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[GREEN INFRASTRUCTURE FUNDING MECHANISMS]

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GREEN INFRASTRUCTURE FUNDING MECHANISMS

Executive Summary

This memorandum details funding strategies available to municipal governments to hasten widespread implementation of Green Infrastructure (GI) in the public right-of-way. The next Municipal Regional Permit will require municipalities to develop drainage area-specific GI plans. These plans will be critical for local governments and the general public to understand the scope of estimated costs, benefits, and implementation timescale (decades at least). The total cost of GI practices includes capital (design, engineering, construction) and annual (operations and maintenance and replacement) costs, which may require different sources of funding. The memorandum briefly describes a number of potential GI funding strategies being used or proposed by some Bay Area jurisdictions. These include: 1) stormwater assessment fees, 2) long-term debt instruments, 3) sales tax measures 4) special benefit assessments, 5) motor vehicle registration fees, and 6) grants. Once a jurisdiction develops its GI plan(s), the associated cost estimates may guide the direction(s) taken to secure needed funds.

The memorandum closes with in-depth descriptions of municipal Alternative Compliance (AC) program options, which allow a developer flexibility to build or contribute to an off-site GI project when unable meet stormwater management requirements within the regulated project site or when it is more beneficial to provide stormwater treatment or flow controls off-site. AC program options include: 1) off-site mitigation (private to private), 2) off-site mitigation (private to public), and 3) payment in-lieu (private to public). Each option comes with obligations for municipal staff.

GREEN INFRASTRUCTURE FUNDING MECHANISMS

BENEFITS OF GREEN INFRASTRUCTURE

Municipal governments across the country and in the San Francisco Bay Area are beginning to recognize and realize the variety of benefits derived from Green Infrastructure (GI)[1] practices. When widely dispersed throughout a watershed, GI practices can improve water quality while reducing runoff volumes and rates entering the storm sewer system, local waterways, and ultimately the San Francisco Bay and Pacific Ocean. Depending on where and how it is implemented, GI can also promote infiltration and groundwater replenishment, neighborhood beautification, reduced heat island effects, and increased pedestrian safety.

To date, jurisdictions with combined sanitary and stormwater sewer systems[2] are typically the nation's most advanced municipal GI practitioners. Many are legally mandated to reduce wet-weather overflows that overwhelm treatment plants and discharge untreated effluent directly to receiving waters. Because the sanitary sewer element is a public utility generating enterprise funds, cities with these combined systems are financially well-positioned to undertake GI in the public right-of-way. It is important to note that most of California municipalities have separate sewer systems and the California Constitution requires voter or property-owner approval of stormwater utility rates, significantly hampering the ability to fund green infrastructure in much of the state.

INCREASING GI IMPLEMENTATION

The San Francisco Bay Regional Water Quality Control Board (Water Board) favors Low Impact Development (LID) design and stormwater treatment practices (such as GI), mandating these measures for new and redevelopment projects of a certain size threshold ("Regulated Project") in its Municipal Regional Stormwater Permit (MRP). Typical road reconstruction projects are exempt from LID treatment unless widened for additional traffic lane(s). MS4[3] jurisdictions in the Bay Area have generally not yet adopted widespread use of GI within the public right-of-way as standard operating procedure, in large part due to lack of comprehensive GI planning and funding.

To hasten widespread GI implementation, the Water Board's Tentative Order MRP 2.0 mandates the development of actionable municipal GI plans by permittees (due with the 2019 Annual Report). This requirement and timeline recognizes the internal challenges of adjusting municipal planning and public works operations to include GI as a standard practice. Comprehensive GI planning entails: watershed

[1] The term Green Infrastructure is used to denote landscape-based drainage practices that disconnect impervious surface conveyance to restore a more natural (pre-development) hydrograph

[2] These cities include: New York, Philadelphia, Washington, DC, Chicago, Seattle, Portland, and San Francisco

[3] MS4 means "municipal separate storm sewer systems"

analyses, revisions to existing policies and plans, design standards development, capital improvement planning, outreach and education, and identifying funding sources for long-term implementation.

Once required GI plans[4] are developed, municipalities will have a better sense of the associated programmatic costs and implementation timescale (realistically 50 to 100 year plans to reach pollution and/or runoff reduction targets). Retrofitting the public right-of-way at a large scale is quite expensive. Designing and implementing GI as a portion of a larger capital improvement project rather than as a stand-alone endeavor is a cost-containment measure. Ideally GI plans will be integrated with local public works departments' capital improvement plans which identify advanced funding needs for specific street, sidewalk, and storm drain infrastructure rehabilitation projects. .

Potential Sources of GI Program Funding

Funding is a critical issue in the realization of local governmental GI plans. When considering life-cycle costs of GI practices relative to conventional public right-of-way improvements, GI pencils-out favorably due to its multi-benefit nature. Municipalities must account for the added GI planning, design, engineering, and construction costs on the front end, as well as ongoing maintenance over the long term. There are a variety of approaches and resources available to local governments to help finance these up-front and long-term investments. A few examples are briefly discussed below:

Stormwater Assessment Fees

Many Bay Area municipalities have enacted assessments on real properties contributing stormwater runoff to the municipal storm drain infrastructure. These property-related fees are typically based on estimates of impervious area and land use type. These revenues usually can only be expended for stormwater quality protection and conveyance activities, including MRP required programs and stormwater infrastructure capital improvements, operations, and maintenance. Currently, most stormwater assessment fees are at their maximum allowable ceiling and do not fully cover the costs of MRP compliance.

Voters or property owners must approve establishment of, or increases to, these fees or special taxes as per Proposition 218[5]. This can be a difficult hurdle as evidenced by a 2012 ballot initiative in Contra

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[4] Tools such as GreenPlan-IT, developed under the same State Grant as this memorandum, are ideal for creating GI Plans. In collaboration with SFEP, the San Francisco Estuary Institute created the GreenPlan-IT toolkit, which combines science and engineering principles with GIS analysis and optimization techniques to support the selection and placement of GI at a watershed scale. The Toolkit and user guides are available for download at http://greenplanit.sfei.org/.

[5] The **Stormwater Initiative (Assembly Bill 1362- Omnibus Act Amendment)** seeks to pass a Constitutional Amendment through the State Legislature with a November 2016 ballot measure that would allow voters to designate stormwater as a utility on par with drinking water, wastewater, and refuse services (all exempt from Proposition 218 requirements). If approved, local stormwater agencies could establish or raise rates in a manner

Costa County that failed to add an additional fee to property taxes to increase funding for local stormwater pollution prevention programs. However, in the same year, 70% of Santa Clara County voters passed a special tax for *the* ***Santa Clara Valley Water District's Safe, Clean Water and Natural Flood Protection Program***. This is a continuation of the pre-existing special tax from the sun-setting Clean, Safe Creeks plan. The new funding structure will generate an estimated $700M over its lifetime, which automatically sunsets on June 20, 2028.

Long-Term Debt Instruments – General Obligation Bonds/Certificates of Participation

Debt financing is a way for local agencies to borrow money up-front against the stream of revenue projected over the life of the program. This approach provides a large injection of capital which can greatly accelerate GI implementation, storm drain pipeline rehabilitation, and public right-of-way improvements. Both General Obligation (GO) Bonds (secured and voter approved) and Certificates of Participation (COPs) (not secured and not voter approved) are popular methods of funding physical improvements intended to last longer than the repayment period. While these mechanisms have low interest repayment rates, they do incur administrative costs and are typically restricted to funding capital costs rather than planning and O&M activities, and require dedicated revenue streams for repayment.

SCVWD will use a combination of debt financing and pay-as-you-go funding to pay for the Safe, Clean Water and Natural Flood Protection program's capital projects. Approximately 21% of capital project costs are anticipated to be funded through debt financing via the issuance of COPs. Total debt service over the life of the program comprises repaying the principal borrowed ($121 million) and interest on the borrowed money ($43 million), assuming a 3.2 percent fixed interest rate over a 14 year horizon. In addition, to free up more funds early in the program, staff is working with the District's financial advisor to construct a debt service payment assumption where debt service payments are low in the early years and higher in the later years.

The City of Berkeley's ***Citywide Watershed Management Plan*** identifies over $200M of needed funding for recommended improvements, including GI as well as upgrades and rehabilitation of aging storm drain pipelines. In 2012, Berkeley voters passed Measure M – a $30M GO Bond to fund five years of street repaving and rehabilitation and the installation of green infrastructure as part of street work. The debt service on this bond is to be paid by an annual property tax at a rate of about $0.0159 per $100 on estimated assessed valuation over a 30 year horizon.

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similar to water and wastewater districts. The ballot measure, by itself, will not raise revenues—a local public process would be required to: 1) establish the "utility", 2) determine scope and level of services, and 3) determine rates and rate structures. Allowable stormwater utility expenditures could include: watershed and GI planning; environmental restoration, capital improvements, operations & maintenance, and outreach and education.

Development Impact Fees

Local governments may enact a development impact fee that is paid by an applicant seeking approval for a development project, if the fee is exacted for the purpose of defraying all or a portion of the cost of public facilities related to the development project. Municipalities must carefully prepare and enact a development impact fee program to ensure it meets the requirements in California Government Code §§ 66000-66025 (the Mitigation Fee Act). Under state law, a development impact fee is not a tax or special assessment, and therefore is not subject to voter approval. However, if the development impact fee is found to not relate to the impact created by development, or to exceed the reasonable cost of providing the public service, then the fee may be declared a "special tax" subject to approval by a two-thirds majority of voters. As an example of how a development impact fee may be used to fund GI, the City of San Mateo's Sustainable Streets Plan recommends replacing the city's existing Traffic Impact Fee program (fee assessed to developers to fund roadway O&M to mitigate vehicle trips generated) with a Sustainable Streets Fee focused more specifically on intermodal improvements and GI. A fee of this type could only cover the costs attributable to the increased demand for public facilities reasonably related to the development project to achieve an adopted level of service consistent with the municipality's general plan.

Special Benefit Assessments

Benefit assessments can be levied on property owners to pay for those public improvements and services that specifically benefit their property. The amount of the assessment is directly related to the amount of benefit the property receives. All property owners in a watershed could be assessed to fund stormwater management programs that provide direct benefit to properties within that watershed or sub-basin. The watershed unit may be particularly effective and equitable as programs can be tailored to address specific priorities identified within that watershed and would include the diverse socio-economic demographics from the hills to the flatlands typical to an urban watershed. Assessments are not taxes or fees, and must be approved by a weighted majority of the affected property owners that cast votes.

Motor Vehicle Registration Fees

Since approved by voters in 2010, an annual fee of ten dollars ($10) is imposed on motor vehicles registered in San Mateo County for transportation-related traffic congestion and water pollution mitigation programs. The revenue is estimated at $6.7 million annually over a 25 year period. Per the Expenditure Plan, 50% of the net proceeds will be allocated to cities/county for local streets and roads and 50% will be used for countywide transportation programs such as transit operations, regional traffic congestion management, water pollution prevention, and safe-routes-to-school. Timing is important, however, as the passage of Proposition 26 in 2010 now makes such a Motor Vehicle Registration Fee a "tax", requiring a 2/3 approval threshold.

GRANTS

Federal, State, and Regional grant programs have awarded funding to local governments to support Green Infrastructure efforts around San Francisco Bay. Some of these programs include:

- US Environmental Protection Agency: San Francisco Bay Water Quality Improvement Fund
- CA Water Resources Control Board: 319(h) Non-Point Source Implementation Program
- CA Department of Water Resources: Integrated Regional Water Management Program Implementation Grants
- CA Department of Transportation: Planning Grants
- CA State Parks: Land & Water Conservation Fund and Rails-to-Trails Programs
- CA Department of Forestry and Fire Protection: Urban and Community Program
- Strategic Growth Council: Urban Greening Program (planning and implementation)

Other potential grant resources that may be tapped in the future to support GI include Greenhouse Gas Reduction Funds derived from the CA Cap and Trade Program and Federal, State, and Regional transportation program funds.

ALTERNATIVE COMPLIANCE PROGRAMS

Another available strategy to increase public right-of-way GI/LID retrofits is development of Alternative Compliance (AC) programs. The Tentative Order MRP 2.0, Provision C.3.e., gives permittees the ability to provide Alternative or In-Lieu Compliance Options. The first option, **LID Treatment at an Offsite Location**, allows a regulated project proponent to provide hydraulically-sized treatment offsite for any remaining required stormwater treatment/retention quantities not addressed at the regulated project site. The second option, **Payment of In-Lieu Fees**, allows a regulated project proponent to pay the municipality an amount necessary to provide both hydraulically-sized GI/LID treatment and a proportional share of operations and maintenance cost sat a regional or municipal stormwater treatment facility. In either case, the mitigating project must be built in the same watershed and have a net environmental benefit. Unless approved by the Water Board's Executive Officer, the mitigating project must be completed within three years after the construction of the regulated project.

While the AC option has been available since 2009[6], there has been limited use of AC in the Bay Area. When used, AC has generally occurred on a case-by-case basis, with minimal or no consideration of AC program planning. Although they take effort and resources to establish, AC programs can be beneficial both to the developer community and to local governments. Developers get the flexibility to install off-

[6] Countywide stormwater permits that preceded the MRP (i.e., adopted in 2001-2003) included a provision that allowed Permittees to establish "waiver" programs under which a project proponent could request a waiver of on-site treatment based on demonstration of "impracticability or infeasibility" if equivalent treatment was provided at another location or at a regional facility. This provision was essentially a precursor to the current Alternative Compliance provision in the MRP (C.3.e.i), which prescribes AC options and supersedes any previous waiver programs established by Permittees.

site treatment when infeasible on-site or beneficial for other reasons). Local governments can better direct developer funding or construction of GI projects towards priority locations. Ultimately the local neighborhood and watershed are beneficiaries since these AC projects are mandated to provide a net environmental benefit.

Alternative Compliance Frameworks

Internal frameworks are needed to establish a viable municipal AC program. These frameworks take staff resources to develop and implement. If the municipality intends to lead developers to pre-determined public right-of-way sites or to establish a Payment In-Lieu program, a greater level of GI/LID feasibility study and watershed analyses is needed. This can be accomplished using the GreenPLan-IT toolbox.

The level of pre-planning for AC-related public right-of-way GI improvements is consistent with the Tentative Order MRP 2.0's, Provision C.3.j., which instructs permittees to quickly develop "approved" internal frameworks for developing drainage-area-specific GI plans. The GI Plans must be developed by 2019 and must include: prioritization criteria, maps, lists, targets for impervious surface area to be retrofitted, general guidelines, standard specifications & design details, and implementation work plan and schedule. Further, the Tentative Order's Provisions C.11.c /C.12.c require the creation and implementation of GI Plans to specifically reduce mercury and PCB loads. *Note: the GreenPlan-IT toolbox will be enhanced in 2016 to better align with MRP requirements.*

Regulated Project Compliance Hierarchy/AC Program Options

In developing an AC program, local governments must determine if its program will: 1) assist in brokering between private entities, 2) direct off-site mitigation efforts to the public right-of-way, or 3) *both* broker between private entities *and* direct off-site mitigation to the public right-of-way. The municipal burden increases for AC options designed to facilitate GI/LID in the public right-of-way, either through developers performing the work or paying an In-Lieu Fee. However, early investment of permittee resources to create both the GI Plans and AC frameworks can result in project-specific efficiencies and ideally faster achievement of required (mercury and PCB) load reductions. The tables[7] below describe the anticipated municipal and developer roles and responsibilities associated with various AC program options.

[7] These tables, modified for the SF Bay Area use, are derived from the Center for Watershed Protection, Inc.'s ***Guidance For Developing an Off-Site Stormwater Compliance Program in West Virginia: Local Stormwater Program Development in Accordance With The West Virginia General Permit For Stormwater Discharges From Small Municipal Separate Storm Sewer Systems***, prepared in 2012 for the West Virginia Department of Environmental Protection.

1) On-site Compliance – Developer designs & installs required stormwater controls on-site.

Municipality Role	Developer Role
- reviews and approves developer compliance - inspects installation - conducts on-site O&M inspections once every five years to ensure correct operation of controls.	- demonstrates full compliance on-site - maintains operating condition or transfers requirement and information to new property owner.

2) Developer-driven Off-site Mitigation (private/private) – use off-site project at another private property to fulfill entire required stormwater treatment/reduction volume or remaining required volume after partial stormwater management on-site.

Municipality Role	Developer Role
- reviews on-site & off-site plans - inspects on-site & off-site installation - conducts on-site & off-site O&M inspections once every five years to ensure correct operation of controls.	- ID locations for off-site - prepares plans - secures property rights - constructs project - maintains operating condition or transfers requirement and information to new property owner.

3) Municipality-facilitated (Regional) Off-Site Mitigation (private/public) – developer builds off-site project on public land (right of way or environmentally sensitive area) at site(s) suggested/determined by municipality.

Municipality Role	Developer Role
- IDs priority areas & potential projects - works with developer to select site (meeting community-watershed goals) - reviews on-site & off-site plans - may assist with securing property rights, approvals, permits - inspects installation - conducts on-site O&M inspections once every five years to ensure correct operation of controls. - maintains controls depending on agreement	- IDs locations for off-site - prepares plans - secures property rights - constructs project - maintains operating condition, pays for hired contractor to perform maintenance, pays Municipality a maintenance fee, or has no maintenance obligation and Municipality performs maintenance.

4) Payment In-Lieu (private/public) – developer pays fee to cover cost of municipality implementing and maintaining off-site project in the public right-of-way or on municipal property.

Municipality Role	Developer Role
- IDs priority areas and potential projects, - sets payment in lieu rate - assesses and collects fee from developer - plans off-site project - constructs off-site project - maintains off-site project - administers In-Lieu program - conducts on-site O&M inspections once every five years to ensure correct operation of controls	- pays in-lieu fee for construction cost and pro-rated maintenance cost for 20 years or agreed upon term.

METHODOLOGICAL FRAMEWORK FOR FEE-IN-LIEU PROGRAMS[8]

This section proposes a methodological framework to assist municipalities in establishing fee-in-lieu programs tailored to their specific watershed requirements and community needs. Many of the considerations of establishing such a program would also be applicable to the AC Option 3 above (Regional Project). Payment In-lieu fees programs allow a municipality to fund 1:1 mitigation or to aggregate mitigation fees for larger off-site projects. Additionally, an established fee-in-lieu rate allows developers to estimate their off-site treatment/retention costs in advance and make informed choices regarding whether to seek AC options or implement full on-site compliance requirements.

The methodological framework for fee-in-lieu programs consists of a series of program framing questions to assist municipalities in building their own program framework tailored to their watershed, community needs, administrative capacity, and benefit-risk tradeoffs:

- Demand for alternative compliance
    - Are developers or on-site property owners predicted to have a high, medium or low demand for off-site compliance?
    - Is demand expected to be consistent or sporadic?
- Project scale
    - Are off-site treatment/retention areas predicted to be large, medium or small?
    - Will off-site projects be 1:1 or aggregate mitigation (mitigation of off-site treatment/retention areas from more than one regulated project)?
- Program scale
    - Will AC be implemented under site-specific conditions, or under a watershed planning approach such as a Green Infrastructure Master Plan?
    - Will AC be allowed only in specific areas of the municipality such as: a downtown area or Priority Development Area?
- Land availability and constraints

[9] This section, modified for the SF Bay Area use, is derived from Violetta Pristel's California State University, Monterey Bay graduate thesis entitled, ***An Alternative Compliance Framework for Stormwater Management in the Central Coast Region***. Submitted in the fall of 2013, this document provides a thorough examination of the benefits and risks of various AC strategies and uses the City of Watsonville's AC Program as a case study.

    - Will off-site projects be located on public and/or private property?
    - What are the constraints to land availability (e.g., low soil infiltration rates, steep slopes, sensitive habitat, willing land owners, and community support)?
- Operations and Maintenance (O&M)
    - Will the municipality or private property owners be responsible for long term O&M?
    - If private property owners/privately contracted landscape maintenance crews are allowed to maintain GI/LID facilities in the public right of way:
        - What are the liabilities?
        - How will municipality ensure proper O&M?
        - Will landscape management training/qualifications be required?
        - Who replaces the facility if it is damaged by third parties unable to pay? (For example, a crash in the roadway by an uninsured motorist.)
- Jurisdiction
    - Will off-site projects be located solely within a municipality's jurisdictional boundary or will projects outside the jurisdiction also be considered?
    - Will the municipality form partnerships or agreements with other municipalities, counties, or agencies?
    - Is there a municipal preference (when possible) for GI/LID measures to be located on the frontage of the project invoking AC? *This could provide for easier and lower cost maintenance for the developer since their landscape maintenance contractor may be at the site anyway maintaining landscaping on the private property or frontage, such as street trees.*
- Mitigation type
    - What types of GI/LID practices will be allowed at off-site projects?
    - What are the design requirements for the GI/LID facilities?
    - What are the operation, maintenance, and monitoring requirements of the GI/LID facilities?
    - Will the trading currency be square feet of treatment area, runoff reduction volume, or another unit of measure?
    - Is C.3.d sizing possible at the on-site location but not at the off-site location and if so what will the muni report as the justification to the Water Board for infeasibility? *The MRP 2.0 Tentative Order currently only allows for a region-wide analysis and rationale for why C.3.d sizing isn't possible at some GI locations. If a muni goes ahead with an AC program and the region-wide rationale hasn't yet been developed, then that may restrict the muni's AC program. Additionally that region-wide rationale may not consider a unique situation in a muni's area.*
    - What quantitative analysis will be used to evaluate off-site compliance?
- Prioritization criteria
    - What criteria will be used to prioritize off-site locations, to maximize benefits and minimize risks?
    - How will the criteria be weighted?

METHODOLOGY

In establishing a payment in-lieu AC program, the fee structure is an important consideration. Municipalities may choose to identify an inventory of potential off-site projects and base their fee

rate on estimated/average costs of these projects or may choose to base their fee rate on the cost of a typical GI/LID implementation scenario. Tied to the fee structure is the "trading currency", which for MRP permittees would likely be expressed as "$/square foot of impervious surface area treated". This approach is simpler than using a volume-based trading currency because 'area treated' is easily calculated by all parties and is consistent with the Tentative Order MRP 2.0's GI tracking and reporting requirements (Provision C.3.j.iv). When a regulated project requires off-site compliance, the in-lieu fee is calculated by multiplying the flat fee rate ($/sq. ft. of impervious area treated) by the off-site area of impervious surface treated.

Additional questions to be answered by a municipality interested in using a payment in-lieu AC option include:

- Fee calculation
    - Will in-lieu fees be estimated using a pre-determined rate or will fee payment be determined on a project-by-project basis?
    - Will a fee rate be based on a pre-established portfolio of off-site mitigation projects or 'typical' GI/LID life-cycle costs (including installation and O&M)?
    - Can in-lieu fees pay for pre-existing municipal projects or does the off-site public project have to be built after the AC agreement has been approved?
    - Can maintenance costs legally be included in an in-lieu fee?
    - What level of detail (and cost) will be required in the nexus study typically developed in order to add an in-lieu fee to a municipal master fee schedule?
- Fee schedule
    - Will the fee schedule be a one-time payment (representing the cost of construction and O&M in perpetuity) or an annual fee paid by the on-site property owner (amortized over the project's lifespan)?

The fee amount should ideally reflect the life cycle costs of a typical off-site project or the average life cycle costs of an inventory of potential projects. *Note: in-lieu fees must meet the requirements of the California Mitigation Fee Act* Cost categories for fee-in-lieu programs will depend on program characteristics and may include:

- Design and engineering costs (e.g., grading plans, installation plan)
- Construction costs (e.g., materials, equipment usage, labor)
- Operation and maintenance costs (e.g., periodic (at least 20 years) maintenance tasks such as pruning, weeding, sediment removal, trash removal, mulch replenishment, and replacement costs).
- Land costs (e.g., easement purchases, opportunity costs (the foregone opportunity to use the land for another purpose).
- Overhead costs (e.g., program administration, site identification, project management, site inspections, building and administrative overhead, equipment acquisition and maintenance, interest on loans, accounting fees, insurances, and taxes)
- Out-of-Kind allowances, where AC fee collections can be applied to other types of GI, such as creek and wetland restoration.

RECOMMENDATIONS FOR AC PROGRAMS

Ideally, AC programs will maximize environmental and economic benefits and minimize compliance and financial risks. Design challenges include optimizing flexibility and reducing uncertainty and transaction costs. To overcome these challenges municipalities should identify off-site locations prior to demand, develop prioritization and weighting criteria for off-site projects, and build safeguards into programs to reduce environmental and socioeconomic risks. Further research at the regional level is recommended to assist municipalities develop their fee- in-lieu programs to ensure full recoup of project costs.

Plan Ahead: The primary recommendation is for municipalities to identify potential off-site locations prior to AC demand. Municipalities can get ahead of AC demand and maximize benefits by using available tools (such as Green Plan-IT) to conduct GI planning based on feasibility assessments, application of prioritization criteria, and hydrologic modeling tools. Planning ahead is vital for in-lieu fee estimation and to avoid the scramble to implement off-site projects within the allocated time period.

Prioritization and Weighting Criteria: Prioritization and weighting criteria for off-site projects on publically-owned land can streamline AC program administration, minimize transaction costs and uncertainty, and maximize cost-benefits. AC program transaction costs may be reduced using public ROWs due to the potential for reducing off-site project maintenance costs (e.g., municipalities already maintain ROWs and there is potential to involve neighboring private owners in maintenance tasks). Also public ROWs may be the ideal size for anticipated AC demands (i.e., where small off-site mitigation requirement are predicted). The hierarchy of mitigation project siting will depend on many factors including AC demand, availability of sites, and watershed priorities. Municipalities should tailor prioritization criteria to environmental and community needs using a general siting preference hierarchy:

1) GI/LID projects in public right-of-way (ROW) fronting the regulated project and also meeting other prioritization criteria;

2) GI/LID projects in public ROWs within the watershed & jurisdiction;

3) GI/LID projects on other public land within the watershed & jurisdiction;

4) GI/LID projects on private property within the watershed & jurisdiction;

5) GI/LID projects on public land within the watershed but outside the jurisdiction;

6) Out-of-kind[9] projects on public land, inside or outside the jurisdiction.

[9] Out-of-Kind projects are other types of green infrastructure that provide environmental services, such as creek or wetland restoration.

Build in Safety Factors: Safety factors should be built into local governmental AC programs to further reduce environmental and socioeconomic risks. These may include:

- more stringent requirements (e.g., higher trading ratios) for on-site treatment in sensitive area locations to avoid 'hot spot' development;
- development of trading ratios to assure net environmental benefits;
- set fee rates to cover all anticipated life-cycle costs and only allow mitigation types with known costs;
- one-time in-lieu fee payments rather than using annual fee collections, which may be more difficult and expensive to manage, especially when property ownership changes

Conduct More Research Regionally: Further research and analyses can assist municipalities with their AC programs. Information and research gaps identified include:

- examples of legal agreements, MOUs, etc. between AC parties (e.g., municipality and developer, municipality and other municipalities);
- better cost information broken out into planning, design, construction, and operation and maintenance to improve in-lieu fee estimation;
- better cost data for different AC scenarios (e.g., for new development, redevelopment, different soils);
- better understanding of methodologies to determine cost-benefits and trading ratios for out-of kind mitigation;
- better understanding of how to assess cumulative risks of unmitigated runoff at parcel scale and watershed scale.