Fact Sheet for Reviewing Wetland and Riparian Projects

San Francisco Bay Water Board

December 1, 2006

The purpose of this document is to generally summarize the Water Board's Clean Water Act (CWA) Section 401 Certification Program and to facilitate the permit application process. Each 401 Certification application is decided on a case-by-case basis and will be guided by the applicable requirements of the CWA, Porter-Cologne and the regulations thereunder. Nothing contained herein is intended to establish policy or legal requirements beyond what is required by duly established law, regulation, and policy. This document was written as internal guidance for Water Board staff, and is not intended as advice to members of the public regarding mandatory requirements of law, regulation, or policy; for this, independent counsel and advice from outside this agency should be sought.

Fact Sheet for Reviewing Wetland Projects

TABLES:

APPENDICES:

SOME ACRONYMS AND TERMS USED:

CRWQCB = California Regional Water Quality Control Board, San Francisco Bay Region. Note that "Water Board" is the preferred term for references to the agency, but the long version is used in this document for literature references.
CEQA = California Environmental Quality Act
CWA = Clean Water Act
DOD = Department of Defense
NWP = Nationwide Permit
Porter-Cologne = Porter Cologne Water Quality Control Act
State Water Board = California State Water Resources Control Board
Corps = United States Army Corps of Engineers
U.S. EPA = United States Environmental Protection Agency
Water Board = California Regional Water Quality Control Board, San Francisco Bay Region
WDRs = Waste Discharge Requirements

I. LAWS & REGULATIONS:

The Water Board's authority to approve, with or without conditions, or deny projects[1] that potentially impact wetlands and/or other waters of the state comes from the following:

(1) the state's Porter-Cologne through Waste Discharge Requirements (WDRs) to protect waters of the state; [2]
(2) the federal Clean Water Act under Section 401[3];
(3) the San Francisco Bay Basin Water Quality Control Plan (Basin Plan [2005])[4] (Sections 4.23 & 4.23.4) which is available at http://www.waterboards.ca.gov/sanfranciscobay/basinplan incorporates several State directives to protect wetlands including:

(a) Governor's Executive Order W-59-93 (i.e., the "California Wetland's Policy" which requires "No Net Loss of Wetlands");
(b) Senate Concurrent Resolution No. 28; and
(c) California Water Code Section 13142.5 (applies to coastal marine wetlands).

In addition to the state directives to protect wetlands, the Basin Plan also directs the Water Board staff to use U.S. Environmental Protection Agency's (EPA) CWA 404(b)(1) guidelines to determine circumstances under which the filling of wetlands may be permitted and requires that attempts be made to avoid, minimize, and only lastly to mitigate for adverse impacts. The Basin Plan also contains two policies for constructed wetland treatment systems, one for wastewater and one for urban runoff (Section 5.2.11).

Differences Between Federal and State Jurisdiction Over Wetlands:

California's jurisdiction to regulate its water resources is much broader than that of the federal government. While the U.S. Supreme Court's 2001 decision in *Solid Waste Agency of Northern Cook County vs. U.S. Army Corps of Engineers* (the "SWANCC" Decision) called into question the extent to which the federal government may regulate isolated, intrastate, non-

[1] Projects that might affect wetlands or other waters of the state include those that fill wetlands as well as those that change hydrology or drainage such as dams, abutments, piers, pilings, riprap, retaining walls, culverts, outfalls, and restoration projects.
[2] The Porter Cologne Act gives the state authority over all waters in the state, and thereby protects wetlands, including isolated wetlands, from any direct or indirect impacts.
[3] The section of the Clean Water Act that gives the U.S. Army Corps of Engineers authority to regulate placement of dredge or fill material into U.S. waters is Section 404. Section 401 of that Act requires any applicant for a federal license or permit for any activity which may result in a discharge into navigable waters to obtain from the state in which the discharge originates a certification that the discharge will comply with applicable state laws and regulations. No federal license or permit can be granted until the certification has been obtained or waived.
[4] The final section numbers provided in this report for the 2005 Basin Plan will be verified when it is officially adopted.

navigable waters as "waters of the United States" under the CWA, state law is unaffected by that decision.[5] Indeed, the Court expressed its expectation that states would regulate such waters in the absence of federal regulation. The State Water Resource Control Board's (State Water Board's) Executive Director also issued a memo directing the Regional Water Boards to regulate such waters under Porter-Cologne authorities. Porter-Cologne extends to "waters of the state," which is broadly defined as "any surface water or groundwater, including saline waters, within the boundaries of the state."[6] This definition includes isolated wetlands and any action that may impact isolated wetlands is subject to the Water Board's jurisdiction, which may include the issuance of WDRs. For projects that will impact less than 0.2 acres of "isolated" wetlands, the State Water Board issued Order No. 2004-004-DWQ, *Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to waters Deemed by the U.S. Army Corps of Engineers to be Outside of Federal Jurisdiction* (General WDRs). These General WDRs streamline the permitting process for low impact projects in isolated wetlands.

II. 401/WDR APPLICATION

The information provided below pertains to 401 certifications under the CWA since they are the primary means used to ensure the protection of water quality in the San Francisco Bay Region. Each 401 certification issued by the Water Board incorporates WDRs under State Water Resources Control Board Order No. 2003-0017-DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges that Have Received State Water Quality Certification". The use of the General WDRs along with the 401 certifications is intended to assure greater authority and enforcement power, even when no Report of Waste Discharge is submitted. At times, WDRs will be issued without a certification where the U.S. Army Corps of Engineers (the Corps) does not have jurisdiction, such as for the isolated waters mentioned above, for groundwater, or when beneficial uses are only indirectly threatened. WDRs can also be issued for more complicated projects that present a long term potential to affect water quality and beneficial uses of waters, and other projects that involve other types of permits, such as NPDES permits, that combine wetland mitigation or restoration projects under one WDR.

Application forms are available at http://www.waterboards.ca.gov/sanfranciscobay/certs.htm and detailed guidance for filling out the forms is available at http://dwqweb/wqcert/default.asp. A checklist for this application is provided in Table 1. An application form is not required but if the applicant chooses not to use our application form, the following information should be submitted in the application:[7]

1. Description of site location, project purpose, and avoidance/minimization efforts.
2. A full, appropriately detailed, and technically accurate description, including the purpose and final goal of the entire activity.

[5] See Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers (2001) 531 U.S. 159, 121 S.Ct. 675, 148 L.Ed. 2nd 576.
[6] Water Code Section 13050.
[7] 23 CCR 3856 et seq.

3. Copies of all completed or draft federal, state, and local permits or agreements related to the project; or a copy of the completed Joint Aquatic Resource Permit Application (JARPA) form, if available (www.abag.ca.gov)
4. Documentation of coordination with other agencies
5. A copy of California Environmental Quality Act (CEQA) compliance documentation (if available[8]) and any other required environmental documents (required before any approval action)
6. U.S. Environmental Protection Agency's 404(b)(1) guidelines analysis
7. Mitigation & Monitoring Plan, if required
8. Any other information requested by the Water Board staff
9. Fee: A $500 base price fee is required for fill and excavation, dredging, and shoreline discharges in addition to assessments based on the size of the projects (maximum fees of $40,000); discharges to isolated waters are double the application fee schedules; and flat fees of $500 are required for restoration and low impact discharge projects and of $60 for projects under general orders requiring notification[9]. For a complete description of fees and a fee calculator, see http://www.waterboards.ca.gov/cwa401/docs/dredgefillfeecalculator.xls or http://www.waterboards.ca.gov/sanfranciscobay/certs.htm

Applications for 401 certifications are reviewed for completeness within 30 days of receipt and the Water Board should act on an application before the federal period for certification expires. For Corps 404 permits, that period is 60 days, but it may be extended up to one year from receipt of a complete application for certification. An application cannot be deemed incomplete for lack of a California Environmental Quality Act (CEQA) document. However, the Water Board may not act on an application until a certified final CEQA document has been submitted and reviewed by the Board and/or Board staff. The Water Board may deny without prejudice a complete application that is missing a CEQA document.

Section 401 of the CWA requires any applicant for a federal license or permit to conduct any activity which may result in a discharge into navigable waters to obtain a certification from the state in which the discharge originates. That certification must report that the discharge will comply with all applicable state laws and regulations. The Water Board establishes that an activity requiring a federal license or permit is consistent with state law by issuing Clean Water Act Section 401 Water Quality Certification for that activity. These certifications often include conditions that go beyond the requirements of the federal permit. The Water Board predominantly issues certifications related to activities requiring Corps permits. The Corps issues two types of permits under Section 404 of the CWA: Individual Permits, for projects with large impacts; and Nationwide Permits (NWPs), for categories of routine projects with less

[8] If the project is categorically exempt from the requirements of CEQA, the application should provide a determination of this exemption from the Lead Agency or, if this is not available, explain the basis for considering the project to be exempt.

[9] State Water Resources Control Board Resolution No. 2003-0064: Revisions to the fee schedules contained in Title 23, Division 3, Chapter 9, Article 1, Section 2200 of the California Code of Regulations [http://www.waterboards.ca.gov/water_laws/index.html]

significant impacts. Individual Permits are only issued by the Corps after the Water Board has issued its Section 401 Water Quality Certification. NWPs may be issued prior to the Section 401 Certification, but they are not valid without the certification. The Corps also issues approvals under the federal Rivers and Harbors Act of 1899 which also require state certification.

In a letter dated March 12, 2002, the State Water Board's Executive Director issued blanket 401 Water Quality Certification for a number of NWPs for all of California, subject to conditions and notification requirements specified in that letter. A copy of the letter, including the conditions and notification requirements, is available at http://www.waterboards.ca.gov/cwa401/generalorders.html under "Corps NWPs". If a project meets the conditions of the March 12, 2002 letter, an application for Section 401 Water Quality Certification is not required.[10] Lists of certified NWPs and General Permits for the San Francisco Corps can be found at http://www.spn.usace.army.mil/regulatory/nwp.html. Guidance to protect streams and rivers for regulators and program managers can be found in California Regional Water Quality Control Board (CRWQCB), San Francisco Bay (2003) (see Literature Cited section for website links to Water Board staff reports).

Many wetland mitigation and restoration project sites in the San Francisco Bay Region can be located on the Wetland Tracker (http://www.wrmp.org) which is maintained by the San Francisco Estuary Institute.[11] Wetland restoration project sites can also be found on the San Francisco Bay Joint Venture website at http://www.sfbayjv.org/. The State Water Board also maintains a 401 certification database.[12]

Dischargers whose projects disturb 1 or more acres of soil are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit, 99-08-DWQ; **www.waterboards.ca.gov/stormwtr/construction.html**).

III. COMPENSATORY WETLAND MITIGATION PLANS:

Pursuant to Title 23, California Code of Regulations, Section 3856, 401 Certification applications require a description of the total estimated quantity of wetlands proposed to be

[10] If a project may negatively impact a species that is listed as endangered under either the federal or state endangered species acts, the project should apply for Section 401 Water Quality Certification.

[11] At the time of this writing (July 2006) the Water Board is working toward a wetland mitigation form that can be filled out by the project applicant and uploaded on the San Francisco Estuary Institute's Wetland Tracker along with accurate site locations and other project information. The form will be available on the Water Board website and should be completed by the applicant and sent to wetlandtracker@waterboards.ca.gov.

[12] The State Water Board's 401 Certification database is in the process of being transferred to the California Integrated Water Quality System (CIWQS). In order to assure that certifications are recorded statewide, San Francisco Region Water Board staff have copies of certifications sent to the State Water Board, in addition to maintaining a database at the Oakland office. WDRs should also be put in the State Water Board's certification database and/or CIWQS by assigning a "WDID" number to the certification or WDR to assure project tracking.

created, restored, enhanced, purchased, set aside or otherwise identified as compensatory mitigation for any anticipated adverse impacts. This allows the State and Regional Water Boards to track changes in the quantity of wetlands, and thereby determine if the No Net Loss of Wetlands Policy is being followed. Additionally, under CEQA, all individual and cumulative significant environmental impacts associated with a project must be mitigated. These two requirements are usually addressed through Mitigation Plans. In reviewing and approving Mitigation Plans, Water Board staff relies on best professional judgment, information in the published and unpublished literature, the Corps Mitigation and Monitoring Proposal Guidelines (2004) and the Corps 404(b)(1) Guidelines which are incorporated into the Water Board's Basin Plan.

Mitigation Plans must contain the following:

1. Proof that impacts to wetlands have been avoided and minimized to the maximum extent possible.
2. Baseline studies of both the impacted site and the mitigation site to determine what wetland functions will be lost at each location. Studies should contain adequate spatial and temporal coverage and include all wildlife and vegetation species expected to be impacted at the two sites; hydrology of the sites; and soils present at the sites. A wetland delineation approved by the Corps should also be included for both sites. If the wetland is isolated, and no longer subject to Corps jurisdiction under the SWANCC decision, then the applicant should provide a delineation based on the Corps' *Wetland Delineation Manual* (1987) prepared by a qualified professional and, if funds and staffing permit, the Water Board staff will verify the delineation.

For the Wetland Site to be Impacted*:*

The Basin Plan (Section 4.23.4) states that the "Water Board will evaluate both the project and the proposed mitigation together to ensure that there will be no net loss of wetland acreage and no net loss of wetland functions. The Water Board may consider such sources as the *Baylands Ecosystem Habitat Goals* (1999) and the *Baylands Ecosystem Species and Community Profiles* (2000) (referred to collectively as the "Habitat Goals Reports"), the San Francisco Estuary Project's *Comprehensive Conservation and Management Plan (1993),* or other approved watershed management plans when determining out-of-kind mitigation." Mitigation is most effective at maintaining beneficial uses of waters of the State and achieving conformance with No Net Loss polices, first, if the mitigation occurs at the impacted site, which is referred to as "on site" mitigation, and, second, if the mitigation wetland recreates the same type of wetland as the impacted wetland, which is referred to as "in-kind" mitigation. Water Board staff considers proposals for off-site or out-of-kind mitigation where:

1. on-site/in-kind would be impractical;
2. there is an agreed upon watershed plan that justifies the need for off-site or out-of-kind mitigation or Water Board staff believes that the proposed mitigation is environmentally preferable to on-site/in-kind mitigation;

3. there is general agreement with the ecosystem principles or habitat recommendations contained within the Habitat Goals Reports referred to above;
4. other agencies (e.g., U.S. Fish & Wildlife Service [FWS]) prohibit the re-creation of certain wetland or related habitats that threaten special status species[13]

The No Net Loss Policy is generally used to determine the amount of mitigation required. Existing wetlands are already successful ecosystems, but the success of mitigation projects is highly uncertain until after established monitoring periods have determined that wetland hydrology, vegetation, and soils have developed. When wetlands are lost, their replacement can be determined based on functions or acres. Water Board staff typically look at the functions lost at the impacted wetland compared to the proposed constructed or restored wetland (occasionally enhancement is allowed to compensate for wetland losses). Each site is reviewed on a case-by-case basis, and no pre-determined set of ratios is used to determine mitigation, though a minimum of 1 acre lost to 1 acre gained is typically required. However, temporal losses must also be considered, which are defined as functions lost due to the passage of time between loss of the impacted wetland and creation/restoration of the full-functioning mitigation wetland. The Water Board has typically in the past required an additional 0.5 to 1.5 acres for temporal losses, resulting in a total *minimum* of 1.5 to 2.5 acres gained for each acre lost. Thereafter, additional mitigation can be required for:

- The loss of or potential for impacts to medium to high quality habitat;
- The loss of or potential for impacts to special status species or their associated habitats;
- The construction or restoration of wetlands that take relatively long to develop (e.g., riparian);
- Delays in the construction or restoration of mitigation wetlands, relative to when the impacted wetlands have been filled. Compensatory mitigation wetlands should generally be restored or constructed prior to or concurrent with filling the impacted wetland, and additional mitigation is typically required when the mitigation work occurs after the impacts;
- Uncertainty associated with the construction or restoration of mitigation wetlands;
- The placement of off-site mitigation wetlands or the creation of out-of-kind wetlands (created or restored wetlands that are different habitat types than the impacted wetland), though this can be allowed where it is demonstrated that an overall net gain will occur.

In some cases, an amount of mitigation may already have been determined by agencies such as the Corps, U.S. FWS, CA Department of Fish & Game, CA Coastal Commission, or Bay Conservation and Development Commission, as a part of their permitting processes. Water Board staff typically consult with these agencies and others when determining how much mitigation should be required to compensate for wetland losses. However, the Board's decision

[13] The U.S. FWS, for example, prohibits the creation of perennial open water habitat or ponds in some red-legged frog habitats because those ponds encourage bull frogs, which prey on red-legged frogs. In such cases, the Water Board will accept comparable wetland habitats, such as seasonal wetlands.

on certification is discretionary and based on its own regulations, and it may require more or less mitigation, depending on the combination of factors stated above.

For the Compensatory Wetland Mitigation Site to be Restored or Created:

In order to establish and maintain the restored or created mitigation project should be located on a site with appropriate and reliable hydrology. Elevations are crucial and vegetation may or may not need to be planted depending on site conditions and available seed banks. Most wetland mitigation sites will benefit from planting and maintaining native vegetation species to establish target habitats for riparian, seasonal, freshwater, or tidal systems; some however will seed themselves from seed sources available from soil, water, animals, or surrounding sites. If aggressive non-native vegetation surrounds the site, the practicality of excluding it should be discussed with the permitting agencies. Vigorous maintenance (e.g., weeding or application of a U.S. Environmental Protection Agency approved herbicide) for at least five years may be required to prevent unwanted vegetation from invading the mitigation site, especially if it occurs in the soils or surrounding landscape. Tidal marsh mitigation and restoration projects anywhere in the San Francisco Bay, should discuss control methods with the staff from the Invasive Spartina Project [http://www.spartina.org/] to ensure that the invasive smooth cordgrass (*Spartina alterniflora*) or its hybrids do not infest the site.

Table 2 lists some of the major suggested components of a preliminary and final Mitigation Plan. A few of the elements contained within the table require additional explanation which is provided below:

1. A clear statement of goals. Typical goals include the restoration of specific habitat types, statement of the area to be created, restored, and/or enhanced, desired hydrological regimes, or recreational uses.[14]

2. Adequate site assessments at both the impacted and restored sites are important. Jurisdictional delineations (assessing wetland hydrology, soils, and vegetation) should be conducted, and biological assessments and surveys of all potential species should be performed, to determine use and potential use of the site by fauna. Delineations and surveys should not be more than 5 years old, and must be verified by the Corps.[15]

3. At a minimum, performance criteria should cover hydrology, vegetation, and wildlife species. For some projects it might be appropriate to monitor other performance criteria such as sedimentation rates, channel incision or aggradation, soil type or extent of organic matter accumulation, or water quality. Table 3 lists possible functions or parameters upon which to

[14] Recreational uses should be carefully reviewed in the context of mitigation wetlands, since some recreational activities can impair habitat values.
[15] Corps wetland delineations expire after five years.

base performance criteria and examples of some of these functions or parameters are provided below.

Hydrology. Performance criteria typically include requirements for the extent and duration of inundation or saturation. Examples of hydrology performance criteria include targets for:

- **Tidal wetlands**: the extent of tidal prism and tidal flushing, water elevations, sedimentation rates;
- **Seasonal wetlands** (from saltwater to freshwater) or vernal pools (freshwater): water depths and extent and duration of saturation; depth of soil saturation; flow rates or patterns;
- **Riparian wetlands**: water depths in relation to other stream segments on the same creek; height of the water table (tied to precipitation and streamflow); cross-sectional areas to determine water depths, bank erosion, and sediment inputs; longitudinal profiles; and pebble counts upstream & downstream of project and reference sites.

Vegetation. Examples of this type of criteria include requirements for:

- Percent cover;
- Plant height;
- Reproductive success;
- Vigor; and,
- Eradication of non-native vegetation for the duration of the monitoring program;

Riparian mitigation projects typically measure the canopy layer, shrub stratum, and herbaceous layer.

Wildlife: Examples of this type of criteria include requirements for the presence of:

- Vertebrates (mammals, amphibians, reptiles, birds, fish); or
- Invertebrates.

The wildlife criterion is one that is frequently limited only to special status species. Emphasis should be placed on a minimum of annual surveys that determine the presence or absence of all vertebrates on the compensatory wetland mitigation site based on direct observations or observations of wildlife signs. Performance criteria can be tied to special status species lost at the impacted site or to key species expected to inhabit the new site. At a minimum, performance criteria should be tied to at least one wildlife species or major species group. The total number of wildlife species or communities, the extent of spatial and temporal sampling, and the duration of the monitoring period can depend on the size and complexity of the mitigation project as well as the extent of the wildlife community affected by the loss of the impacted wetland.

4. Monitoring and annual reports should be provided for at least 5 years. Wetlands mitigation projects that take relatively long (e.g., woody riparian wetlands), that may prove risky, that will have substantial temporal losses, or that are compensating for losses to large or high quality wetlands, may need to be monitored for as long as 10 or 20 years, or longer if performance criteria are not met. Some tidal and freshwater wetlands can establish 70% cover or more within 5 years, but many can take longer. Success should be tied to achieving performance criteria, after which the project will be deemed complete. If performance criteria are not met, the monitoring period should be extended or remedial action should be taken. Consultants or agencies with responsibility for large projects (> 20 acres) should offer annual presentations of data for responsible agencies and interested parties, since monitoring reports can lag far behind actual field conditions, and adaptive management often requires that important decisions be made with the most current monitoring data. Technical Advisory Committees should be formed from agencies or the public to review monitoring data and offer suggestions for project direction.

5. Mitigation projects should begin before wetlands are impacted or at least within the same season as wetlands are impacted.

6. The means to cover all mitigation project costs should be guaranteed through some type of financial assurance mechanism. Project costs include project construction, monitoring (typically 5 to 10 or 20 years); operation, maintenance, and contingency plans if monitoring needs to be extended or if elements of the site need to be re-configured. In the worst case, financial assurance should be adequate to cover a complete failure of the mitigation project. Private companies must typically set aside the actual amount as a bond, letter of credit, or other means to ensure adequate funds will be readily available to rectify any problems in perpetuity with the project. For public agencies the Water Board will consider alternatives for financial assurances.

7. Once monitoring periods are over and performance criteria have been met, mitigation project sites should be assessed for permit compliance and wetland function by a qualified professional to assure that a wetland ecosystem has been established as expected. Wetland assessment techniques include, but are not limited to, the California Rapid Assessment Method (Sutula et al. 2006), Wetland Ecological Assessment (Breaux et al. 2005; and CRWQCB, SFB Region 2003), Wetland Rapid Assessment Method (Miller & Gunsalus 1999), Rapid Impact Assessment Method (Stein & Ambrose 1998), the UCLA-CRAM method (Ambrose & Lee 2004), or any of many others contained in Bartoldus 1999 or Fennessy, et al. 2004. Wetland delineations should also be included as part of the overall wetland assessment and be conducted by a qualified professional consultant and verified by the Corps.

Use of Reference Sites as a standard for Mitigation Sites.

Reference sites are used as models for the desired structure and functions of the mitigation wetlands. The use of reference sites is frequently urged as a target for success criteria, with the mitigation wetland required to achieve some level of performance compared to the reference site. However, reference sites should be used with caution. Rarely can reference sites be found with the same soils, seed banks, microclimate, land-use histories, and hydrology as the compensatory wetland mitigation site, even when a reference site is adjacent to the mitigation site. Moreover, reference wetland sites typically contain non-native vegetation that is sometimes highly invasive. By allowing such invaded areas to be used as reference sites, we perpetuate them, and thereby increase the likelihood that sensitive native ecosystems will continue to be lost. Millions of dollars are spent annually throughout the state and nation to eradicate exotic vegetation species that threaten native populations. Therefore compensatory wetland mitigation sites should do the following whenever possible:

- Emphasize native vegetation in compensatory wetland mitigation sites;
- Remove invasive non-native vegetation for at least 5 years; and,
- Continue to remove invasive non-native vegetation even after 5 years;

Tier 1 in Appendix I (this appendix is in progress and is expected to be available in August 2006) lists some highly invasive weeds in the San Francisco Bay Region that should be kept out of wetland restoration sites. Tier II lists some less invasive non-native plants that should be discouraged in wetland mitigation sites, even if the surrounding reference sites contain these species, for at least 5 years. Tier III lists acceptable non-aggressive non-native species that can be tolerated for wildlife food or other reasons since they do not generally out-compete native plants. Appendix I does not represent agency policy, but rather suggestions to keep the most aggressive species out of wetland mitigation sites. The lists should be revised as new information becomes available, with the advice of wetland and/or botanical professionals in the region.

Reference sites can be extremely valuable in comparing responses of established wetlands to newly restored or created wetlands in terms of “normal” or “abnormal” hydrological years. However, because of inevitable significant differences between reference sites and mitigation sites, performance criteria for the mitigation site should not depend too heavily on conditions at the reference site. Because of these limitations, reference sites should be used in conjunction with the scientific literature, the gray literature (e.g., unpublished reports such as Environmental Impact Reports), and best professional judgment of wetland scientists, regulators, and consultants.

Restoration sites that do not require mitigation:

While many wetland restoration projects are carried out as compensatory mitigation for impacts to wetlands, other wetland restoration projects are initiated for the purpose of restoring or improving wetland habitat values, flood protection, or recreational benefits. At some of these wetland restoration sites, the restoration plan will adversely impact some existing wetlands, with

the expectation of ultimately producing more and/or better wetland functions. While wetland restoration has dramatically increased as an industry in the San Francisco Bay Area and nationwide, it is still a very new science. The success of most large and deliberately restored restoration projects (as opposed to accidental, e.g., those where levees have breached in major storms) has not yet been established. Several restoration projects in the Bay Area have not produced all of the benefits that were originally proposed.

- Sonoma Baylands –the largest regional restoration project permitted by the San Francisco Bay Water Board that is at least ten years old -- is providing some excellent wildlife habitat, but is not progressing as quickly toward its final habitat goals as was expected in the early 1990's when the project was proposed.

- The Montezuma wetlands restoration project was in the planning stages for almost twelve years. This project is dependent upon the importation of dredged sediments to provide appropriate hydrologic regimes, but there may be less dredged sediment available in the Bay Area than was originally anticipated.

- The original Bolinas Lagoon restoration project was halted because the scientific assumptions of the project were questioned and the proposed dredging at the site would have affected virtually the entire site, including the special status species therein.

- The invasive cordgrass that is currently costing millions of dollars to eradicate in the San Francisco Bay, was intentionally introduced on Alameda Island in the 1970's to stabilize flood-control levees (Philip Williams & Associates, Ltd. & Faber 2004). At that time no one realized that this introduced species would jeopardize the entire Bay tidal marsh ecosystem.

Thus, while the Water Board encourages wetland restoration, examples such as these illustrate the need for caution.

To ensure that the beneficial uses of wetlands as waters of the state are protected, the Water Board generally considers the following before issuing a WDR and/or 401 Certification for restoration projects:

1. A description of existing site conditions and post restoration target habitat goals. Quantitative estimates of target habitats should cover a wide range of possibilities in order to protect against uncertainties. Some sites remain as open water for long periods with vegetated marsh and tidal channel development taking longer to develop than expected. To prevent being held accountable for predictions that do not materialize in the short-term, the applicant should consider stating all the possibilities and related functions that can still be realized for those habitats that may not evolve as rapidly as expected into the intended target habitat. For example, if open water continues as a habitat longer than expected, then it should be stated that if the open water provides

habitat for shorebirds and waterfowl (proven by adequate monitoring), it is providing important habitat functions. Resource agencies can then review the regional status of special status species and determine how to optimize available and planned habitats for the most threatened species.

2. Unlike compensatory mitigation projects, penalties are generally not imposed on restoration projects for failure to attain project goals or meet success criteria. However, as stated above, projects should establish quantitative goals which can be assessed over time to determine if restoration goals or predictions are eventually met. Simply to state that "biodiversity will be increased" is not sufficient without a summary of the baseline, pre-project, or reference site information. Quantitative targets or performance criteria should be estimated for vegetated percent cover and for increases in the number of species groups or of specific species.

3. Monitoring for large restoration projects (> 20 acres[16]) typically includes assessments of:

- acreages for habitat types;
- water and sediment quality if appropriate,
- vegetation composition and percent cover;
- control of exotic species;
- wildlife (special status species in addition to general abundance and diversity of major species groups);
- bathymetry and sedimentation rates; and,
- hydrology and channel geomorphology.

Restoration Projects Using Dredged Sediment

Wetland restoration projects that raise subsided elevations with dredged sediment need to ensure that levels of pollutants in those sediments (i.e., inorganic, organic, natural or synthetic chemicals) are kept within environmentally safe levels. This generally involves testing of pre-dredged sediment and post-placement monitoring of sediment constituents and/or biological populations at the mitigation or restoration site for a period of 5 to 20 years. The Water Board (note that the following sources are listed in the references under "California Regional Water Quality Control Board, San Francisco Bay Region" [CRWQCB, SFB] with links provided there) has developed draft guidelines to assist with screening dredged sediments for use in restored wetlands (CRWQCB 2000). The Dredged Material Management Office[17] can also assist with

[16] Note that "large" is both a relative and arbitrary term that depends on the number of wetland projects in the area, the total amount of natural wetland area, and the environmental assumptions of the community.

[17] The Dredged Material Management Office (DMMO) is a joint program which includes several San Francisco Bay Area agencies that review sediment quality sampling plans and make suitability determinations for sediments

testing protocols and recommended concentration limits for contaminants in dredged sediments that are used in wetland restoration projects.

In addition, the Water Board sponsored studies of ambient levels of some sediment contaminants in the San Francisco Bay (CRWQCB 1998). While the Water Board has also developed Environmental Screening Levels (ESLs) for evaluation of sites with contaminated soil (CRWQCB Board 2005), these ESLs are designed primarily to protect terrestrial ecological receptors and are not appropriate to protect wetland resources. However, one set of the ESLs was developed for cleanup of contaminated groundwater that may be in contact with surface water. Since these ESLs were developed to be protective of surface water beneficial uses, they may be appropriate for use at wetland sites. The ESLs are updated regularly. Staff in the Water Board's Watershed Division that can assist with questions regarding wetland and riparian projects in the San Francisco Bay Region can be found at **www.waterboards.ca.gov/sanfranciscobay/certs.htm** or by contacting the Water Board's receptionist at 510-622-2300.

Department of Defense (DOD) Wetland Clean-up sites:

The role of the Water Board in the remediation of DOD sites is discussed in the Basin Plan (Section 4.25.3.4). Where wetlands are impacted by remediation activities, the Water Board should ensure that wetland functions are maintained, in conformance with the No Net Loss Policy. Where wetlands have been degraded by past military activities, mitigation should compensate for the wetland functions that would have been present in the absence of the activities that degraded the wetlands. Generally, at least a one-to-one replacement of wetlands will be required, i.e., each wetland acre lost through the clean up requires replacement and additional compensation may be required as described above in the Wetland Impact Site section (see page 6).

Monitoring of restored or created wetlands is usually required for at least 5 years to ensure their success, and, if monitoring is required, performance criteria should be agreed upon (see section on Compensatory Wetland Mitigation above). In 2002, the Corps's CWA Section 404, NWP No. 38 (for cleanup of toxic and hazardous waste sites) was conditionally certified by the State Water Board's Executive Director. The 10 conditions include, but are not limited to, project notification, meeting state water quality objectives under the Porter Cologne Act, and the absence of endangered species on the site. All the NWPs and their associated conditions certified by the State Water Board are available at **http://www.waterboards.ca.gov/cwa401/generalorders.html**.

If any of the 10 conditions of certification are not met, the Water Board may require that DOD meet the substantive requirements of Waste Discharge Requirements under the Porter Cologne Act or a project-specific water quality certification for Nationwide Permit 38, under Clean Water Act Section 401. Wetland replacement is typically proven after at least 5 years of monitoring and maintenance to meet specified performance criteria to ensure the success of

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disposed of in the Bay and surrounding habitats. Information can be found at the Corps website: http://www.spn.usace.army.mil/conops/dmmo.htm.

wetland restoration projects. However, at riparian sties where the successful establishment of trees is essential to the beneficial uses of the riparian habitat, 10 years of monitoring is usually required to demonstrate the successful establishment of planted trees. Appendix II provides a summary of the suggested substantive requirements for wetland mitigation projects that could be applied to wetland restoration on DOD clean-up sites[18].

Target cleanup criteria will generally be established through the CERCLA process. Cleanup to site-specific ambient levels or San Francisco Bay ambient levels is generally acceptable. Import fill for wetland sites may be required to meet more stringent contaminant levels than negotiated cleanup criteria. In some instances, residual contamination may remain at sites where remedial actions have occurred. Monitoring of wildlife (tissue samples, success of reproduction) may be used to evaluate whether or not residual contaminants at the site are having a negative impact on wildlife at the site.

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[18] The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires two classes of requirements: substantive and administrative. Substantive requirements specify a level of control that can include performance criteria and monitoring requirements. Administrative requirements involve those that do not define standards but are administrative such as approvals, permits, reporting, and record keeping. Generally CERCLA sites are exempt from administrative requirements on-site but must comply with substantive provisions (U.S. EPA 1992).

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- California Coastal Commission -- http://www.coastal.ca.gov/
- California Coastal Conservancy -- http://www.coastalconservancy.ca.gov
- California Fish & Game -- http://www.dfg.ca.gov/
- California Resources Agency -- http://www.resources.ca.gov/
- California State Water Resources Control Board -- http://www.waterboards.ca.gov/
- San Francisco Bay Regional Water Quality Control Board -- http://www.waterboards.ca.gov/sanfranciscobay
- San Francisco Estuary Institute -- http://www.sfei.org/
- Corps [San Francisco District]-- www.spn.usace.army.mil/regulatory
- Corps, Dredged Material Management Office (DMMO) -- www.spn.usace.army.mil/conops/dmmo.htm
- Corps [Sacramento District; note that the Region 2 is not in the Corps Sacramento District, but this web page has useful material on the federal 404/401 wetland program] -- www.spk.usace.army.mil/organizations/cespk-co/regulatory/index.html
- U.S. Environmental Protection Agency -- http://www.epa.gov/
- U.S. Fish & Wildlife Service -- http://www.fws.gov/pacific

TABLE 1: Checklist for Contents of a Complete Application for Water Quality Certification (see California Code of Regulations, Title 23, Section 3856):

A complete application must include the following:

1. The name, address, and telephone number of:
   - (a) the applicant's name and identifying information ☐
   - (b) the applicant's signature ☐
   - (c) applicant agent's identifying information ☐
2. Full description of the activity (see also #8) ☐
   - (a) purpose of the activity ☐
   - (b) final goal of the entire activity ☐
3. Identification of federal licenses/permits:
   - (a) federal agency ☐
   - (b) type of permit ☐
   - (c) general license/permit number(s) (if applicable) ☐
   - (d) license/permit (file/application) number(s) ☐
4. Copies of either:
   - (a) application for federal license/permit ☐
   - (b) federal notification ☐
   - (c) any applicant/federal agency correspondence ☐

   or (d) written statement that 4(a)-(c) not available ☐
5. Copies of:
   - (a) final/signed federal, state, and local licenses, permits, and agreements (approvals) ☐
   - (b) draft approvals ☐
   - (c) list of remaining agency approvals ☐
   - (d) copy of any application for FERC license ☐
6. <u>If/when available</u>, copy(ies) of:
   - (a) draft CEQA document(s) ☐
   - (b) final CEQA document(s) ☐
7. **Fee deposit** ☐
8. Additional project information:
   - (a) Receiving water body(ies) ☐
   - (b) Type(s) of receiving water body(ies) (e.g., at a minimum: river/streambed; lake/reservoir; ocean/estuary/bay; riparian area; or wetland type) ☐
   - (c) Location (lat/long, township/range, or on published map ☐
   - (d) temporary/permanent fill/disturbance in acres/cubic yards/linear feet ☐
   - (e) compensatory mitigation in acres/cubic yards/linear feet ☐
   - (f) other mitigation steps (to avoid, minimize, compensate) ☐
   - (g) size and description of project area ☐
   - (h) brief list/description of applicant's previous and future projects related to the proposed activity or that may impact the same receiving water body(ies)… ☐

TABLE 2: Suggested Components of Mitigation & Monitoring Plans (adapted from Hruby & Bower 1994 & Corps, San Francisco District 1991 & 2004).

PRELIMINARY MITIGATION & MONITORING PLAN

- Executive Summary
- Project Description (location, responsible parties; ownership), wetland delineation of impacted and proposed mitigation site;
- Ecological Assessment of Impact Site (existing vegetation, water regime, soils, fauna, functions and values, water quality, buffers, and position and function in the landscape; in addition, a wetland rating can be provided if the assessment method lends itself to one);
- Mitigation Approach (mitigation sequencing; goals and objectives; time lapse between wetland destruction and expected completion and functioning of mitigation wetland; performance standards)
- Proposed Mitigation Site (site description; ownership; rationale for choice; ecological assessment of mitigation site including existing site functions; quantitative justification for project if wetlands already exist on the site; habitat types to be created; present & proposed uses of adjacent areas; constraints)
- Source of the Water Supply
- Preliminary Site Plan
- Monitoring & Maintenance Plan (vegetation; water regime; soils; fauna; development of habitat structure, water quality; buffers)
- Site Protection

FINAL MITIGTION & MONITORING PLAN

- Executive Summary
- Project Description & Location
- Ecological Assessment of Impact Site
- Mitigation Goals, Objectives, and Performance Standards
- Proposed Mitigation Site and Rationale for Expected Success
- Final Site Plan (site surveys/topography; site preparation; water regime including irrigation plans; soils; landscape plans; construction specifications)
- Monitoring Plan with quantifiable performance criteria
- Maintenance and Contingency Plans
- Site Protection
- Exotic Species Control Plan
- Implementation Schedule (construction specification; monitoring schedule; reporting schedule)
- Performance Bond or Other Financial Assurance for ongoing maintenance, monitoring, and contingency measures
- Recorded conservation easements or transfer of fee title to park or open space districts
- Additional Information for Preparation of Final Plans (notification of completion; confirmation of completion from WATER BOARD and/or Corps)

FINAL AS-BUILT REPORT SUBMITTED WITHIN 3 MONTHS AFTER FINAL CONSTRUCTION AND PLANTING:

- Topographical survey
- Photographs taken from permanent reference points
- Actual planting plan
- Final habitat features plan
- Note any major changes from the Mitigation Plan

TABLE 3. Ecosystem Attributes to Consider in Assessing the Functional Equivalency of Constructed and Natural Wetlands (Adapted from National Research Council, 1992; Pacific Estuarine Research Laboratory 1990; Lugo, et al. 1988; and Kentula et al. 1992.)

Function	Suggested Measures	Monitor/Measure
Hydrologic Function	**Wetlands in General:** Ground water recharge	•Water levels in nearby wells.
	Flood-peak reduction	•Water level depths in relation to flow velocity and changes in hydrograph.
	Development of hydrologic equilibria:	•Erosion and accretion of channels and marsh.
	Water Budgets	•Inflowing waters for flow rates, sediment flux, and nutrient concentrations (N,P).
	Tidal Wetlands: Restoration tidal flows:	•Water levels over tide cycles; determine amplitude; lags; monitor salinity of water and soil.
	Shoreline stabilization:	•Shorelines from aerial photographs or monitor markers.
	Forested or Riparian Wetlands: Restoration of hydrologic flows	•Flow rates, direction, frequency, depth, and duration to determine flooding patterns
Nutrient Processing	**Wetlands in General:**	•Nutrient concentrations (nitrogen, phosphorus, sulfide) in soil and pore water. •Nitrogen fixation and mineralization rates. •Amounts and rates of nutrients in litter decomposition and in live plant leaves.
Water Quality	**Wetlands in General**:	•Dissolved oxygen, pH, total suspended sediments, temperature, conductivity, salinity, turbidity, coliforms, biological oxygen demand, chlorophyll a, and total organic carbon, and nutrients. •Toxic substances (heavy metals, selenium, pesticides, and others).
Soil Quality	**Wetlands in General:**	•Salinity, pH, texture, organic matter, redox potential, sulfides, depth, color, and nutrients. •Toxic substances (heavy metals, selenium, pesticides, and others).
Persistence of the plant community	**Wetlands in General**:	•Cover of dominant species and map using aerial photographs and ground truthing. •Sensitive species populations. •Life history characteristics of sensitive plant populations to predict their ability to persist in the restored wetland (e.g., numbers, flowering, seed production, seed germination potential, seedling establishment, and successful recruitment).
Plant growth and its limiting factors	**Wetlands in General**:	•Structural features: average number of species, density, height or percent cover.

		•Standing stocks (above ground biomass; below ground biomass, litter). •Redox potential, organic matter decomposition, and pH in soil profiles. •Cover of floating or epibenthic algae by dominant type. •Nutrient content of inflowing waters.
	Tidal Wetlands:	•End-of-season live standing crop; estimate biomass by measuring total stem length (meters per square meter) of species such as cordgrass.
	Forested or Riparian Wetlands:	•Basal area and crown cover. •Plant health and vigor.
Persistence of consumer populations	**Wetlands in General**:	•Arthropods: Document outbreaks; document presence of carnivores that could control potential pest species. •Fish and aquatic invertebrates: sample community composition (seasonal sampling probably needed). •Reptiles and Amphibians: survey for abundance seasonally. •Birds: survey for abundance seasonally. •Mammals: survey for abundance seasonally. •In general: record activities (habitat use and movements between habitats) in relation to changes in water levels (e.g., tidal inundation); identify areas used for feeding, nesting, and refuge during adverse conditions.
Resilience	**Wetlands in General**:	•Recovery of populations that die back during periods of environmental extremes
Resistance to invasive exotics	**Wetlands in General**:	•Weedy plants and exotic animals •Tidal Wetlands: e.g., control *Spartina alterniflora*, •Brackish Wetlands: e.g., control *Lepidium latifolium* •Freshwater Wetlands: e.g., control *Arundo donax* • [For more exotic species see Watershed Staff.]
Other items	**Wetlands in General**:	•Monitor trash so that the area can be cleaned up at appropriate intervals. •Document any visual disturbances or noise problems that are correctable. •Adequately photograph site seasonally or annually

TABLE 4. Some Wetland Functions or Beneficial uses Potentially Impacted by Mitigation Projects

Beneficial uses in the San Francisco Bay Water Board's Basin Plan:	**Other Wetland Functions or Potential Beneficial uses Served by Wetlands:**
Warm Freshwater Habitat	Flood Storage
Cold Freshwater Habitat	Groundwater Discharge
Estuarine Habitat	Sediment/Toxics Retention
Freshwater Replenishment	Biogeochemical Processing
Marine Habitat	Uniqueness/Heritage
Fish Migration Habitat	Education/Research
Fish Spawning Habitat	
Wildlife Habitat	
Preservation of Rare and Endangered Species Habitat	
Ocean-commercial and Sport Fishing	
Shellfish Harvesting	
Plant Communities	
Areas of Special Biological Significance	
Groundwater Recharge	
Contact Recreation	
Non-contact Recreation	
Municipal and Domestic Supply	
Industrial Service Supply	
Agricultural Supply	
Navigation	
Aesthetics	

Appendices are provided separately.

APPENDIX I: Invasive Non-Native Species to Avoid in Wetland Projects In the San Francisco Bay Region [12/1/06]

The following lists of very invasive non-native species in Tiers 1 and 2 should not be planted and should be excluded in wetland mitigation and restoration sites. Tier 1 contains the most problematic species followed by Tier 2 with less invasive but still problematic species; Tier 3 lists some non-native species that may be acceptable as wildlife food or cover, and do not tend to out-compete native vegetation. Planting native species is recommended to preserve the biodiversity and unique vegetation of wetland ecosystems in the San Francisco Bay Region. This is a particularly important consideration in wetland mitigation sites, as well as their associated buffers and transitional areas, because these areas tend to be highly disturbed and are consequently more vulnerable to the invasion of non-native species. The following list of invasive non-natives species is intended to (1) increase awareness of non-native invasives (2) identify the most problematic non-native invasives and (3) identify potentially invasive non-native species before they become a problem.

This list is intended to provide general guidance only and does not serve as regulation. Wetland mitigation sites, including associated buffers and transitional areas, should ultimately provide habitat for native vegetation unless the project goal requires the use of non-natives (e.g., to provide acceptable wildlife food). Some non-native species may be exceptions to the guidelines below based on available information and professional opinions. In some cases, site-specific factors might make a species more or less aggressive such as habitat type, micro-climate, or different plant communities. Some non-natives may be aggressive initially but are ultimately ephemeral and will not persist.

The project applicant responsible for the mitigation site should provide site conditions that prevent invasive non-native species from persisting as dominants over the long term. Some native species (e.g., cattails, bulrush) may also require control depending on the target habitat, though this list deals only with non-native vegetation. For advice, consult a professional botanist or wetland consultant and review the updated CAL-IPC lists (reference provided below). This appendix is specifically for the San Francisco Bay Region and should be updated as information becomes available. Please send additional suggestions to Andree Breaux Greenberg at Abreaux@waterboards.ca.gov, or Agnes Farres at AFarres@waterboards.ca.gov.

TIER 1 = HIGHLY INVASIVE NON-NATIVE SPECIES:
Keep out of wetland mitigation and restoration sites.

Species Name	Common Name	Wetland Status[a]	1999 Cal EPPC List[b]	2006 Cal IPC List[c]	Habitat Type[d]	Reference[e]	Comments
Arundo donax	Giant reed	FAC+	A-1	High	FM, R	2, 5, 7, 9, 10, 11, 17	
Agrostis avenacea	Australian bent grass	FACW*	NMI	Limited	TM, BM, DB, SM, VP, SW	2, 3, 7, 10, 12, 17	Considered a naturalized alien (Ref. #2). In North SF Bay as of 2005; not yet widely recognized as strongly invasive (Ref. #12). Noted as a serious threat to vulnerable native wetlands in August 2006 issue of *Estuary* (Vol.15, No. 4).
Carpobrotus chilensis	Iceplant, Pink sea fig	NG	CBNL	Moderate	U or TA; DB, Gr, R	3, 7, 17, 19	In transition zones around tidal wetland habitats and former salt ponds (Ref. #19).
Carpobrotus edulis	Iceplant, Yellow sea fig	NG	A-1	High	TM, DB	3, 6, 7, 9, 17, 19, 20	Coastal communities, especially on dunes; In transition zones around tidal wetland habitats and former salt ponds (Ref. #19). Hybridizes with *C. chilensis*; invasive (Ref. #20).
Centaurea solstitialis	Yellow star thistle	NG	A-1	High	Gr, U or TA	4, 5, 7, 9, 17, 20	Invasive, especially in pastures. Cumulatively toxic to horses (Ref. #20).
Cortaderia sellanoa (or C. jubata)	Pampas grass	NG	A-1	High	U or TA, R	4, 5, 6, 7, 9, 11, 12, 17, 20	*C. jubata* occurs more frequently along the coast, while *C. sellanoa* occurs more inland and in baylands (Ref. #12). *C. jubata* considered invasive (Ref. #20).
Cynara cardunculus	Artichoke thistle	NG	A-1	Moderate	Gr	5, 7, 17	
Cytisus scoparius	Scotch broom	NG	A-1	High	U or TA	7, 9, 17	
Delairea odorata	Cape ivy	NG	A-1	High	R	5, 7, 9, 11, 12, 17, 20, 21	Highly invasive (Ref. #20). Formerly *Senecio mikanioides* (Ref. #20)
Egeria densa	Brazilian waterweed	OBL	A-2	High	OW	3, 7, 10, 11, 17	
Eichhornia crassipes	Water hyacinth	OBL	A-2	High	CW, OW	3, 7, 10, 11, 17, 20	Plants multiply and spread rapidly by vegetative means; perhaps the world's most troublesome aquatic weed (Ref. #20).

Species Name	Common Name	Wetland Status[a]	1999 Cal EPPC List[b]	2006 Cal IPC List[c]	Habitat Type[d]	Reference[e]	Comments
Elytrigia pontica	Tall/Rush wheatgrass	NG			TM, BM	3, 12	Has naturalized, but is seldom invasive, along brackish marsh edges. Currently local around Alameda Creek and Mare Island (Ref. #3). In Coyote Hills & Mare Island areas as of 2005; not yet widespread but potential to spread to high marsh (Ref. #12).
Ehrharta erecta	Veldt grass	NG	B	Moderate	R, Gr, TA	5, 7, 12, 17	Especially invasive in semi-shaded riparian or coastal habitats (Ref. #12).
Eucalyptus globulus	Tasmanian blue gum	NI	A-1	Moderate	R, Gr	7, 10, 17, 20	Most commonly cultivated and naturalized species in California; grows rapidly (Ref. #20).
Foeniculum vulgare	Fennel	FACU-	A-1	High	Wide, U or TA, Gr, DB	2, 3, 4, 7, 9, 10, 12, 17, 20	Considered a naturalized alien (Ref. #2). Keep very low or out of transition areas for first five years and until native vegetation becomes established (Ref. #12). Locally abundant and invasive (Ref. #20).
Genista monspessulana	French broom	NG	A-1	High	Wide, SW, U or TA, Gr	4, 5, 7, 17, 20	Most naturalized California plants are hybrids involving *G. canariensis*, *G. monspessulana* and *G. stenopetala*; flowers (perhaps all parts) are toxic (Ref. #20).
Hedera helix	English ivy	NG	B	High	R, TA	7, 17, 18, 20	Sometimes spreads aggressively (Ref. #20).
Hydrilla verticillata	Hydrilla	OBL	RA	High	OW	7, 10, 11, 17	
Lepidium latifolium	Perennial pepperweed	FACW	A-1	High	Wide, DB, BM, FM, SM, SW, Gr, VP, U or TA	2, 3, 4, 5, 6, 7, 9, 10, 11, 17	Invasive weed of mesic and wetland habitats with slight salt tolerance. Has aggressively and successfully invaded the middle and high brackish marsh zone (Ref. #3).
Lythrum salicaria	Purple loosestrife	OBL	RA	High	TM, FM, SW, R	2, 5, 6, 7, 10, 11, 17, 20	Considered naturalized (Ref. #20).
Mentha pulegium	Pennyroyal	OBL	A-2	Moderate	SW, VP	7, 10, 17, 18	Poisonous to livestock (Ref. #7).
Mesembryanthemum crystallinum	Crystalline iceplant	FAC	B	Moderate	U or TA, Gr, R	7, 10, 17, 19	In transition zones around tidal wetland habitats and former salt ponds (Ref. #19).
Mesembryanthemum nodiflorum	Slender-leafed iceplant	FAC	NMI	NBNR	U or TA, DB, Gr, R	3, 7, 10, 17, 19	In transition zones around tidal wetland habitats and former salt ponds (Ref. #19).

Species Name	Common Name	Wetland Status[a]	1999 Cal EPPC List[b]	2006 Cal IPC List[c]	Habitat Type[d]	Reference[e]	Comments
Myriophyllum spicatum	Eurasian watermilfoil	OBL	A-1	High	OW, R	7, 10, 11, 17	
Pennisetum setaceum	Fountain grass	NG	A-1	Moderate	Gr	7, 17	
Rubus discolor	Himalayan blackberry	FAC+	A-1	High	Wide, R, FM, DB	5, 7, 8, 10, 11, 17	
Salvinia molesta	Giant salvinia	NG	RA	High	OW, R	7, 11, 12, 17, 20	Present only in Central Valley, but has potential to spread to SF Bay Area (Ref. #12).
Spartina alterniflora	Smooth cordgrass	OBL	A-2	High	TM	2, 3, 5, 7, 10, 11, 17, 20	Will likely spread unless eradicated (Ref. #3, #20). Contact Invasive Spartina Program for control methods [www.spartina.org]
Spartina anglica	Common cordgrass	OBL	RA	Moderate	TM	7, 10, 17	Contact Invasive Spartina Program for control methods [www.spartina.org]
Spartina densiflora	Dense-flowered cordgrass	OBL	RA	High	TM	3, 6, 7, 10, 11, 17	Is expected to become dominant in SF Bay if left unchecked (Ref. #3). Contact Invasive Spartina Program for control methods [www.spartina.org]
Taeniatherum caput-medusae	Medusa head	NG	A-1	High	Wide, Gr, U or TA	7, 17, 18	Favors poorly drained areas (Ref.#7)
Tamarix chinensis	Tamarisk (salt cedar)	FACW	A-1		R	7, 10, 11, 20	Invasive weeds with deep roots, especially along streams and irrigation canals. Commonly hybridizes with *T. ramosissima* (Ref. #20).
Ulex europaeus	Gorse	NG	A-1	High	Gr	7, 17, 20	Old plants very flammable (Ref. #20).
Vinca major	Periwinkle	NG	B	Moderate	R	5, 7, 11, 17, 20	Occur in sheltered places, especially along streams (Ref. #20).

TIER 2 = MODERATELY INVASIVE NON-NATIVE SPECIES: Discourage in wetland mitigation and restoration sites.

Species Name	Common Name	Wetland Status[a]	1999 Cal EPPC List[b]	2006 Cal IPC List[c]	Habitat Type[d]	Reference[e]	Comments
Ailanthus altissima	Tree of heaven	FACU	A-2	Moderate	U or TA	7, 10, 17, 20	Invasive roots (Ref. #20).
Atriplex semibaccata	Australian saltbush	FAC	A-2	Moderate	Gr, SM	3, 7, 10, 17, 19, 20	Limited distribution but can be very invasive regionally (Ref. #17). Generally in alkaline or saline soils (Ref. #20).
Avena barbata	Slender wild oat	NG	AG	Moderate	U or TA, Gr	2, 7, 17, 18	Considered a naturalized alien (Ref. #2).
Avena fatua	Common wild oat	NG	AG	Moderate	U or TA, Gr	2, 5, 7, 17, 18	Considered a naturalized alien (Ref. #2).
Brassica nigra	Black mustard	NG	B	Moderate	Wide, SW, DB, U or TA	2, 3, 7, 17, 19	Considered a naturalized alien (Ref. #2).
Bromus diandrus	Ripgut brome	NG	AG	Moderate	Gr, U or TA, DB	2, 3, 5, 7, 17, 18	Considered a naturalized alien (Ref. #2).
Bromus hordeaceus	Soft chess	FACU-		Limited	Gr, U or TA, DB	2, 3, 10, 17, 18	Considered a naturalized alien (Ref. #2).
Carduus pycnocephalus	Italian thistle	NG	B	Moderate	Wide, Gr, U or TA	5, 7, 17, 18	
Cirsium arvense	Canada thistle	FAC	B	Moderate	R, SW, TA, DB	3, 7, 10, 17, 18	
Cirsium vulgare	Bull thistle	FAC	B	Moderate	R, SW	7, 10, 17	
Conium maculatum	Poison hemlock	FAC	B	Moderate	U or TA, DB, R, Gr	2, 3, 5, 7, 9, 10, 12, 17	Considered a naturalized alien (Reference #2). Keep very low or out of transition areas for first five years and until native vegetation is more established (Ref. #12).
Cotoneaster pannosa	Cotoneaster	NG	A-2	Moderate	TA	7, 17	
Cynodon dactylon	Bermuda grass	FAC		Moderate	SW, TA	10, 17, 18	
Dittrichia graveolens	Stinkwort	NG		Moderate	DB, U or TA	2, 15, 17	
Hirschfeldia incana	Mediterranean hoary mustard	UPL	NMI	Moderate	DB, U or TA	2, 3, 7, 10, 17	Considered a naturalized alien (Ref. #2).

Species Name	Common Name	Wetland Status[a]	1999 Cal EPPC List[b]	2006 Cal IPC List[c]	Habitat Type[d]	Reference[e]	Comments
Holcus lanatus	Common velvet grass	FAC	B	Moderate	Gr, SW, TA	2, 7, 10, 17, 18	Considered a naturalized alien (Ref. #2). Found in coastal grasslands, wet meadows, and roadside ditches (Ref. #7, 18).
Hordeum marinum ssp. gussoneanum	Mediterranean barley	FAC		Moderate	DB, TA, SW	2, 3, 9, 10, 17	Considered a naturalized alien (Ref. #2).
Hypochaeris radicata	Rough cat's ear	FACU*	NMI	Moderate	Gr, SW, TA	7, 10, 17, 18	
Iris pseudacorus	Water iris	OBL	B	Limited	TM	6, 7, 10, 17, 20	Also occur in irrigation ditches and pond margins (Ref. #20).
Lolium multiflorum	Italian ryegrass	FAC*	AG	Moderate	Gr, U or TA, SW, TM, DB	2, 3, 5, 7, 9, 10, 12, 13, 15, 17, 20	Considered a naturalized alien (Ref. #2). An invasive weed of mesic and wetland habitats with a slight salt tolerance. This species has aggressively and successfully invaded the high brackish marsh zone (Ref. #3). Hybridizes with *L. perenne* (Ref. #20).
Lythrum hyssopifolia	Hyssop loosestrife	FACW		Limited	DB, VP, Gr, SW, SM	2, 3, 10, 17, 20	Considered a naturalized alien (Ref. #2). Becomes established in the brackish middle marsh zone (Ref. #3). Also occur along drying pond margins and disturbed ground (Ref. #20).
Oxalis pes-caprae	Bermuda buttercup	NG	NMI	Moderate	Gr, U or TA	5, 7, 17, 20	Possibly toxic in quantity to sheep (Ref. #20).
Pennisetum clandestinum	Kikuyu grass	FACU	NMI	Limited	Gr	2, 5, 7, 10, 17	
Phalaris aquatica	Harding grass	FAC	B	Moderate	VP, Gr, SW	7, 10, 17, 18, 20	Common in coastal sites, especially moist soils (Ref. #7). Also occurs in ditches (Ref. #20).
Raphanus sativus	Wild radish	UPL		Limited	DB, U or TA	3, 9, 10, 12, 17	Keep very low or out of transition areas for first five years and until native vegetation has established (Ref. #12).
Rumex acetosella	Sheep sorrel	FAC		Moderate	TA, SW	10, 17, 18	
Salsola soda	Mediterranean saltwort	FACW+	NMI	NBNR	TM, SM, DB	3, 6, 7, 10, 17, 20	Has demonstrated ability for rapid, extensive invasion and development of monodominant stands in the SF estuary (Ref. #3). Possible threat to salt marshes (Ref. #7). Also found in mudflats and open areas in salt marshes (Ref. #20).

Species Name	Common Name	Wetland Status[a]	1999 Cal EPPC List[b]	2006 Cal IPC List[c]	Habitat Type[d]	Reference[e]	Comments
Salsola tragus	Russian thistle	FACU	NMI	Limited	U or TA	4, 7, 17, 20	Potentially invasive. Needs verification or more information (Ref # 7, 17, 20).
Spartina patens	Salt meadow cordgrass	OBL	RA	Limited	TM, SM	3, 7, 10, 17, 20	May be a latent invader of salt marsh plains (Ref. #3). Contact Invasive Spartina Program for control methods [www.spartina.org]
Tetragonia tetragonioides	New Zealand spinach	FACU*			SM	10, 19, 20	Also occurs in sand dunes, coastal bluffs and margins of coastal wetlands (Ref. #20).

TIER 3 = UNAGRESSIVE NON-NATIVE SPECIES:

Avoid planting in wetland mitigation sites unless for wildlife or other acceptable reason

Species Name	Common Name	Wetland Status[a]	1999 Cal EPPC List[b]	2006 Cal IPC List[c]	Habitat Type[d]	Reference[e]	Comments
Anagallis arvensis	Scarlet pimpernel	FAC		Limited	U or TA	10, 14, 17, 20	Toxic to livestock and humans (Ref. #20).
Beta vulgaris	Common beet	FACU			U or TA, DB, TM	3, 18	
Briza maxima	Big quaking grass	NG		Limited	Gr, U or TA	17, 19	
Bromus madritensis	Foxtail chess	NG	A-2	Limited	Gr, U or TA	7, 17, 19	
Chenopodium berlandieri	Goosefoot	NG			DB	2, 20	Waterfowl food; considered a naturalized alien (Ref. #2). Often confused with *C. album* (Ref. #20).
Cotula coronopifolia	Brass buttons	FACW+		Limited	DB, FM, BM, SW, TA, VP	2, 3, 10, 15, 17, 20	Considered a naturalized alien (Ref. #2).
Convolvulus arvensis	Bind weed	NG	CBNL	EBNL	U or TA	7, 15, 17	Can be invasive, so be careful to control spread (Ref #15).
Crypsis schoenoides	Swamp timothy	OBL			FM, SW, VP	10, 16, 20	Wildlife food (Ref. #16, #20).

Species Name	Common Name	Wetland Status[a]	1999 Cal EPPC List[b]	2006 Cal IPC List[c]	Habitat Type[d]	Reference[e]	Comments
Erodium spp.	Filaree	NG		Limited	U or TA	15, 17	
Heterotheca grandiflora	Telegraph weed	NG			U or TA	15	
Lotus corniculatus	Bird's foot trefoil	FAC		EBNL	SW, DB, SM, U or TA	2, 3, 4, 10, 15, 17	Considered a naturalized alien (Ref. #2). An invasive weed of mesic and wetland habitats with a slight salt tolerance. This species has aggressively and successfully invaded the high brackish marsh zone (Ref. #3).
Medicago polymorpha	California bur clover	FACU-	CBNL	Limited	Gr, SW, TA	7, 10, 17, 18	
Paspalum dilatatum	Dallis grass	FAC			VP, SW	10, 20	Also commonly found in ditches (Ref. #20).
Polypogon monspeliensis	Rabbit's foot grass	FACW+		Limited	BM, SW, FM	3, 10, 12, 15, 16, 17	In some habitat types such as a brackish tidal marsh, it generally does not persist as a dominant after the first 5 years, once native perennial vegetation is established (Ref. #12).
Phyla nodiflora	Frog-fruit	FACW	NMI		VP, SW, TA	7, 10	
Picris echioides	Bristly ox tongue	FAC	CBNL	Limited	U or TA, SW, TM	7, 10, 12, 16, 17, 19	Noxious persistent weed on urban rubble, but cannot compete in shaded areas (Ref. #12).
Plantago coronopus	Cutleaf plantain	FAC		EBNL	U or TA, TM, SM, DB, SW	3, 4, 10, 15, 17, 20	
Plantago lanceolata	English plantain	FAC-		Limited	U or TA, SW, DB	3, 10, 15, 17	
Rumex crispus	Curly dock	FACW-		Limited	FM, SM, VP, DB, SW, U or TA	2, 3, 9, 10, 13, 14, 16, 17	Considered a naturalized alien (Ref. #2). Has naturalized but is seldom invasive along brackish marsh edges (Ref. #3). Can be invasive; keep out of vernal pools (Ref # 13 & 14).
Silybum marianum	Milk thistle	NG	CBNL	Limited	SW, TA	7, 17, 18, 20	Invasive (Ref. #20).

Notes:

[a] Wetland Status indicates probable estimated occurrence in wetlands (from Reed 1998 and RMG 1993 – Reference #10):
OBL (Obligate) = 99% occurs in wetlands
FACW (Facultative Wetland) = 67% - 99% occurs in wetlands
FAC (Facultative) = equally likely to occur in wetlands and non-wetlands (34% - 66%)
FACU (Facultative Upland) = 1% - 33% occurs in wetlands
UPL (Upland) = <1% occurs in wetlands
NG = Not Given
NA = No Agreement
NI = Not an Indicator
+ = more; - = less
* = tentative assignment

[b] 1999 Cal EPPC List (Reference #8)
A-1 = Most Invasive Wildland Pest Plants
A-2 = Most Invasive Wildland Pest Plants - Regional (in SF Bay)
B = Pest Plants of Lesser Invasiveness
RA = Red Alert: Species with potential to spread explosively
NMI = Need More Information
AG = Annual Grasses of Concern
CBNL = Considered But Not Listed

[c] 2006 Cal IPC List (formerly Cal EPPC; Reference #18)
High = Species has severe ecological impact on ecosystems, plant and animal communities, and vegetational structure; exhibits moderate to high rate of dispersal and establishment and is widely distributed ecologically.
Moderate = Species has substantial and apparent, but generally not severe, ecological impact on ecosystems, plant and animal communities, and vegetational structure; exhibits moderate to high rates of dispersal but establishment generally depends on disturbance; distribution can be limited or widespread.
Limited = Species has minor ecological impacts on a statewide level or there is insufficient information available to justify a higher rating; distribution is limited although the species may be locally persistent and problematic.
EBNL (Evaluated But Not Listed) = Inadequate information available; or ecological impacts, invasiveness and distribution fall below the threshold for ranking.
NBNR (Nominated But Not Reviewed) = Insufficient information available to complete an assessment; or species is not yet known to invade wildlands.

[d] Habitat Types: TM = Tidal Marsh; BM = Brackish Marsh; FM = Freshwater Marsh; SM = Seasonal Marsh; VP = Vernal Pool; SW = Seasonal Wetland; R = Riparian; Gr = Grassland; U or TA = Uplands or Transitional Area; DB = Diked Baylands; CW = Coastal Waters; OW = Open Water; Wide = Widespread.

[e] Endnotes (See reference list for complete citations):

[1] Common Wetland Plants of Coastal California, Faber (1993)
[2] Baylands Ecosystem Habitat Goals Report (1999)
[3] Baylands Species & Community Profiles (2000)
[4] Martin Luther King Wetland Restoration Fourth Year Monitoring Report (2002 & 2003), Wetlands and Water Resources
[5] Top 20 Pest Plants in the East Bay. East Bay Chapter of the California Native Plant Society (2006).
[6] "Introduced Tidal Marsh Plants of the SF Bay Estuary", SFEI (1998)
[7] Cal EPPC List: Exotic Pest Plants of Greatest Ecological Concern in CA (1999) [see Reference #17 below for updated version.]
[8] Invasive Plants of CA Wildlands, Bossard et al. (2000)

[9] Evaluation of Vegetation of Wetland Restoration Projects, BMP Ecosciences (2003)
[10] (a) Resource Management Group (1993) based on (b) Reed's National List of Plant Species in Wetlands (1988; updated 1998).
[11] Practical Handbook for the Identification of Invasive Aquatic and Wetland Plants. SFEI (2003).
[12] Personal Communication, Peter Baye, (Nov. 2005)
[13] Personal Communication, John Callaway, (Nov. 2005)
[14] Personal Communication, Bruce Pavlik, (Nov. 2005)
[15] Personal Communication, Brad Olson, East Bay Regional Park District, Nov 23, 2005
[16] "Plant species observed at Stone Lakes National Wildlife Refuge", 7/26/04. Jones & Stokes, Sacramento. (list notes non-natives planted as ornamentals or for wildlife food)
[17] Cal IPC Invasive Plant Inventory (2006); www.cal-ipc.org - update of the 1999 CalEPPC List [see Reference #7 above for early version]
[18] Personal Communication, Agnes Farres (August 2006)
[19] Personal Communication, Marilyn Latta (Dec. 2005)
[20] The Jepson Manual: Higher Plants of California, Hickman, J., Ed., 1993 (http://ucjeps.berkeley.edu/jepson_flora_project.html)

REFERENCES for Appendix I: Invasive Non-native Species to Avoid in Wetland Projects in San Francisco Bay Region (references are listed alphabetically; numbers follow the source list on Appendix I).

(9) BMP Ecosciences. 2003. Evaluation of the vegetation of wetland restoration projects in the San Francisco Bay area. San Francisco, CA.

(8) Bossard, C., Randall J., and M. Hoshovsky. 2000. Invasive Plants of California's Wildlands. University of California Press, Berkeley, CA.

(7) California Exotic Pest Plant Council. 1999. CalEPPC List: Exotic pest plants of greatest ecological concern in California. UC Davis, Davis, CA.

(17) California Invasive Plant Council. 2006 (Updates the 1999 CalEPPC List). Cal-IPC Invasive Plant Inventory. www.cal-ipc.org.

(5) California Native Plant Society, East Bay Chapter. 2006. Top 20 Pest Plants in the East Bay.

(1) Faber, P. 1993. Common Wetland Plants of Coastal California. Pickleweed Press, Mill Valley, CA.

(20) Hickman, J., Ed. 1993. The Jepson Manual: Higher Plants of California. University of California Press.

(16) Jones & Stokes. 2004. Plant species observed at Stone Lakes National Wildlife Refuge. Sacramento, CA.

(10a) Resource Management Group. 1993. National List of Plant Species that Occur in Wetlands, Region 10 – California. Grand Haven, MI.

(10b) Reed, P. 1998. National List of Plant Species that occur in Wetlands: (Updated from 1988, Biological Report 88[26.10]). U.S. Fish & Wildlife Service. Washington, D.C.

(3) San Francisco Bay Wetlands Ecosystem Goals Project. 2000. Baylands Ecosystem Species and Community Profiles. Oakland, CA.

(2) San Francisco Bay Wetlands Ecosystem Goals Project. 1999. Baylands Ecosystem Habitat Goals. Oakland, CA.

(11) San Francisco Estuary Institute. 2003. Practical Guidebook for the Identification and Control of Invasive Aquatic and Wetland Plants in the San Francisco Bay-Delta Region. Oakland, CA.

(6) San Francisco Estuary Institute. 1998. Introduced Tidal Marsh Plants of the San Francisco Bay Estuary. Oakland, CA.

(4) Wetlands and Water Resources. 2003. Fourth Year Monitoring Report for the Martin Luther King Wetland Restoration Project in Oakland, CA.

Personal Communications:

- Peter Baye, Coastal Plant Ecologist
- John Callaway, University of San Francisco
- Agnes Farres, San Francisco Bay Water Board
- Marilyn Latta, Save the Bay
- Brad Olson, East Bay Regional Park District
- Bruce Pavlik, Mills College & BMP Associates

A few of the many San Francisco Bay Area Websites distinguishing between native and invasive plant species are listed below. In addition, many cities, counties, and creek groups provide recommendations for planting native species. To add to the list below, contact abreaux@waterboards.ca.gov or afarres@waterboards.ca.gov.

- Marin County Stormwater Pollution Prevention Program: www.mcstoppp.org [see "Native Plant Information"]
- California Invasive Plant Council: (Cal-IPC): www.cal-ipc.org
- Calflora: www.calflora.org
- California Native Plant Society: www.cnps.org
- California Native Plant Society, East Bay Chapter: www.bringingbackthenatives.net/pestplants.html
- Native Habitats: www.nativehabitats.org

APPENDIX II:

Suggestions for Substantive Requirements under CERCLA for Wetlands on Department of Defense Clean-up Sites in the San Francisco Bay Region

Appendix II:

The San Francisco Bay Water Board has authority to approve, with or without conditions, or deny projects that potentially impact wetlands and/or other waters of the state under the following laws and regulations:

(1) Porter Cologne Water Quality Control Act through issuance of Waste Discharge Requirements (WDRs)
(2) Section 401 Water Quality Certification of the Federal Clean Water Act
(3) San Francisco Basin Water Quality Control Plan (Basin Plan)

Approval of such projects is referred to as Water Quality Certification (WQC) and/or Waste Discharge Requirements (WDRs). Four documents are typically provided during this process, including:

(1) WDR Application (note CERCLA sites do not have to apply for a permit but the information requested in the application needs to be submitted to the Water Board);
(2) Preliminary Mitigation & Monitoring Plan;
(3) Final Mitigation & Monitoring Plan;
(4) Final "As-Built" report (submitted within 3 months after final construction and planting).

Following are suggested substantive requirements that should be addressed by each of the reports. For information on the Board's "No Net Loss" policy see the main report.

Suggestions for the Substantive Components of a WDR Application and Project Notification:

1. Description of site location, project purpose, and avoidance/minimization efforts
2. Copies of all completed or draft federal, state, and local permits or agreements related to the project; or a copy of the completed JARPA form, if available
3. Documentation of coordination with other agencies
4. A copy of California Environmental Quality Act (CEQA) compliance (if available) and any other required environmental documents
5. U.S. Environmental Protection Agency's 404(b)(1) guidelines analysis
6. Mitigation & Monitoring Plan, if required
7. Any other information requested by the Water Board staff
8. Fee: Note that DOD cleanup sites are not charged the typical fees found at http://www.waterboards.ca.gov/cwa401/docs/dredgefillfeecalculator.xls or http://www.waterboards.ca.gov/sanfranciscobay/certs.htm

See Table 2 in main report for appropriate content of Wetland Mitigation Plans, Monitoring Reports, and As-Built reports.

For questions or comments contact Gina Kathuria at 510-622-2378 or GKathuria@waterboards.ca.gov; or Andree Breaux 510-622-2324 or abreaux@waterboards.ca.gov.