stream flow information and installation and monitoring of shallow piezometers to quantify the proximity and seasonal variability in depth to water table. An important variable sought during pond sighting was the presence of migration corridors between known breeding areas and/or perennial water sources. Based on in-depth research and post–project monitoring for other ponds they created in the San Francisco Bay area, Mr. Kamman refined site-specific evapotranspiration estimates. Accurate evapotranspiration rates are necessary if ponds are intended to periodically dry-down as a means to preclude undesired species such as bullfrog or mosquito fish.

Other design challenges experienced included: design of impermeable liners for ponds located in upland areas or highly permeable soils; hydraulic analysis and design of outfalls/spillways; sedimentation management/maintenance approaches; and requirements of inoculum and water used to line and fill the pond, respectively. Mr. Kamman has designed numerous ponds for the NPS and affiliates within the Bay Area, including Mori Point (constructed 2007), Banducci (constructed 2007) and Giacomini (Phase I and Phase II constructed in 2007 and 2008) project sites.

Hydrologic Assessment and Restoration Feasibility Study for Shadow Cliffs Regional Recreation Area, Alameda County, CA

East Bay Regional Park District, 2009–2010

Mr. Kamman developed and implemented an assessment to identify groundwater levels and supplemental water supplies that will sustain seasonal wetland restoration areas and riparian habitats under an altered future hydrologic regime. This work will inform a forthcoming Land Use Plan Amendment for park occupying a series of former gravel quarry pits. Work included: obtaining and synthesizing available surface water and groundwater data to characterize existing hydrologic and water supply conditions and seasonal variability; quantifying the likely changes in groundwater conditions and quarry pit lake levels in association with changes in regional water transmission and groundwater recharge operations; and identifying, developing and evaluating a suite of ecosystem restoration alternatives. Other important project objectives include: improving habitat for waterfowl and wildlife; broadening recreational use; enhancing visitor education and wildlife interpretation; improve park aesthetics. Mr. Kamman evaluated a preferred park and ecosystem enhancement alternative that involves diverting high winter flows from an adjacent arroyo. This project demonstrates Greg's ability to characterize hydrologic conditions and quantify the relationship between groundwater, surface water and wetland habitat conditions, both under existing conditions and in predicting future hydrologic and ecologic conditions under an altered hydrologic regime (i.e., lower groundwater table).

Laguna Salada Marsh and Horse Stable Pond Restoration Project, San Mateo County, CA

Tetra Tech, 2007–2009

Mr. Kamman provided technical hydrology and hydraulics support to the planning and conceptual restoration design of Laguna Salada marsh and Horse Stable Pond, located adjacent to Sharp Park Golf Course in the town of Pacifica, California. The primary objectives of the project are: to reduce flood impacts within the project vicinity; improve sustainable ecological habitat for the endangered San Francisco garter snake and the threatened California red-legged frog; better understand and characterize the hydrologic and water quality conditions/processes affecting flood and ecological habitat conditions within the project vicinity; provide an effective pumping operation plan to meet ecological objectives; and develop appropriate hydrologic analytical approaches and models to assist Tetra Tech and the San Francisco Recreation and Park Department in the planning and design for marsh, pond, and creek restoration. The project is also a unique opportunity to connect this resource with the California Coastal Trail, the Bay Area Ridge Trail, and the surrounding GGNRA lands.

Mr. Kamman's work included completing a comprehensive review of available hydrologic and site information and implementing selected field investigations to develop and calibrate an integrated hydrology-flood routing–pond water operations model that will quantify the volume and depth of water moving through the project system. The investigation will also further characterize shallow groundwater conditions and water quality with respect to effects on Laguna Salada and Horse Stable Pond. Analytical and numerical modeling tools are being used to better characterize existing hydrologic and water quality conditions and to assist in identifying project opportunities and constraints as well as evaluate potential restoration design components - all necessary to inform a sustainable and successful restoration design.

Tolay Lake Restoration Feasibility Assessment, Sonoma County, CA

Sonoma County Agricultural Preservation and Open Space District, 2003

Mr. Kamman completed a detailed hydrologic feasibility analysis to evaluate a suite of potential freshwater lake and wetland restoration alternatives. Sites were evaluated under existing watershed land-use practices and under existing and forecasted water demands (in the form of existing water rights/applications). Analysis consisted of developing a detailed water budget model to simulate alternative restored lake inundation areas and depths under median and dry year conditions, as well as a 50-year historic period (1947-1997) displaying highly variable rainfall and runoff supplies. Three lake restoration alternatives were evaluated based on existing topography and likely historic lake configurations. The restoration alternatives include lakes with storage volumes equivalent to 136-, 1100-, and 2550-acre feet.

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Haypress Pond Decommissioning and Riparian and Channel Restoration, Marin County, CA
Golden Gate National Recreation Area (GGNRA), 2001–2002

This project restored 170 meters of historic creek and riparian habitat through removal of Haypress Pond dam in Tennessee Valley within GGNRA. The goals of the project were to alleviate long-term maintenance needs and eliminate non-native bullfrog habitat threatening native California red-legged frog habitat in adjacent watersheds.

Working with the Park biologist, Mr. Kamman developed designs to decommission the dam and restore natural riparian and meadow habitat. This work included: characterization of existing topographic conditions; design of a channel profile through the proposed restoration project reach; preparation of a grading plan for the restoration project; and hydrologic and hydraulic analyses to evaluate the performance of the creek channel and flood plain below the former dam during a variety of flows. Challenges of this work included integrating sediment reuse into plans and construction phasing.

Damon Slough Site Seasonal Wetland Design, Alameda County, CA
Port of Oakland, 1999–2001

Working on behalf of the Port of Oakland, Mr. Kamman completed extensive surface and groundwater monitoring and data analyses to develop a detailed water budget to assist in the evaluation and design of a 7.5 acre seasonal freshwater wetland. Primary project objectives included a design that would provide shorebird/waterfowl roosting habitat, minimize impacts to existing seasonal wetland areas, and lengthen the duration of ponding through the end of April to promote use by migratory birds. In addition to developing hydrologic design criteria, responsibilities included development of grading plans to accommodate a local extension of the Bay Trail and wetland outlet works.

Water Quality Projects

Lower Miller Creek Channel Maintenance and Material Reuse Sampling Analysis Plan, Marin County, CA
Las Gallinas Valley Sanitary District, 2015

Mr. Kamman was commissioned to formulate and implement a plan for sediment removal and improved flood flow conveyance in the Lower Miller Creek channel. Accumulation of course sediment in the project reach had reduced discharge efficiencies at District outfalls. Miller Creek supports a population of federally listed Steelhead and adjacent wetland/marsh areas potentially support other state and federally listed special status species. Working with District Staff, Greg developed a suite of potential project alternatives and identified a preferred approach. Mr. Kamman completed all CEQA compliance (IS/MND), permitting and oversaw development of engineered plans and specifications.

In order to evaluate if reuse of excavated material from 2,655 feet of creek corridor in upland areas was feasible, Mr. Kamman developed and implemented a Sampling Analysis Plan (SAP) pursuant to U.S. Army Corps Guidance for Dredging Projects within the San Francisco District. Sample collection, sample handling, and analysis were performed in accordance with the SAP. Results for analytes were compared to a variety of screening criteria to determine the material's suitability for reuse in aquatic environments. A full suite of chemical and physical analyses were performed on soil samples collected from 16 locations, including: metals, PAHs, PCBs, pesticides, TOC, specific conductance, pH, sulfides, percent moisture and grain-size. Mr. Kamman managed all aspects of this effort including reporting and presentations/negotiations at multi-agency meetings through the Corps Dredge Materials Management Office (DMMO).

Chicken Ranch Beach Soil and Groundwater Quality Investigation and Restoration Planning, Marin County, CA
Tomales Bay Watershed Council, 2007–present

Mr. Kamman is leading scientific and engineering efforts for a wetland and riparian corridor restoration project on Third Valley Creek and Chicken Ranch Beach in Inverness, California. The main project goals are to create a self-sustaining riparian and wetland system (requiring minimal operation and maintenance) and eliminate public exposure to high levels of bacteria that exist in a site drainage ditch discharging to the beach. The design will likely include establishing a blend of habitats, including: riparian stream corridor, seasonal/perennial freshwater marsh, and tidal/saltwater marsh.

Current efforts have included the development and implementation of a soil and groundwater quality investigation to delineate the source of elevated bacteria levels. This work includes: the collection and testing of depth-discrete soil samples; groundwater well installation, sampling and testing; and surface water sampling and testing; analysis of laboratory results; and reporting, including recommendations for further/expanded investigations. Mr. Kamman coordinated this time-sensitive sampling and analysis (six hour hold times) with Brulje and Race Laboratories in Santa Rosa.

Lower Pitkin Marsh Hydrologic and Water Quality Monitoring, Sonoma County, CA
Sonoma Land Trust, 2008–2010

Mr. Kamman was retained to develop and implement a hydrologic and water quality monitoring program at Lower Pitkin Marsh outside of Forestville, California. The Pitkin Marsh area is one of the most valuable complexes of mixed riparian woodland and thicket, freshwater marsh, wet meadow, oak woodland and grassland in Sonoma County. The complex interaction of surface water, ground water, and scattered seeps and springs on the site creates unusual hydrologic conditions that promote a rare assemblage of plant species which includes several endemics. The primary objective of the hydrologic monitoring program was to understand the annual and season sources of both surface and ground water supplying wetlands. Hydrologic and water quality monitoring was initiated during the winter wet season of 2008/09 and will be conducted for a 12-month period through the ensuing summer dry-down and into the following wet season. Understanding how groundwater levels, spring flow and creek flow rates recede from winter wet to summer dry conditions will provide an important understanding and quantification of the seasonal variability in water supplies feeding selected wetland types. General water quality parameters (temperature, pH, specific conductance, and ORP) are measured at all monitoring locations during each visit. Nutrients (N and P) are measured in selected surface water and groundwater samples collected during at least three monitoring events, including a winter high flow, spring high base flow and summer low baseflow.

Pescadero Lagoon Restoration and Enhancement, San Mateo County, CA
California State Coastal Conservancy, 2005–2006

Mr. Kamman was retained to support restoration and water quality enhancement planning efforts in Pescadero Lagoon. In 2005–2006, he completed a synthesis of available hydrologic and water quality information in responding to requests for development of a hydrodynamic and water quality model of the lagoon. This model was considered as a means to identify causes for repeated fish-kills in the lagoon that occurred during initial breaching of the inlet. Mr. Kamman assisted in preparing a synthesis and model development feasibility report from this effort.

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Water Temperature Simulations for Trinity River Fish and Wildlife Restoration Project, Trinity County, CA
Trinity County Planning Department, 1994–2004

For over a decade, Mr. Kamman completed a number of hydrology and water quality investigations in support of alternative feasibility studies on the Trinity River Fish and Wildlife Restoration Project in direct support of the Trinity River Restoration EIR/EIS. Studies involve assessing the effects of proposed flow alternatives on water temperature within and downstream of Lewiston Reservoir. Mr. Kamman was responsible for data collection, processing, and flow/temperature modeling of Lewiston Reservoir as part of a coordinated evaluation including other Trinity River system models. Another study included evaluating how project operations could be implemented or modified to optimize Lewiston Lake release temperatures to meet downstream temperature criteria and compensate for increased warming of the river associated with side channel and feather edge restoration activities. Mr. Kamman continues to evaluate how more recent water projects (raising Shasta Dam, Sites Reservoir, and the Waterfix tunnels) consider and integrate with the Trinity Restoration Project.

Upper Eel River Unimpaired Flow and Water Temperature Assessments, Humboldt County, CA
CalTrout, 1997-1999

Mr. Kamman evaluated changes in the natural flow regime of the upper Eel River, and developed an Upper Eel River proposed release schedule to enhance downstream Chinook and Steelhead spawning and rearing habitat. This work was triggered by proposals set forth by PG&E as part of their Potter Valley Project FERC relicensing process. Work consisted of two main investigations. The first included reviewing results of a ten year PG&E study and development of multivariate regression and stream reach (SSTEMP) temperature models to assess the effects proposed flow alternatives would have on downstream temperatures. The second investigation consisted of characterizing unimpaired flow conditions and developing a daily unimpaired flow record for use in project operation models.

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Kamman, G.R., 2016, Review of Draft EIR for General Waste Discharge Requirements for Vineyard Dischargers in the Napa River and Sonoma Creek Watersheds. Prepared for: Law Offices of Thomas N. Lippe APC, September 14, 81p.

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Kamman, G.R., 2015, Sharp Park Project Impacts to Laguna Salada. Prepared for National Parks Conservation Association and Wild Equity Institute, April 14, 1p.

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