

Breaking the Environmental Gridlock: Advance Mitigation Programs for Ecological Impacts

Keith Greer, Marina Som

The environmental review process and the required federal and state permits for wetlands and endangered species impacts have been blamed for delays in the development of critical infrastructure projects. Many of the delays are a result of negotiations surrounding the compensatory mitigation that is included as a part of the environmental review and included in the subsequent regulatory permits. Various programs around the nation are using proactive planning and advance compensatory mitigation to reduce delays and increase the environmental benefits associated with mitigation for infrastructure development. In this article, we provide case studies of four programs that illustrate how various agencies are incorporating *advance mitigation* into their infrastructure planning and implementation, and provide a critical examination of the attributes and status of these programs, along with the opportunities and challenges associated with advance mitigation. We have chosen these case studies to reflect a range of advance compensatory mitigation approaches toward endangered species and wetlands at various scales from four different regions of the nation. We contend that advanced mitigation offers a more effective and efficient approach. However, challenges exist in the need for up-front capital investment, the current lack of regulatory certainty, and lack of incentives to go beyond project-level mitigation. These challenges are significant, but are being addressed in some progressive ways across the nation. We believe that advance mitigation is the most cost-effective method for streamlining regional unavoidable impacts and should be

explored and in any future federal surface transportation reauthorization.

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No other phase of project development may contribute as significantly as the environmental phase to delays [of transportation infrastructure projects].

American Association of State and Highway Transportation Officials (AASHTO), 2003.

Further benefits can be achieved by anticipating compensation needs and accomplishing “advance mitigation” when the opportunities for larger ecosystem benefits still exist.

Wilkinson et al., 2009

Prior to starting projects that impact natural resources, such as wetlands or endangered species, caused by development projects, specific permits or consultations may be required under the Clean Water Act of 1972, the Endangered Species Act of 1973, the National Environmental Policy Act, and other state or local regulations. While the process of approval and method of permitting may differ by the various regulatory agency, these permits require that the projects provide mitigation to the maximum extent practicable [California Environmental Quality Act Guidelines sect. 15370; National Environmental Policy Act sect. 1508.20; United States Army Corps of Engineers (USA-COE), 2008]. *Compensatory mitigation*, or mitigation as used in this report, is action taken to provide substitute resources for the purpose of offsetting unavoidable loss and adverse impacts to a resource after measures to avoid and minimize those impacts have occurred.

Traditional approaches toward negotiating and securing compensatory mitigation has lead to delays in the regulatory permits and been identified as a primary cause of costly construction delays to transportation infrastructure

Affiliation of authors: Keith Greer, San Diego Association of Governments, San Diego California. Marina Som, San Diego State University, San Diego, California.

Address correspondence to: Keith Greer, San Diego Association of Governments, 401 B Street, Suite 800, San Diego, CA, 92101; (phone) 619-699-7390; (fax) 619-699-1905; (e-mail) kgr@sandag.org.

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projects (AASHTO, 2003). For example, cost overruns for California Department of Transportation projects were estimated at \$59 million per year because of delays caused during environmental review (Byrne, 2005). Consequently, as Congress grapples with developing the next national surface transportation bill, it should consider new methods of streamlining the delivery of transportation projects while proactively protecting the environment. This position is consistent with the recommendation from eight federal agencies and the departments of transportation of four states that state, "Federal Government should provide leadership in and cooperate with activities that foster the 'ecosystem approach' to infrastructure project development" (Eco-Logical, 1995). A method to achieve this goal is advance mitigation; the proactive acquisition and restoration of lands for compensatory mitigation in advance of anticipated future impacts.

Advance mitigation has been promoted by AASHTO as a cost-effective method of achieving increased efficiency in the delivery of transportation projects while promoting environmental protection (Venner, 2005). Advance mitigation is an integrated, programmatic approach to mitigation and conservation that seeks to maximize effective environmental stewardship and efficiently streamline the development of transportation projects, thus breaking the gridlock that can occur. It is a collaborative effort that involves state and federal agencies, as well as public and private organizations. Unlike other mitigation approaches, advance mitigation consists of proactive efforts to identify, fund, and compensate for future environmental impacts associated with transportation projects. The benefit of such a program is often greater environmental protection afforded from greater predictability in the regulatory process and preidentified conservation outcomes. In addition, mitigation opportunities are limited and securing these disappearing opportunities through advance mitigation further aids in the future delivery of transportation projects.

This article highlights four advance mitigation programs that are currently in existence across the nation: the Washington State Department of Transportation, Wetland Compensation Banking Program; North Carolina Ecosystem Enhancement Program; Wyoming's Programmatic Biological Assessment and Programmatic Biological Opinion; and San Diego California's Environmental Mitigation Program. These programs were selected to provide a cross section of approaches used throughout the nation and to illustrate various aspects of advance mitigation programs. While these case studies focus on transportation projects, they may serve as models to expedite the delivery of any type of

regional infrastructure programs (e.g., water, electric, oil, natural gas, wastewater).

Washington State Department of Transportation (WSDOT) Wetland Compensation Bank Program

Background and Motivation

Wetlands are protected under the Clean Water Act (33 USC 1344) because they absorb stormwater, filter out pollution, recharge the underground water supply, and provide habitat for a wide range of wildlife [US Environmental Protection Agency (USEPA), 1995]. Estimates from Washington State place the cumulative loss of wetlands as great as 50%–70%, with a continued wetland loss of 700–2,000 acres per year (Lane and Taylor, 1996). On-site and single-project off-site compensatory mitigation is no longer considered to be the most ecologically effective or cost-effective approach to address the compensation of wetlands lost as part of transportation infrastructure projects (US-ACOE, 2008).

As an innovative approach to maintaining the state's remaining wetlands while advancing development of its transportation infrastructure, the Washington State Department of Transportation (WSDOT) Wetland Compensation Bank Program was established in 1994. Through a multiagency agreement with state and federal regulatory agencies, WSDOT established a program to provide off-site compensation in advance of adverse impacts to wetlands resulting from state-sponsored transportation projects in the form of wetland mitigation banks. The WSDOT program defines the principles and procedures for the implementation and maintenance of a mitigation banking system in the state, where WSDOT would compensate in advance for environmental damages to wetlands in "off-site and non-contiguous locations." The program ensures that there would be no net loss of wetland acreage from WSDOT activities, and by proactively acquiring and restoring wetlands, there would be no temporal loss of wetland habitat. This advance mitigation is taking a watershed approach, the preferred method of compensatory mitigation under the Clean Water Act (USACOE, 2008)

Attributes and Measures

Under the WSDOT program, an Oversight Committee was established that consists of representatives from each of the

eight signatory agencies: USACOE, USEPA, US Fish and Wildlife Service (USFWS), National Marine Fisheries Service, Federal Highway Administration (FHWA), Washington State Department of Ecology, Washington State Department of Fish and Wildlife, and WSDOT. The Oversight Committee reviews and provides recommendations on candidate wetland compensation banking (WCB) sites, as identified and selected by WSDOT. Candidate WCB sites are judged based “upon their potential to provide sustainable, quality wetland functions and values with development, management, and maintenance, and for their potential to compensate for anticipated adverse impacts to wetlands attributable to WSDOT activities” (WSDOT, 1994). The Oversight Committee is also responsible to review and work with WSDOT to develop a restoration plan for the candidate WCB sites, which includes site design(s), bank service area, credits accrual, buffers/setbacks, quantitative performance measures/standards, credit-release schedule, and monitoring (Leonard, 2006). The Oversight Committee certifies the WCB sites, and WSDOT is responsible for managing, maintaining, and protecting the sites in perpetuity. There are no limitations to the location, number, and size of WCB sites. The bank becomes certified and available for use upon signature of the banking agreement/instrument by representatives serving on the Oversight Committee. Credits become available for use as specified goals and performance targets are achieved.

In addition, comprehensive monitoring and reporting protocols are defined to ensure success of the WCB. These comprehensive protocols include provisions for: documenting current conditions; determining significant changes in hydrology, soils, and vegetation; recording development of wetland functions and values; and determining attainment of performance standards. WCB sites are to be inspected semiannually for five years after the certification by the Oversight Committee and annually thereafter. Currently,

WSDOT has three certified mitigation banks as shown in Table 1.

WSDOT has promoted mitigation banking as a better alternative, both ecologically and economically, compared to traditional project-by-project mitigation. Public mitigation banks have resulted in a 30%–80% cost savings compared to traditional mitigation (Leonard, 2006). Leonard (2006) has indicated that the savings result from (a) economies-of-scale savings by restoration of one large site compared to several smaller sites, and (b) more time to evaluate the best opportunities to maximize environmental benefits and reduce overall cost rather than just meet a minimum mitigation requirement for a single project; however, no supporting reports have been prepared.

Ken Risenhoover (e-mail communication, February 1, 2010) has estimated that cost of concurrent mitigation (project by project) averages approximately \$1,215,461 per acre for nine transportation projects, comparing all aspects of mitigation. This is a sharp contrast to the cost per acre for the three wetland mitigation banks established by WSDOT and listed in Table 1.

Moreover, a funding mechanism was specifically developed to maximize WSDOT opportunities for advance mitigation. In 1998, the Washington State legislature established the Advanced Environmental Mitigation Revolving Account (AEMRA) for WSDOT to conduct advanced mitigation efforts (RWC 47.12.340). AEMRA provides reimbursable funds for environmental mitigation completed in advance of project impacts. AEMRA can be used for a variety of advance mitigation efforts, such as correcting fish passage, stormwater management, or habitat restoration. As transportation projects in the service area of the bank acquire the wetland credits, capital funds are transferred to AEMRA to repay the loan amount plus interest and management

Table 1. Summary of Washington State Department of Transportation (WSDOT) wetland banking

Wetland mitigation bank	Service area	Year of certification	Years to complete	Site acreage	Credits	Credits used	Credit value ^a
Springbrook Creek Wetland and Habitat Mitigation Bank	Puget Sound Basin	2006	18 months	130	44 ^b	4.02	\$835,000
North Fork Newaukum Wetland Mitigation Bank	Chehalis River Basin	2005	6 years	240	78.39	12.39	\$80,333
Moses Lake Wetland Mitigation Bank	Columbia River Basin	2003	4 years	12	5	1.37	\$91,050

^a Credit value is the monetary amount at which credits are sold and may include costs of development, current appraised land value, and administrative costs.

^b Credits awarded are equally shared between WSDOT and the City of Renton, WA.

Source: Updated numbers are from Ken Risenhoover (e-mail communication, February 26, 2010) based on original numbers from Leonard (2006).

fees. Since 1998, 32 loan applications have been submitted to the AEMRA program for consideration. Of these projects, 19 (59%) were judged to be eligible for the program. Projects were deemed ineligible if no source of funding identified for repayment were identified, the project was not in WSDOT's six-year improvement plan, or other sources of funds for mitigation were determined to be more appropriate (Risenhoover, 2009).

Of the 19 eligible projects, only 11 have been successfully developed (Risenhoover, 2009). Factors affecting the successful completion of AEMRA projects include the loss or reallocation of project funding, indefinite project delays, a loss of collaborative funding from development partners, and an inability to find suitable mitigation sites proximal to the project location. Regardless of the past performance, AEMRA remains a powerful tool in the WSDOT arsenal for promoting advance mitigation.

WSDOT (2008) has identified challenges in implementation of its wetland compensation banking program. For example, some of the local jurisdictions, which can participate on the Oversight Committee, are insisting on higher levels of compensatory mitigation identified in their municipal codes than established under the conditions of the mitigation bank. Furthermore, some jurisdictions are requiring that mitigation for impacts in their jurisdiction remain in their jurisdiction. This severely hampers the use of regionally established mitigation banks. Although these challenges are not insurmountable, they reduce the effective time and cost benefits of advance mitigation.

North Carolina Ecosystem Enhancement Program

Background and Motivation

During the mid-1990s, the North Carolina Department of Transportation (NCDOT) grew increasingly frustrated with project delays in its transportation program that were caused by shortcomings in meeting federal wetland permitting standards. Up to 40% of new construction project delays were related to problems with wetland and stream requirements under the Clean Water Act, and the agency was spending between \$40 and \$60 million per year on mitigation (D'Ignazio and McDermott, 2004). Transportation development projects were delayed 18–24 months by negotiations over project-level impacts (Bill Gilmore, e-mail communication, January 11, 2010).

To address NCDOT permitting delays, the North Carolina Ecosystem Enhancement Program (EEP) was established on July 22, 2003, through a memorandum of agreement (MOA) between NCDOT, North Carolina Department of Environment and Natural Resources (NCDENR), and US-ACOE, the permitting agency. The parties agreed that a significant gain in operational efficiency could be achieved by combining the mitigation programs of NCDOT with those of the Wetlands Restoration Program. The objective was to use NCDOT's future need for mitigation as a means to programmatically acquire and restore lands in advance of impacts caused by the actual development of transportation infrastructure.

The mission of the EEP is to produce watershed restoration and preservation projects that meet regulatory mitigation requirements with respect to type, quality, and compliance schedule in the most cost-effective way while maximizing environmental return for North Carolina (NCDENR, 2003). The EEP process (with support from USACOE) allowed the "decoupling" of mitigation from site-specific impact assessment, allowing permits to be issued for unavoidable impacts without the reliance on individual project-specific mitigation sites. As a benefit, mitigation could occur in advance of the project-level impacts.

Under the MOA, the parties established a shared commitment to restore, enhance, and protect the state's wetlands and waterways through a watershed planning approach while fostering responsible economic growth. The parties agreed that the need for future compensatory mitigation should be anticipated and should occur prior to impacts caused by new transportation infrastructure. The opportunity that the EEP seeks to promote is to provide timely, cost-effective, high-quality functioning compensatory mitigation for authorized impacts in advance of the actual project impacts, in a way that enhances ecosystem functions in an integrated and sustainable manner.

Attributes and Measures

Under the EEP, mitigation is done programmatically for the list of projects on North Carolina's seven-year State Transportation Improvement Program (STIP). The US-ACOE issues project-level Clean Water Act section 404 permits for transportation-related impacts, but relies upon the mitigation provided by the EEP. Regulatory oversight of the EEP is conducted through annual and quarterly reports and inspections of all EEP mitigation sites to assure that the programmatic mitigation is achieving the condi-

tions set forth in the MOA. This programmatic review eliminates project-specific mitigation being tied to specific transportation project. Protocols, clearly defined by the MOA streamline project development, as well as the identification of mitigation opportunities in targeted watersheds. In February of each year, NCDOT provides the EEP with its mitigation request in the form of a forecast of impacts to wetlands and stream resources for the seven-year STIP list (NCDOT, 2010). Most importantly, NCDOT funds mitigation in advance and thereby enables the EEP to produce mitigation prior to the impact of the transportation project.

The EEP depends solely on revenues collected and receives no state appropriations. Approximately 75% of the funding for the EEP comes from NCDOT for mitigation of STIP projects. The remaining 25% comes from in lieu fees from private development and other public agencies (Bill Gilmore, personal communication, January 11, 2010).

The EEP does not have eminent-domain authority, nor can it condemn property, but instead acts on the philosophy that a programmatic, watershed-based planning process will result in the best possible economic and environmental return. Through comprehensive identification and prioritization of opportunities and the development of local watershed plans, the EEP is able to proactively engage private property owners and land trusts to develop opportunities for transportation providers seeking turnkey mitigation sites.

The EEP has a record of carrying out its mission without a single transportation-project delayed due to lack of available mitigation credits and has helped to move forward more than \$5.4 billion in transportation-infrastructure improvements since becoming operational in 2003 (EEP, 2009). An unexpected challenge for the EEP is that at least 4,000 acres of wetland credits are available, and tens of thousands of feet of stream restoration have been created that are not needed within the current seven-year window of transportation mitigation needs (*Greenways*, 2007). Also of concern to NCDOT is that sometimes they pay more than once for mitigation. This occurs if the USACOE determines that on-site mitigation is required in addition to fulfilling the off-site obligation of the MOA (*Greenways*, 2007). While this has been a concern, only three incidences were identified (*Greenways*, 2007) out of a total of 400 NCDOT transportation project requests (EEP, 2010). Finally, a downturn in the economy has caused a slowdown in the demand for mitigation credits from both public and

private sources, thus slowing the ability to take advantage of new restoration opportunities. This later concern may be short-lived as the economy rebounds and with it funding for infrastructure.

Wyoming's Programmatic Biological Assessment (PBA) and Programmatic Biological Opinion (PBO)

Background and Motivation

Unlike the North Carolina program, the motivating factor for the Wyoming PBA/PBO was the high number of individual project-by-project consultations with the USFWS, which was burdensome and costly for all agencies involved [FHWA, Wyoming Department of Transportation (WYDOT), and USFWS]. As a result, in 2003, WYDOT, the FHWA, and the USFWS collaborated to develop a PBA and a PBO to address federally listed endangered species to help streamline transportation section 7 consultations for projects in the WYDOT five-year STIP. The PBA describes the general highway project types and the typical impacts associated with the project types on the species listed for Wyoming, and concludes with determinations for potential impacts to these species. This programmatic approach satisfies the regulatory requirements of the federal Endangered Species Act, promotes the conservation of endangered and threatened species and their habitats, enables more efficient use of agency resources, and strengthens interagency cooperation.

As an alternative to the project-by-project approach, the PBA/PBO established a programmatic mitigation strategy that streamlines section 7 consultation by comprehensively evaluating and addressing proposed impacts of the STIP projects, not only for listed species, but also for species that are proposed as candidates to become listed under the federal Endangered Species Act. The PBA/PBO identifies conservation reasonable and prudent measures and the terms and conditions that WYDOT is required to implement to minimize or avoid adverse effects to the identified species and their habitats. The USFWS also provided discretionary conservation recommendations to further minimize effects to listed species, aid in their recovery, and develop additional information for the species. The PBA for all Wyoming-listed threatened and endangered species and critical habitats was submitted to the USFWS in March 2005; the USFWS issued its PBO in November 2005.

Attributes and Measures

The PBO of the USFWS is based on an assessment that evaluates potential impacts and cumulative effects against an environmental baseline for the areas covered by the projects in the STIP. The PBA covers 15 species and 3 designated critical habitats of which the PBO found adverse effects may occur to 4 threatened species but were not likely to jeopardize their continued existence (USFWS, 2005). This programmatic approach exempts all projects within the WYDOT's five-year (2005–2009) STIP from an individual section 7 consultation process, except for the following reasons:

- The project specifically requires an environmental impact statement and has the potential to adversely affect listed species
- The scope of work changes creating potential effects to listed species or critical habitats not previously considered
- New information reveals effects of highway projects may impact listed species in a manner not previously considered in the PBA

The PBA/PBO also allows WYDOT to substitute similar projects in similar locations without further consultation with the USFWS. For example, WYDOT can substitute a new project for one of the 328 projects included in the STIP without additional consultation, as long as the effects of the new project are determined to be the same or less than the original STIP project by WYDOT. This flexibility was considered critical to WYDOT because their STIP is very dynamic regarding programming of funds and implementation of projects.

The FHWA and WYDOT must comply with the terms and conditions of the agreement, which includes a maximum amount of loss of individuals and impacts to their habitat, reporting/monitoring, and enforcement of all conservation measures as outlined in the biological assessment (for more details on conditions of PBO, see USFWS, 2005). In practice, the PBA/PBO is used for STIP projects that qualify for a categorical exclusion under the National Environmental Policy Act (NEPA), while larger projects that would require a higher level of NEPA environmental review would likely have their own individual section 7 consultation (Randy Strang, personal communication, January 11, 2010).

WYDOT, the FHWA, and the USFWS have developed a project-specific monitoring/reporting form, and they meet annually to review the effectiveness of PBA conservation measures and PBO terms and conditions of the PBO. The

FHWA has indicated that the USFWS is very happy with the process and the reduction in the case-by-case review that occurred prior to the PBA/PBO program (Randy Strang, personal communication, January 11, 2010). WYDOT staff believes that the ability to consult at a program level has saved the involved agencies both time and money, but the amount has never been quantified (Thomas Hart, e-mail communication, January 21, 2010).

Since inception of the PBA/PBO program, there have been no impacts (also referred to as *incidental take*) on three of the four species and negligible (0.43 acres of the 64 acres permitted under the PBO/PBA) on the fourth species (WYDOT, 2009). One insight has been that while incidental take was expected to be much higher, actual impacts were dramatically less because of project-level avoidance measures and an overestimation of anticipated impacts.

The PBA/PBO was set to expire in September 2009. It was extended for one year while the USFWS reviews the revised PBA for the current STIP, which will run through 2014. The effects of these projects on threatened and endangered species will be reevaluated and a new PBO issued.

San Diego TransNet Environmental Mitigation Program

Background and Motivation

Larger in area than both Rhode Island and Delaware combined, and home to more people than 20 of the 50 US states, San Diego County is a nationally recognized hot spot for biodiversity and endangered species [San Diego County has the most federally listed species (48) of any county in the continental United States (Dobson et al., 1997; Rutledge et al., 2001)] and a region under tremendous growth pressure [San Diego Association of Governments (SANDAG), 2010]. The struggle between population growth, economic prosperity, and dwindling habitat for native species led to the creation of the Natural Community Conservation Planning (NCCP) programs by the state of California, an intensive proactive effort to plan and protect an interconnected system of natural habitat to conserve endangered species at the landscape level (California Department of Fish and Game, 2010). This program creates the framework for regional habitat preserves that, once acquired and managed, will promote the conservation of endangered species and avoid the need for future listing of endangered species under the federal and/or California

endangered species acts (for more details on the NCCP program, see California Department of Fish and Game, 2010).

Seeing the benefits of implementing this regional framework, SANDAG in 2002, acting as both the regional metropolitan planning organization and regional transportation agency, decided to establish a proactive approach to satisfy future regional and local transportation mitigation needs to expedite congestion relief while reducing overall costs and securing mitigation opportunities in advance of the individual needs of transportation projects. This program, referred to as the Environmental Mitigation Program (EMP), goes beyond traditional mitigation programs to provide for the proactive, large-scale acquisition and management of habitat lands for future mitigation of projects while promoting the goals of implementing the land acquisition of the NCCP. The EMP is a funding allocation included in the TransNet measure—a 40-year 0.5-cent sales tax approved by the San Diego voters in 2004 to improve transportation in the region.

It allows SANDAG to buy land early—at lower costs—and “bank” the land for future needs. As SANDAG and its partner agencies, such as California Department of Transportation (Caltrans) and the local jurisdictions, seek permits to construct transportation projects over the next several decades, the purchased land will be used for mitigation. This approach creates a reliable source of mitigation land for future transportation improvements and at the same time is expected to reduce overall costs while accelerating project completion. Mitigation cost under a traditional project-by-project approach was estimated at \$850 million for all of the transportation projects identified under the 40-year Regional Transportation Plan. Historically the average value of land in San Diego County has increased 286% over the last 26 years, with a high of a 645% increase at the height of the market in 2005 (Davis and Palumbo, 2009). Under the EMP, it is estimated that \$200 million in economic savings could be achieved by investing in advance mitigation while also assisting with the habitat preservation efforts of the NCCP.

In March of 2008, SANDAG entered into an MOA with the USFWS, the California Department of Fish and Game, and Caltrans to formalize a process for implementing advanced land mitigation. The MOA is a 10-year processing agreement that will allow all the agencies to evaluate how the EMP implements the provisions of the TransNet ordinance for advanced land mitigation (SANDAG, 2004). The MOA has budgeted \$440 million for mitigation over the next

decade to jump start advanced mitigation, with additional funding after the first 10 years of the program, if a comprehensive economic analysis concludes that direct cost savings has occurred under the EMP (SANDAG, 2004).

Attributes and Measures

Like the North Carolina and Wyoming programs described earlier, mitigation under the EMP takes a programmatic approach that must achieve the requirements of the MOA both to acquire significant biological land identified in the NCCP and to meet the mitigation requirement of one or more transportation-related infrastructure project within the budget approved by the SANDAG board of directors. An aspect unique to the EMP is that many of the transportation improvements listed in the Regional Transportation Plan may not occur for 10–20 years. In this case, the process needs to have flexibility to allow for changes to occur over the 40-year planning horizon. As a point of clarification, the EMP does not seek to eliminate the need for future federal and state permits necessary for compliance with state and federal endangered species acts, the Clean Water Act, and local provisions. Instead, the EMP uses the foundation of the regional preserve system established under the NCCP to identify larger parcels that could both meet the mitigation needs of future regional transportation projects and help to implement regional habitat conservation. Prior to any acquisitions, a letter of concurrence and commitment is obtained from the necessary resource agencies that memorializes the future use of the parcel as mitigation for all or part of future transportation projects.

One criticism of the program has been that a permit is not issued at the time the land is acquired. This issue was a major hurdle for the signatories of the MOA. A vision was embraced by many stakeholders that the EMP could provide guaranteed funding and get guaranteed permits. Legally this was not achievable because of the predecisional nature of providing a permit for a project that may not be completed for a decade or more. Economically the idea of providing a guaranteed funding stream was financially risky because the TransNet funding is tied to annual sales tax revenues, which historically fluctuate [as was the case in 2007–2009, with a 9.2% decline (SANDAG, 2009)]. Managing the expectations of what could be accomplished given the current legal framework and prudent financial management was a significant task.

The implementation of the EMP program is slightly less than three years old. However, in that time, 1,040 acres

have been acquired at a savings of over \$24 million dollars (32.3%) from the original estimated acquisition costs established in 2003 and the acquisitions continuously occurring since 2007 (author's unpublished data). This in part reflects the downturn in the real estate market, the economy of scale for larger acquisitions, and the luxury of time that allows staff to identify the properties with the greatest environmental benefit at the lowest economic cost. A complete picture of cost savings can not be determined with such limited data. However, SANDAG will continue to monitor the budgets during the 10-year evaluation period. One of the major projects identified in the MOA has been fully permitted, and another is close to getting all federal and state permits. Although this trend shows the promise of expediting project processing, more time is needed to see whether this trend persists.

While the EMP is still in its infancy, this approach is being adopted by other counties (e.g., Measure M in Orange County, California), and a bill has been introduced in the California Legislature (AB 1321: the Advance Infrastructure Mitigation Program Act) that would authorize state infrastructure planning agencies to identify future infrastructure projects for the purposes of promoting regional advance mitigation.

Conclusion

These case studies represent several approaches to proactively address required state and federal mitigation for transportation-related projects in advance of project-level need and provides an overview of their current status. The motivation for the development of each program was born from the need to reduce project delays, secure opportunities for mitigation sites that would be more difficult to find in the future, and/or to reduce staff workload by developing an overall strategic approach toward mitigation. The four transportation agencies each found that building collaborative partnerships was a necessary ingredient to provide for and produce shared benefits so as to expedite project approvals to alleviate transportation problems and achieve greater environmental protection. A programmatic approach toward streamlining the regulatory process has demonstrated a method to save both time and money because of the predictability in the regulatory process and tangible environmental outcomes. As the North Carolina EEP Director, Bill Gilmore states, "It is easier to show the permitting agencies a successful restoration site that will be used for mitigation, rather than talking about what a potential mitigation site will look like once restored" (per-

sonal communication, January 21, 2010). This in turn can streamline the permitting of transportation infrastructure projects and reduce the overall cost.

Advance mitigation programs have begun to be developed around the nation as a way to proactively protect and conserve the environment while responsibly delivering critical transportation infrastructure (Marble and Riva, 2002). Comprehensive advance mitigation has been advocated by the academic community (Thorne, Girvetz, and McCoy, 2009; Zedler et al., 2001), the transportation community (AASHTO, 2003; Venner, 2005), the permitting agencies (Eco-Logical, 1995; USACOE, 2008), and environmental stakeholders (Kiesecker et al., 2010; White and Ernst, 2003; Wilkinson et al., 2009). The authors believe that advance mitigation is the most cost-effective method for streamlining regional infrastructure development and enhancing the required compensatory mitigation for any unavoidable impacts. The case studies in this article reflect transportation project development, but other regional infrastructure providers (e.g., water, gas, electric) would also benefit from this approach.

The challenges to this approach have been the need for up-front funding to establish the mitigation sites in advance of project-level mitigation needs, the perceived need for greater specificity of project-level impacts, the regulatory certainty that most infrastructure projects desire before tax or rate payer funding is invested, the commitments of both the infrastructure providers and the permitting agencies to implement a program through changing administrations and staff, and the need for strong national leadership to embrace and incentivize advance mitigation. These challenges are significant, but are being addressed in progressive ways across the nation as shown through the case studies in this report.

In researching the case studies for this article, the authors came to find that hard data to reflect cost-saving and reduced project delivery are sparse. We still argue that advance mitigation is a more efficient approach than compensatory mitigation and well supported by a variety of infrastructure providers and environmental stakeholders. The weakness of this conclusion comes in the lack of sufficient data to make a universal business case for advance mitigation. While some work is being done to better quantify advance mitigation (Marie Venner, e-mail communication, June 14, 2010), the authors encourage the FHWA and the Transportation Research Board to develop metrics for measuring the efficiency and effectiveness of advance

mitigation programs and to warehouse these data for research.

We still contend that compensatory mitigation had not led to optimal environmental benefits. Advance mitigation is supported by a wide range of stakeholders, but unless it is more actively ingrained into the funding of capital improvement projects and the regulatory permitting process, and actively endorsed in a future surface transportation reauthorization act, a project-by-project approach toward compensatory mitigation will continue to prevail as the norm.

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