An Infiltration Model for Enhanced Stormwater Management

City of Santa Fe, New Mexico

River, Watershed, and Trails Division

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An Infiltration Model for Enhanced Stormwater Management
A Preliminary Report for the City of Santa Fe, New Mexico

This preliminary report requested by a resolution of the governing body of the City of Santa Fe on March 31, 2016 (Res. #2016-25) is charged with researching, evaluating, and reporting on the city's stormwater policies. This report is also responsible for making policy recommendations with respect to the use of green infrastructure (GI) strategies and low-impact development (LID) techniques for city parks, public works projects, and other public places. In addition, as per the resolution, this report must address stormwater within the context of the furthering of the City of Santa Fe's "environmental and sustainability policies and goals."

In an average year, an estimated 730 million gallons of precipitation fall on Santa Fe's roofs. Another 435 million gallons of water land on our streets, roads, and parking surfaces. In all, over one billion gallons (3,578 acre feet) of water fall on our city's impervious surfaces in various forms of rain and snow. This significant quantity represents a resource that is just beginning to be tapped. It is the intent of this report to describe the transition toward utilizing this mostly ignored resource.

A Model for Enhanced Stormwater Management
Previous Approaches

Post-WWII development in most US cities treated stormwater as a nuisance that should be diverted as quickly as possible from the built environment. The approach dramatically changed the natural hydrologic cycle by rendering vast areas of the built environment impervious to stormwater, increasing pollutants, and damaging downstream watersheds and their associated river systems. Over time and in light of increasingly rigorous federal environmental regulations, many municipalities have looked for better ways to manage stormwater.

Since the 1990's, the City of Santa Fe replaced the diversion model of stormwater-management for private development, with a detention/retention ponding model to mitigate offsite erosion concerns. After years of success using this approach, research shows that this model of stormwater management can be further improved by infiltration.

The New Model

Santa Fe will look different in 20 years because of the stormwater-management methods that we choose today. For Santa Fe the choice is between allowing stormwater to infiltrate safely into the soil or allow soil to continue to erode.

In contrast, the retention/detention approach tends to hold back stormwater in wider and deeper ponding structures. The new approach reserves and infiltrates water instead of losing it up to evaporation and is another effective approach to reducing downstream pollutants. For these reasons, the infiltration model is generally recommended as the preferred go-to approach for managing stormwater.

Infiltration is accomplished by using GI strategies and LID techniques. Strategies associated with GI include green streets, infiltration buffers, parks, river-corridor improvements, and wetlands/bosques. Techniques associated with LID include rain gardens, infiltration basins, bio-swales, curb cuts, and

porous-material wicks. With respect to interdepartmental cooperation, GI will often require multiple city departments, while LID will likely involve fewer departments and divisions.

The Benefits of Infiltration

Using GI strategies on large-scale projects and LID techniques on a smaller scale, stormwater will infiltrate absorbent soils for the benefit of the local community as well as downstream water users. Like previous approaches to stormwater management, the infiltration model diverts stormwater from structures, and also provides the following ecological benefit:

- Reduces water pollutants in surface water, groundwater, and arroyo systems
- Establishes and supports native vegetation
- Recharges aquifers
- Builds soil and slows erosion
- Creates shade and wind protection
- Increases biodiversity
- Supports wildlife
- Reduces ecological harm caused by development
- Provides positive outdoor experiences for the community

Although it is difficult to estimate an economic value to preservation and conservation of the Santa Fe River, the benefits of stormwater infiltration to the city's wellbeing are measureable. Since the City of Santa Fe was founded on the Santa Fe River, it seems that the traditional connections among human settlement, river, and watershed are better respected by an approach to stormwater that conserves water, produces vegetation, and walks lightly on the earth.

From an economic sustainability standpoint, a successful stormwater-management program also has real benefits. When water quality is high, this results in lower water production costs. In the city's case, this would be largely effluent production from the wastewater treatment plant. In addition, each year the Public Works Department spends millions of dollars protecting city-owned infrastructure from damaging storm flows. Our streets and maintenance departments are regularly cleaning out excessive sediment flows and erosion that damage our streets, river, and arroyos after larger storm events. Efforts that slow these flows and trap sediments will greatly reduce overall erosion-project costs. Also, local employment is created by all stormwater projects, and with these jobs unskilled workers gain skills that can make them better wage earners in the future, local small businesses are often hired, and gross-receipts tax revenues go up. Further, visitors tend to report positively about their experiences of places with enjoyable river walks, street trees, and attractive vegetation, so the aesthetic results of effective stormwater management would likely help broaden the tourism sector of our local economy. Meanwhile, these same benefits improve the local quality of life, and this makes Santa Fe an outstanding place to live, work, and raise a family.

Finally, it is critical to report on another benefit of the stormwater infiltration model: compliance with new Environmental Protection Agency (EPA) rules and State of New Mexico requirements from both the Office of the State Engineer and the New Mexico Environment Department's Water Quality Division. As water-quality and water-access issues continue to represent high priorities for federal and state regulators, municipalities must evolve or face fines, costly health issues, and intensified undesirable

scrutiny not only from governmental agencies, but also from community groups, neighborhood organizations, and the media.

Success at the City

- The Land Use Department began to move away from the straight diversion method decades ago and has been specifying ponding and retention/detention on new construction in private developments ever since. The department has been quick to encourage concepts like porous-stone wicking and on-contour swaling as alternatives to the kind of deep-and-wide ponding that often leads to significant evaporation and drowning of plant material.
- The Public Works Division and the Parks Department have designed and constructed many cutting edge projects including trail and river-restoration projects in the Santa Fe River and contributing arroyos including: Railyard Park; Parque del Rio; SWAN Park; Alameda Rain Gardens; Arroyo and River improvements; and innovative design plans soon to be built at Salvador Perez Park and Acequia Trail Underpass Project.
- The Stormwater Division has been successful at monitoring stormwater, BMPs, and SWPPP from the pre-development stage of any project to the substantially complete phase. Essentially, the infiltration approach expands the concepts that the Stormwater Division has been applying for many years. From the application of best-management practices (BMPs) to Stormwater Pollution Prevent Plans (SWPPPs) and associated compliance, the Stormwater Division has a long history of successful TMDL prevention.
- A project built collaboratively by the Streets and Drainage Maintenance Department, Stormwater Division, and Water Conservation Department received an EPA People's Choice Award (2014) for a recent example of LID at the intersection of Saint Michael's Drive and Calle Lorca. There, a curb cut diverts stormwater into a median where a significant quantity of stormwater is absorbed during every precipitation event.
- The governing body and the people of Santa Fe have a long history of supporting the river. Often partnering with non-profit organizations, like Youthworks and the Santa Fe Watershed Association, neighborhood groups, and enthusiastic citizens, events like the annual Fishing Derby and Love Your River Day are becoming lasting traditions for a community whose lifeblood has always been its river and watershed.
- The all-volunteer Santa Fe River Commission is also busy on a number of stormwater-related fronts. The commission currently is studying how salt on roads affects riparian vegetation and water quality, which includes a salt-tolerant plant list for contractors. It is also helping to develop an outreach effort accompanied by educational materials about rain gardens, an increasingly popular LID technique. They have recently received a small grant and will continue to look for other opportunities to work with nonprofit partners and the city.
- This infiltration approach to stormwater dovetails effectively with Santa Fe's goal of achieving carbon neutrality by 2040, by increasing permeable surfaces in public spaces, reducing pollutant loads in the Santa Fe River and the city's aquifers, encouraging water conservation, creating ecological resilience, and reducing carbon emissions (by reducing water pumping and irrigation needs).

Navigating the Evolving Regulatory Environment

Recent changes in the regulatory framework are pointing municipalities toward addressing water-pollutant levels in watersheds. Specifically the EPA's Municipal Separated Storm Sewer Systems (MS4) permit may soon require:

- Regulations implemented at the land-use development stage
- Strict limits on quantity and quality of stormwater discharge
- Rigorous monitoring of stormwater discharges to ensure water quality
- GI and LID to control sediment, velocity, and pollution
- Watershed based permitting

To date, almost every urban reach of the Santa Fe River has been listed as an impaired waterway under Section 303(d) of the federal Water Quality Act, and this impaired rating is attributable primarily to stormwater flows which wash pollutants from roadways, parking lots, parks, and other sources into our river and arroyos. This can result in the adoption of Total Maximum Daily Loads (TMDLs) by the New Mexico Environment Department and the New Mexico Water Quality Control Commission and can trigger more restrictive permit requirements.

The MS4 permit is likely the mechanism for achieving reductions in TMDL contaminants. Water samples will be collected after storm events to identify stormwater pollutants entering our river and arroyo systems. The City of Santa Fe is currently collaborating on the new MS4 permit requirements with Santa Fe County and NMDOT and plans to continue to do so.

Drainage Plans, GIS Mapping and Data Collection

In 1993, the Albuquerque engineering firm Bohannan and Huston, Inc. produced a detailed drainage management plan for the City of Santa Fe. After 23 years, much of the hydrological analysis is still useful with respect to mapping and data collection, but a significant portion is outdated given the growth of the City of Santa Fe since then. The current GIS mapping system with respect to stormwater is in need of updating and expansion. In 2005 Smith Engineering identified some drain inlets and outfalls in downtown area of the city. However, an increased and better data collection is needed for drainage structures, drain boxes, inlets, out falls, catch basins, curb cuts, culverts, and drainpipes that exist in the field. The city has just completed an update to the 2012 arroyo assessment/study with the Santa Fe Watershed Association, which identified and prioritized high-risk erosion problems within our arroyo and river systems. This data is currently being entered into the city's GIS mapping system. In addition, the GIS department has compiled extensive data on major arroyo, terrain, and Federal Emergency Management Agency (FEMA) maps.

An updated look at stormwater management in coordination with new technologies could significantly improve drainage project planning. Many projects that the city undertakes involve several divisions and departments. This scenario will naturally create potential for duplicative efforts. By creating a clear stormwater plan that includes pre- and post- development analysis, many of these efforts can be streamlined and identified, thus reducing duplication. It would be essential to bring the GIS department in at the beginning of such a plan to allow for good documentation and to avoid future complications as systems change.

Funding and True Costs

Dollars invested upstream often mean downstream benefits. A true-cost accounting of watershed protection would need to measure all of the costs and effects of both models. The economic benefits of investing in stormwater harvesting are as hard to precisely quantify, as they are difficult to deny. With the completion of the first phase of the Santa Fe River Trail, efforts to bring back the Santa Fe River over the last few decades have paid off.

Currently, some City of Santa Fe stormwater projects are funded through Capital Improvement Projects (CIP) funds, and occasional grants. The city is looking at how the stormwater fee is structured and what it is used for. Funding mechanisms have varied among bonds, CIP funds, taxes, impact fees / districts, and stormwater fees. Over the last several decades, one of the chief sources of funding for stormwater projects has been revenue from the issuance of municipal bonds.

During the research phase of the production of this report, the funding methodologies of many different urban areas were considered including Bend, OR, Los Angeles, CA, San Diego, CA, San Francisco, CA, Tucson, AZ, and Washington, D.C. Some municipalities, such as Bend, San Francisco, and Los Angeles have generated revenue with mechanisms in which stormwater fees are related to impervious surfaces associated with development. Incentives and credits are being added for GI across the country.

In Washington, D.C., properties generate Stormwater Retention Credits (SRCs) for the application of voluntary GI strategies. Property owners trade SRCs in a market with developers who use them to meet regulatory requirements for their projects. This revenue incentivizes the installation of GI and LID as it prevents surface-water pollution.

When the benefits of the infiltration model are factored into budgetary analyses and true-cost accounting is applied to fiscal analyses, GI and LID are cost competitive compared to the diversion and retention approaches. Recent work by the EPA highlights these findings reported by cities like Los Angeles, CA and Tucson, AZ.

Across the West, it appears that cities have more stormwater work than they can afford. In this context, most cities use a cooperative, inter-agency approach to meeting regulatory, design, construction, planning, education, and inspection needs. All interviewed cities agreed that regulatory agencies were more lenient with respect to imposing fines as long as reasonable plans are in place and implementation is in progress.

Proposed Arroyo and Flood Control District

The resolution behind this report also directed staff to facilitate collaboration among city departments to consider the creation of an Arroyo and Flood Control District that would work in cooperation with Santa Fe County. Such an authority would have greater jurisdictional abilities as it pertains to holding water. This district would work with private property owners to solve erosion and flooding problems not only for problems that threaten municipal infrastructure, but also for those that may not. Given such an authority, it is possible that more cooperative financial arrangements would be created in which private-public partnerships can succeed, especially within the evolving regulatory environment. Creating a flood control district may not require an official agreement with Santa Fe County. During the legal department's investigation of this question, it was discovered that the city could create its own district independent of the county. According to New Mexico statute, municipalities have an opportunity to levy

taxes for flood control purposes. Funds associated with this effort could be used for projects within or outside the municipal boundary. By adopting this section NMSA 3-41-1 to 3-41-5, 1978 into our code the city could consider a mill levy for stormwater of up to five dollars per $1,000. (For details about the flexibility in the tax code, please see 3-41-1.)

Creating New Guidelines and Benchmarks

According to a recent internal survey of city employees who work with stormwater or in related departments, cooperation among departments could be improved, but this was not seen as the largest barrier to the infiltration model, see appendix A. A much larger percentage of respondents said a lack of education and training was the number-one barrier to the use of GI strategies and LID techniques.

Making project managers aware of the potential opportunity for infiltration and how to site such structures would greatly benefit the city. When project managers ask for GI and LID techniques to be included in the programmatic planning, it is more likely that infiltration will be incorporated by consultants and design professionals. Educational tools including training sessions, web-based videos, and design manuals should be used and if necessary created. By making these learning tools available, we would increase the overall education of our management staff. A city-created design manual or a reference list to existing links on the web would also increase staff's knowledge base. Additionally, contracts with local nonprofit organizations, city-sanctioned committees, and city staff could work in cooperation to produce these relevant materials and keep the overall costs down.

Also shown in appendix A, installation and maintenance costs were significant concerns for city-staff survey respondents. No matter what training media are used, given a high rate of turnover for seasonal workers, it is clear that regular education and training would be a benefit at this level too. Requiring site-specific maintenance instructions from engineering and landscape-architecture consultants and/or firms for city projects would be beneficial and inexpensive. Instructional methods also include training sessions, videos, and manuals that provide better training. The videos could be made available on the city's website, so that anyone could download them from the field.

The City of Santa Fe is fortunate to have various nonprofit partners working to improve our quality of life and environment. Our nonprofit partners work with staff to organize cleanup efforts across the city. Similarly, the City of Tucson, AZ recently joined efforts with the nonprofit Watershed Management Group to create "monsoon squads" that clean out LID structures such as rain gardens, energy dissipaters, drain boxes etc. These volunteers coordinate and work with staff to clean out structures after larger storm events and on a regular schedule throughout the year. The City of Santa Fe with our non-profit partner the Santa Fe Watershed Association has had great success with the Adopt-the-River program with at least three cleanup days per year and hundreds of volunteers coming out to clean our river.

Santa Fe Beautiful and the Santa Fe Watershed Association have had good success with cleanup days throughout the city. Expansions of these efforts into the Adopt-an-Arroyo program would greatly increase our ability to maintain these GI and LID structures. Aligning cleanups with our recently updated Arroyo Assessment would maximize our efforts.

Internally it is clear that private-public partnerships and cooperative efforts that include the work of a variety of nonprofit organizations can be very successful. These joint efforts strengthen our community, and the organizations themselves often have significant capacities to write successful grant proposals.

City dollars are stretched by these partnerships, especially when it comes to public education, environmental improvements, and increased community spirit.

With respect to city projects, there is no standard set of guidelines or performance goals that would encourage the design and installation of GI and LID. In order to encourage the use of and streamline the design process for an infiltration model, specific stormwater-management guidelines and protocols should be created. Although it is not the intent to complete these guidelines in this report, appendix B provides a draft for consideration.

Many cities include river and riparian-area goals as well as water-quality benchmarks in their sustainability plans. These performance goals and benchmarks are helpful in the context of building public support. The Sustainable Santa Fe Commission's 2040 plan, will seek to move the city toward a percentage increase of overall infiltration and a percentage decrease in sedimentation & TMDLs. This will be done in cooperation with the efforts of the Santa Fe River Commission and the Santa Fe Water Conservation Committee. Planning efforts are in place and will be presented as part of the 2040 plans.

Conclusions

For Santa Fe, like any other city, what happens next is a question of priorities. In the current budgetary environment, one can imagine stormwater being categorized as a less-than-essential service. Over the course of time, however, the land-use decisions of today will seem essential to future generations. If the Santa Fe River and its contributing arroyos were to continue to become increasingly eroded by excessive runoff, the cost of doing nothing now would be very real later. With every large storm, delayed erosion-control projects become more expensive due to the additional channelization, incision, and sedimentation associated with major precipitation-events.

Not only will the degradation of our watershed worsen if we continue to rely only on conventional engineering, but the benefits of stormwater infiltration will also be lost. Conventional engineering solutions will be among the tools in our community's multifaceted stormwater-management toolbox, but it is time to encourage a stormwater-infiltration model whenever possible.

The recommendations attached provide a starting point for ensuring that the adoption of an infiltration model is successful. Certainly, they are not the only recommendations that could be made, and obviously adopting all of the recommendations would not necessary in order to make a successful transition to the consistent use of GI strategies and LID techniques. But the city would clearly benefit by the concerted effort described in this preliminary report.

Recommendations

Recommendation 1: Update the GIS Stormwater Infrastructure Map by contracting with a surveying company to GPS-indicate stormwater features (estimated budget $150,000 - $250,000). Use this map for interdepartmental cooperation and to collaborate with other agencies to manage water quality through a combination of conventional and green infrastructure strategies as they relate to permit requirements.

Recommendation 2: Funding opportunities should be explored through the following:

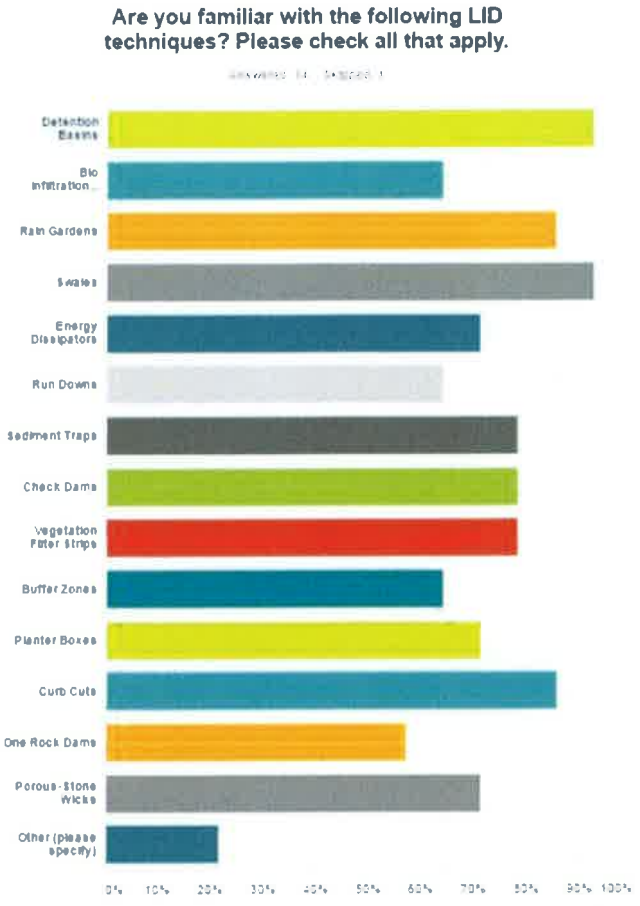
a. Arroyo and watershed protection and improvement bond initiatives should be considered within the next two years.
b. Appropriations of the current stormwater fee should be directed to stormwater and watershed programs to meet our permit requirements, sampling and water quality testing, assessments, educational and outreach materials, BMPs and CIP projects
c. Further research on fees and incentives that could be assessed on new developments that take into account the effect of impervious surfaces on the watershed. This could include a stormwater credit system.
d. Grant-writing consultants and/or grant-writing training for staff should also be considered, especially as larger grants for water infrastructure are becoming more likely after recently publicized water-systems failures nationwide. In an effort to aggressively pursue grants, college interns should be assigned to research, develop, and obtain grant monies for these efforts.
e. Consider a mill levy for stormwater. (For details about the flexibility in the tax code, please see 3-41-1.) Significant property taxes could be levied for flood control purposes as per NMSA 3-41-1, 1978, and should be considered.
f. Set-up a separate research committee and/or commission to evaluate the pros and cons of a Regional Flood Authority.
g. Create an on-call contract for minor drainage improvements and repair-projects with specific skill sets and experience to work within the river, arroyo, and drainage ways.

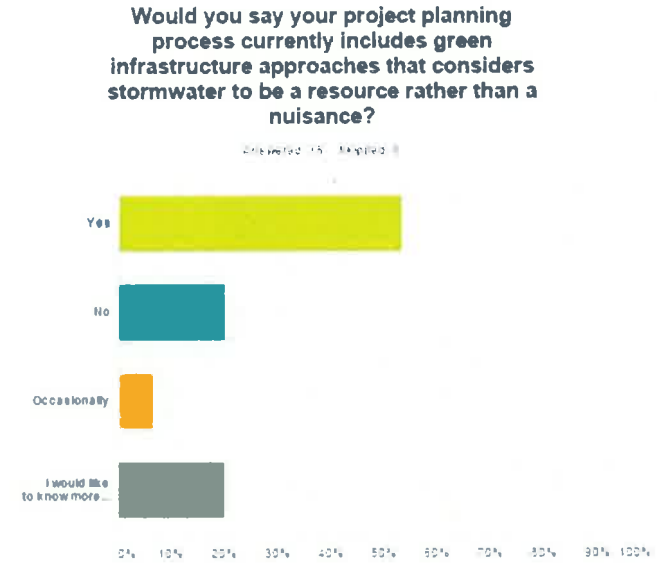
Recommendation 3: Encourage the use of and streamline the design process for an infiltration model, specific stormwater-management goals should be created by:

a. Creating Watershed Protection Guidelines see appendix B, the purpose of these guidelines would be to further the concepts and intent for green infrastructure and low-impact-development is to slow, filter, infiltrate, and eventually discharge stormwater.
b. Ensuring that periodic training sessions, manuals, and other instructions cover the long-term financial benefits of the infiltration model. This big-picture context would also serve to develop interdepartmental cooperation by describing infiltration as a common goal.
c. Providing potential educational tools including training sessions, web-based videos, and how-to manuals.
d. Requiring site-specific maintenance instructions from engineering and landscape-architecture consultants and/or firms.
e. In order to evaluate, improve, and encourage projects that use the infiltration model, benchmarks should be developed.

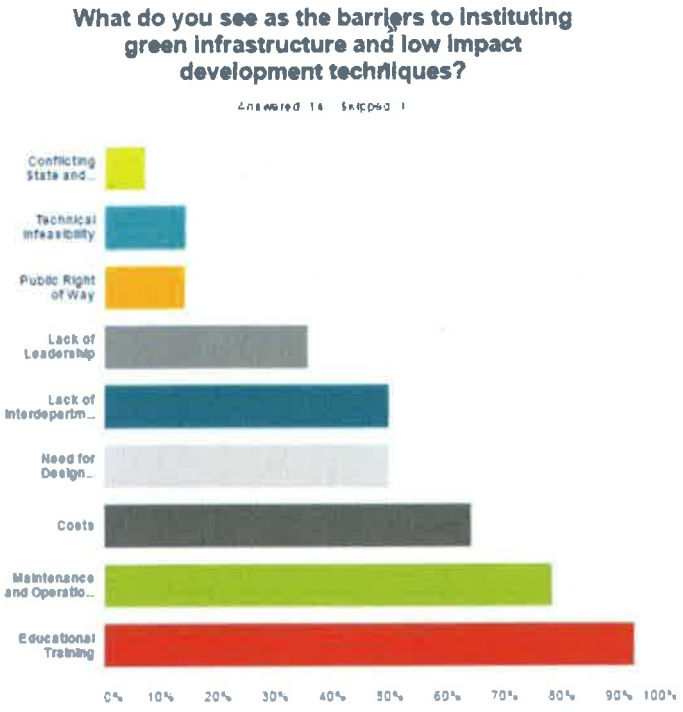
Recommendation 4: Amend the city's terrain management code to include a greater emphasis on infiltration and to stay up-to-date with regulatory changes. Staff shall provide suggested revisions.

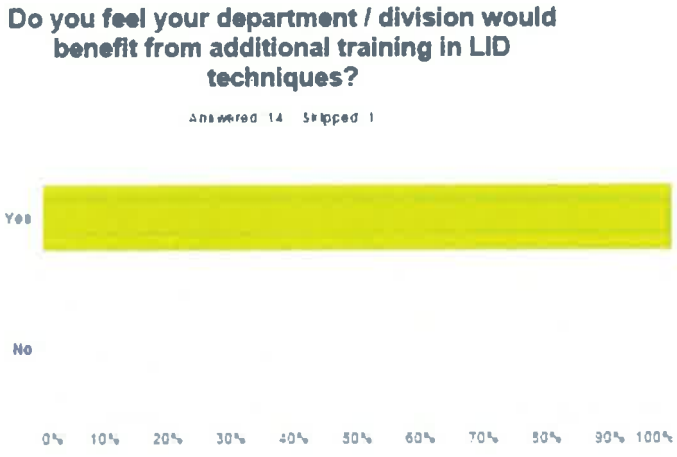
Appendix A


Are you familiar with the following LID techniques? Please check all that apply.
Detention Basins
Bio Infiltration...
Rain Gardens
Swales
Energy Dissipators
Run Downs
Sediment Traps
Check Dams
Vegetation Filter Strips
Buffer Zones
Planter Boxes
Curb Cuts
One Rock Dams
Porous-Stone Wicks
Other (please specify)
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%


Would you say your project planning process currently includes green infrastructure approaches that considers stormwater to be a resource rather than a nuisance?
Yes
No
Occasionally
I would like to know more...
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Appendix A


What do you see as the barriers to instituting green infrastructure and low impact development techniques?
Answered 14 Skipped 1
Conflicting State and...
Technical Infeasibility
Public Right of Way
Lack of Leadership
Lack of Interdepartm...
Need for Design...
Costs
Maintenance and Operatio...
Educational Training
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%


Do you feel your department / division would benefit from additional training in LID techniques?
Answered 14 Skipped 1
Yes
No
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

APPENDIX B
Watershed Protection Guidelines

Purpose:
The purpose of these guidelines is to incorporate green infrastructure (GI) and low impact development (LID) techniques into the City of Santa Fe's public projects wherever possible. The guidelines apply to new construction, renovation, and refurbishment of all publicly funded projects: parks, facilities, roadway, drainage projects, stormwater management projects, public rights-of-way, trails, sidewalks, parking lots, and medians. The guidelines are intended to encourage infiltration strategies and techniques that improve water quality by reducing flow volumes, runoff velocities, and the turbidity caused by erosion. They are also formulated to ensure that GI and LID practices are considered early in the design process, and that they are built in an effective manner that minimizes maintenance.

The Basic Principle: The design concepts and intent of GI and LID to slow, filter, infiltrate, and eventually discharge stormwater.

Watershed Protection Goals: Where possible, these guidelines should be required for all public projects.

1) Runoff from impermeable surfaces should be directed through LID techniques before it enters storm drains or natural drainage ways.
2) The sizing of LID techniques can be determined by the application of runoff coefficients to the following basic formula:

Runoff Volume (gal) = Runoff Depth (in) X Collection Area (sq.ft.) X 0.623 X Runoff Co-Efficient

3) All basins are required to have a percolation test to determine infiltration rates before and after construction. Infiltration basins shall be designed to drain within 24 hours of the latest rainfall event. Soil type should be considered. Ponding or impoundments may be subject to the Office of the New Mexico State Engineer water-law requirements.
4) Basins shall accept up to a maximum of 12" of stormwater (8" preferred) when plant material is present to avoid damage and root rot.
5) The bottom of infiltration basins should be loosened to a minimum depth of 12" and if necessary mixed with sand, mulch, compost, or other amendments to increase percolation.
6) Stormwater should be directed to provide supplemental irrigation for plant establishment.

Procedures
Projects shall include watershed protection goals in the scope of work. The project manager leading the project team for the city shall document that at each stage of project development, 30%, 60% and 90%, the following protocols have been considered by the engineer, landscape architect, or other qualified consulting firm performing the drainage design:

Planning Program:

At 30% submittal, the consultants shall include:

- ☐ Determination of the size of runoff from a design storm.
- ☐ Identification of infiltration methods that are proposed;
- ☐ Conceptual grading to maximize water-quality improvement;
- ☐ Mapping of existing drain inlets, outfalls, catch basins, piping, curb cuts, and utilities (underground and aboveground);
- ☐ Conceptual grading should seek to minimize conflicts between structures, access ways, utilities and LID techniques;
- ☐ Conceptual details for water ingress and egress from infiltration structures;
- ☐ Landscape concepts showing vegetation to maximize utilization of stormwater runoff.
- ☐ Public projects shall consider the requirements of private developments as listed in Article 14-8.2, Watershed Protection Guidelines, Landscape Design Guidelines for Medians and Planting Strips, and Landscape Irrigation Design Standards as they relate to stormwater.
- ☐ All work must conform to local, state, federal, and tribal laws where applicable permit requirements or codes exist.

At 60% submittal, the consultants shall include:

- ☐ Detailed plans and cross sections of drainage structures indicating the extent and depth of infiltration areas, slopes, and areas of stormwater flow and overflow;
- ☐ Grading and drainage plan;
- ☐ Preliminary planting plan;
- ☐ Utility plan created in coordination with utility representatives showing proposed modifications.

At 90% submittal, the consultants shall provide construction documents:

- ☐ These documents should be detailed and descriptive enough to allow contractors to build any drainage or stormwater structures;
- ☐ Final construction notes shall include estimated final water catchment and infiltration numbers.
- ☐ All proposed drainage structures including drain boxes, inlets, out falls, catch basins, culverts, drainage swales, and piping shall be indicated for construction purposes.
- ☐ The project manager shall be responsible for the documentation of review-team comments to ensure compliance with watershed performance goals. Final sign-off on stormwater compliance shall be documented on the cover page of all public projects by the signature of the River and Watershed Coordinator.

Projects that do not apply:

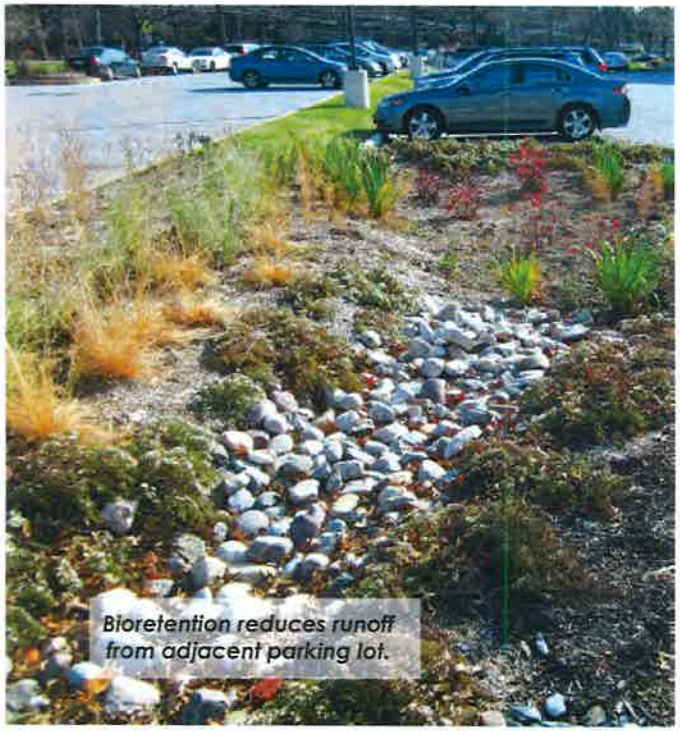
- Pavement maintenance activities such as top-layer of asphalt grinding and repaving within the existing footprint;
- Filling pot holes;
- Interior remodeling projects;
- Utility repair work, trenching, and patching.

Eligible Green Infrastructure (GI)

Stormwater green infrastructure helps protect the District's water-bodies by reducing stormwater runoff. Common GI includes:

Green Roofs
-
Permeable Pavement
-
Bioretention
-
Rainwater Harvesting

DDOE's Stormwater Management Guidebook includes design standards and other technical specifications for GI, referred to as stormwater retention Best Management Practices.
See *ddoe.dc.gov/swregs*



Bioretention reduces runoff from adjacent parking lot.

APPENDIX C

DDOE is hard at work to restore full use of the Anacostia and Potomac Rivers and Rock Creek to District residents, visitors, and businesses. The SRC trading and RiverSmart Rewards programs are important parts of that effort.

Great Egret perches on driftwood in the Anacostia River

SRC Trading
Website: *ddoe.dc.gov/src*
Email: *src.trading@dc.gov*

RiverSmart Rewards
Web: *ddoe.dc.gov/riversmartrewards*
Email: *riversmart.rewards@dc.gov*

1200 First Street NE, 5th Floor
Washington, DC 20002
Phone: 202-535-2600

FOR INFORMATION, CALL;
Para obtener información llame al;
Pour de plus amples renseignements, veuillez appeler le;
ለመረጃ ይህንን ቁጥር ይደውሉ ; 자세한 정보는 (202) 535-1934 로 문의하십시오 ; *Để biết thêm thông tin, vui lòng gọi;* 詳情請致電 (202) 535-1934.

Stormwater Retention Credit Trading & RiverSmart Rewards

Reduce Runoff | Make Money Save The River

DISTRICT DEPARTMENT OF THE ENVIRONMENT
green forward

Making the District's rivers and streams healthier has never been more rewarding. By installing rain gardens, green roofs, and other stormwater retention green infrastructure, you can earn money by selling Stormwater Retention Credits (SRCs) and save money on your water bill.

You Can Generate and Sell SRCs

- Sell your SRCs in an open market to regulated development sites that can buy and use SRCs to meet their retention requirements.
- Use DDOE's SRC database, public registry, template sales contract, and other tools to make this easy.

You Can Earn a RiverSmart Rewards Discount

- Earn a discount of up to 55% off DDOE's Stormwater Fee and up to 4% off DC Water's Clean Rivers Impervious Area Charge. Both fees are collected on the DC Water utility bill and based on the amount of impervious surface on your property.

DDOE certifies SRCs and approves RiverSmart Rewards discounts for 3 year periods.

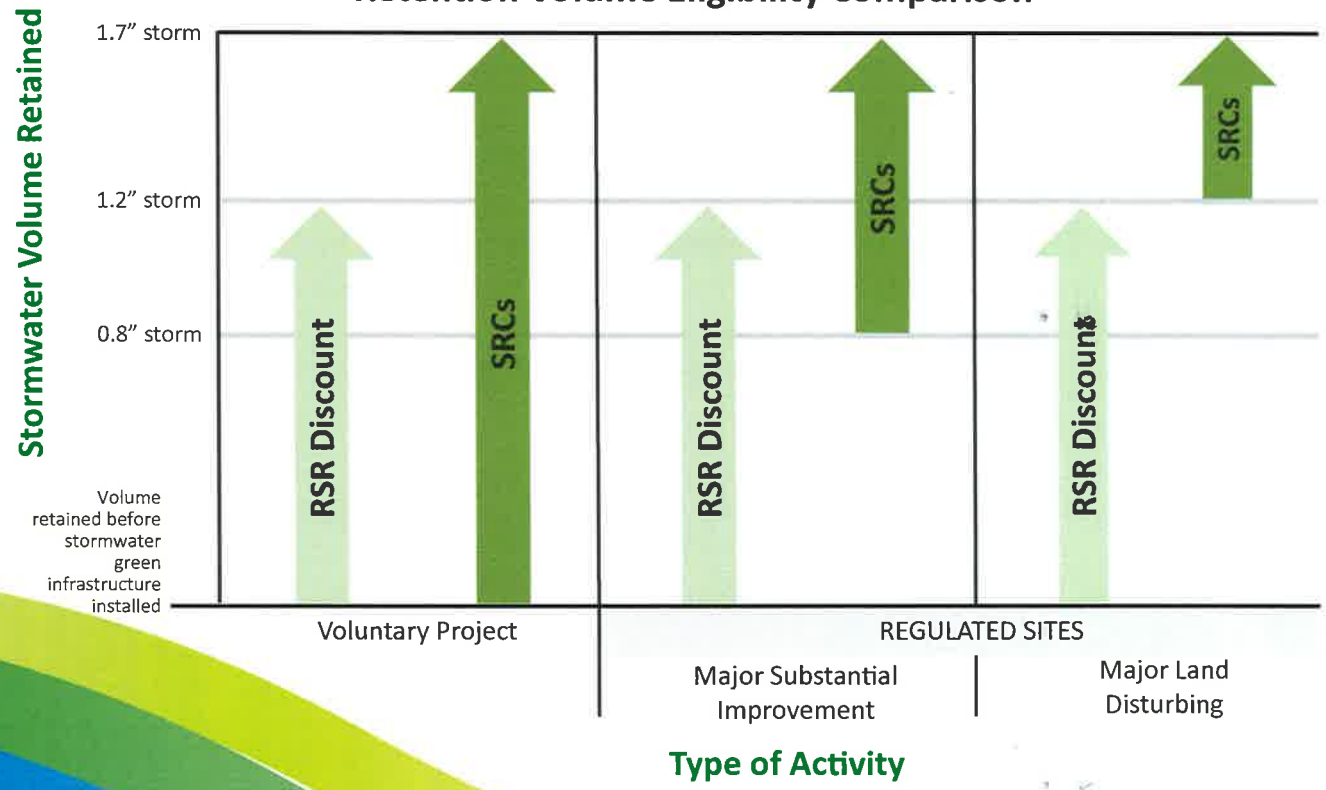
Permeable pavement installed at a parking lot reduces runoff from the property.

Eligibility Requirements

To receive a Stormwater Fee discount and/or generate SRCS, you must:

- **Design stormwater green infrastructure (GI) in accordance with the Stormwater Management Guidebook** – Typically, this is demonstrated with a DDOE-approved Stormwater Management Plan (SWMP). Projects only applying for a discount do not need a formal SWMP.*
- **Install GI before applying for SRCs or a discount** – GI must also pass DDOE inspection.
- **Provide on-going maintenance** – Proper maintenance ensures optimal performance of GI.
- **Capture stormwater runoff** – The maximum Stormwater Fee discount is awarded to sites that retain a 1.2" storm. However, GI that retains up to a 1.7" storm is eligible for SRC certification. DDOE will only certify SRCs for retention in excess of regulatory requirements or existing retention (see figure below).

Retention Volume Eligibility Comparison



** Small projects that manage stormwater from less than 2,000 square feet of impervious surface can use a Simplified Application for a RiverSmart Rewards discount.*

References and Research

Guides and Manuals:

- City of Los Angeles, CA, Department of Building and Safety Guidelines for Stormwater Infiltration, 2008, Reference No: LABC Sec 7013.9 & 7013.10 Document No. P/BC 2008/118
- City of El Paso, Engineering Department, Drainage Design Manual, May 2013
- City of Tucson Green Streets, Suggested Technical Best Practices, by Watershed Management Group, Published December 2013
- City of Philadelphia Green Streets Design Manual, www.phillywatersheds.org/what_were_doing/gsdm
- County of San Diego Sneak Preview of Green Streets Guidance, Construction Management Association of America San Diego Chapter, René Vidales, PE, Program Coordinator, Stuart Kuhn, PE, Civil Engineer, Watershed Protection Program County of San Diego July 23, 2015
- Right Place, Right Project Green, Stormwater Infrastructure Program Department of Natural Resources and Parks, Wastewater Treatment Division, A Community Guide to Partnership Opportunities

Reports:

- Green Infrastructure for Los Angeles: Addressing Urban Runoff and Water Supply Through Low Impact Development, Haan-Fawn Chau, April 17, 2009
- Banking on Green: *A Joint Report by American Rivers, the Water Environment Federation, the American Society of Landscape Architects and ECONorthwest* April 2012
- Green Infrastructure for Southwestern Neighborhoods, Watershed Management Group , Version 1.2, October 2012
- Barriers to Low Impact Development, Laura Podolsky, Prepared by the Local Government Commission for the Southern California Stormwater Monitoring Coalition September 2012
- Green Infrastructure & Economic Development: Strategies to Foster Opportunity for Marginalized Communities, Massachusetts Institute of Technology (MIT) , Community Innovators Green Economic Development Initiative., March 2013
- Green Infrastructure Opportunities and Barriers in the Greater Los Angeles Region An Evaluation of State and Regional Regulatory Drivers that Influence the Costs and Benefits of Green Infrastructure, August 2013, EPA 833-R-13-001
- Municipal Separate Strom Sewer System Permits: Post –Construction Performance Standards and Water Quality Based Requirements. A Compendium of Permitting Approaches, EPA 833-R-14-003, June 2014
- Case Studies Analyzing the Economic Benefits of Low Impact Development and Green Infrastructure and Green Infrastructure Programs, U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds, Nonpoint Source Control Branch (4503T), 1200 Pennsylvania Ave., NW Washington, DC 20460, August 2014
- Estimating Predevelopment Hydrology for Urbanized Areas in New Mexico
- U.S. Environmental Protection Agency, Office of Wastewater Management Water Permits Division Municipal Branch, Tetra Tech March 2015
- Tools, Strategies and Lessons Learned from EPA Green Infrastructure Technical Assistance Projects, U.S. Environmental Protection Agency, EPA 832-R-15-016, December 2015
- Potential Storm-Water Projects Assessment CITY OF SANTA FE NEW MEXICO PUBLIC WORKS DEPARTMENT, Streets and Drainage Maintenance Division Potential Storm-Water Projects, November 2015

Presentations:

- Watershed Based MS4 Permitting Pilot in the Middle Rio Grande, 9/2010, Sarah Holcomb, Point Source Regulation Section, sarah.Holcomb@state.nm.us and Heidi Henderson, Monitoring and Assessment Section, hedi.henderson@state.nm.us
- E2RC, Santa Fe Area Homebuilders Association lecture, August 2015

- Inspections and Maintenance of BMPs: Old Problems, New Solutions, Stormwater Solutions Webinar, April 13, 2016, ARCADIS, Design & Consultancy for natural built assists

- CITY OF SANTA FE, GREEN INFRASTRUCTURE WORKSHOP, November 30, 2012, Federal Grant Identification Number: 10---PA---11031600---078 Recipient Organization: City Of Santa Fe, New Mexico Data Universal Numbering System Number:069420818

Ordinances, Resolutions, Permits:

- Los Angeles Low Impact Development ordinances, NO 181899, NO 173494, http://planning.lacounty.gov/assets/upl/data/ord_green-building-final-ordinances.pdf
- $3 Billion dollars General Obligation Bond, SAVE OUR STREETS BOND, City of Los Angeles, CA, Enrique C. Zaldivar, Director Bureau of Sanitation
- Resolution approving the Green Streets Policy for the National Capital Region. National Capital Region Transportation Planning Board, 777 North Capitol Street, N.E. Washington, D.C. 20002
- Municipal Separate Storm Sewer System (MS4) General Permit, US EPA Region 6
- Cleveland, Ohio, Ordinance number 798-11, An ordinance to provide consideration of Complete and Green Street elements in all construction projects with in the public right- of-way, Gary Singletary, 9/14/11
- City of Tucson, Arizona, Department of Transportation, Active Practices Guidelines, Gary Wittwer, August 2013

White Papers:

- Water Resources and Community and Regional Planning Programs, Katherine Labadie, The University of New Mexico Albuquerque, New Mexico, May 2010
- Solving Flooding Challenges with Green Stormwater Infrastructure in the Airport Wash Area, Prepared for Ward 1, City of Tucson, by Watershed Management Group, Inc. with collaboration with Pima County Regional Flood Control District, May 2015
- New Mexico Interstate Stream Commission Comment on NPDES Permit NO NMROA000, Rolf Schmidt Peterson, Rio Grande Basin Manager, February 29, 2016

Interviews:

- Harry Cooper, RLA, Flood Control District of Maricopa County, Phoenix, AZ, February 26, 2016
- Kenneth Francis, Santa Fe Surroundings, April 12, 2016
- Tyler J. Ashton, Wilson & Company, April 12, 2016
- Steven King, PE, Paul Fendt, PE & Sara Lavy, PE of Parametrix Inc., April 21, 2016
- J. Rob von Rohr, PE & Justin Lyons, PE of Biohabitats, Inc., April 18, 2016
- Wendy Edde, Stormwater Division, Bend, Oregon
- Estevan Tineo, PE & Elizabeth Leibold, PE of Transportation, City of Tucson AZ, May 2, 2016
- Gary Wittwer, RLA, of Department of Transportation, City of Tucson AZ, May 3, 2016
- Wing Tam, City of Los Angeles, May 6, 2016
- Andy Otto, Santa Fe Watershed Association, May 12, 2016
- Matthew Espie & Emily Rice, Stormwater Retention Credit Trading & RiverSmart Rewards, District Department of the Environment, May 31, 2016

Websites/Links:

- www.epa.gov/polluted-runoff-nonpoint-source-pollution/urban-runoff-low-impact-development
- https://www.epa.gov/region8/green-infrastructure
- http://www.chattanooga.gov/public-works/water-quality-program/public-education

CITY OF SANTA FE, NEW MEXICO

RESOLUTION NO. 2016-25

INTRODUCED BY:

Councilor Peter N. Ives
Mayor Javier M. Gonzales
Councilor Joseph M. Maestas
Councilor Patti Bushee
Councilor Carmichael Dominguez

A RESOLUTION

DIRECTING THE CITY MANAGER TO DEVELOP A STORMWATER MANAGEMENT PROGRAM THAT UPDATES THE CITY'S STORMWATER MANAGEMENT POLICIES IN FURTHERANCE OF THE CITY'S ENVIRONMENTAL PROTECTION AND SUSTAINABILITY POLICIES AND GOALS.

WHEREAS, the City of Santa Fe and the State of New Mexico [~~have~~]are in arid climates and have experienced drought conditions for many years, putting strains on available water resources, riparian areas and aquifer recharge; and

WHEREAS, stormwater management by the Public Works Department's Streets and Drainage Division is accomplished through the operation and maintenance of the City's drainage infrastructure (arroyos, streets, curbs, drainage structures, culverts, erosion control structures, washouts, etc.); and

WHEREAS, minimizing pollutants in stormwater is essential for maintaining compliance with the Environmental Protection Agency's (EPA) Clean Water Act, the EPA's new clean water rule (2015), the National Pollutant Discharge Elimination System (NPDES) and

Municipal Separate Storm Sewer System (MS4) permit program; and

WHEREAS, green infrastructure is an approach to stormwater management that protects, restores, or mimics the natural water cycle and reduces the need for conventional infrastructure by reducing stormwater volume, and improve[~~ing~~] water quality by reducing pollutant loads, stream bank erosion, and sedimentation; and

WHEREAS, the urban reaches of the Santa Fe River have been listed as an impaired waterbody for specific contaminants under Section 303(d) of the federal Water Quality Act (aka., Clean Water Act) attributed primarily to stormwater flows; and

WHEREAS, this impairment will result in the adoption of Total Maximum Daily Loads (TMDLs) by the New Mexico Environment Department and the New Mexico Water Quality Control Commission for these contaminants; and

WHEREAS, these TMDLs will result in more restrictive permit requirements and controls for any current or new point source and non-point sources to the Santa Fe River, including the City's MS4 (Stormwater) Permit in the future; and

WHEREAS, through the Public Works Department's River, Watershed & Trails Division, the Water Division, and the Santa Fe River Commission the City is currently implementing the Alameda Rain Gardens, a green infrastructure program; and

WHEREAS, the City's Land Use Department has implemented green codes that encourage infiltration and green infrastructure measures; and

WHEREAS, the City's Water Conservation Office has created rebates and incentives for passive and active rainwater systems; and

WHEREAS, green infrastructure must be a part of the Sustainable Santa Fe Commission's 2040 goals; and

WHEREAS, the City should continue to explore all available means to encourage and incentivize private individuals, commercial enterprises and governmental entities to use rainwater

resources; and

WHEREAS, the City should work to ensure the availability of all legal supplies of water for the benefit of the City of Santa Fe; and

WHEREAS, the City will ensure its long-term sustainability and build resiliency within the City of Santa Fe by ensuring that it uses all water resources legally available; and

WHEREAS, rain events are increasing in intensity and quantity in Santa Fe, and the City needs to develop and implement its long-term plan to deal with stormwater to ensure that it does not degrade the water quality of the SF River and its tributaries, is not destructive to private or public property and infrastructure, and ensure that it is used in beneficial ways; and

WHEREAS, the City should promote and emphasize utilizing green infrastructure to slow down runoff, increase stormwater infiltration, prevent the transport of pollutants from urban and commercial areas, and maximize the benefits derived from precipitation events; and

WHEREAS, the City should explore the expansion of its urban trails system along existing arroyos to promote healthy lifestyles and public safety; and

WHEREAS, implementing this Resolution, increasing green infrastructure, and managing stormwater as a resource will promote the well-being and health of the people of Santa Fe and will help build community; and

WHEREAS, if the City needs to contract with a third party to explore the matters set forth herein, the Stornwater Section funds can be used to accomplish the purposes of this Resolution.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BODY OF THE CITY OF SANTA FE that under guidance of the city manager, city staff is directed to research, evaluate and report on current stormwater management policies that:

1. Employ and promote green infrastructure in all city infrastructure projects and improvements;

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2. Examine and implement ways to slow stormwater down, making it less destructive, and allowing it to infiltrate better;
3. Foster the Santa Fe River Commission's participation in the Santa Fe River Corridor Master Plan;
4. Promote and further the City's urban watershed policy, employing green infrastructure improvements in all Public Works projects (roads, parks, trails, etc.) to infiltrate stormwater, and use it more productively in parks and public places to decrease irrigation costs and prevent the runoff of fertilizers, waste-products and other contaminants;
5. Examine ways in which stormwater can be used productively in Santa Fe;
6. Facilitate collaboration among the Public Works Department, Parks and Recreation Department, Public Utilities Department, City Land Use Department, and private stakeholders to evaluate the creation of a Santa Fe Arroyo and Flood Control District, in cooperation with the County of Santa Fe;
7. Evaluate the nature and extent [and]for the possible expansion of City jurisdiction over arroyos and other waterways throughout the City of Santa Fe, allowing for improved arroyo management by the city and the extension of trail systems;
8. Develop a thorough and mapped understanding of the current stormwater system, including existing city drop inlets, storm drains, pipes, and outlet structures that flow directly into the arroyo system and the Santa Fe River;
9. Consider how Public Works projects and private developments can create opportunities for an integrated approach to stormwater management;
10. Provide recommendations from staff that would coordinate the efforts of the above mentioned departments, commissions, committees and other entities to maximize opportunities, while eliminating duplicative efforts.

BE IT FURTHER RESOLVED that the City Manager shall present a preliminary report with recommendations for the development of an updated stormwater policy within 120 days of the adoption of this resolution.

PASSED, APPROVED AND ADOPTED this 30th day of March, 2016.

JAVIER M. GONZALES, MAYOR

ATTEST:

YOLANDA Y. VIGIL, CITY CLERK

APPROVED AS TO FORM:

KELLEY A. BRENNAN, CITY ATTORNEY

M/Legislation/2016 Resolutions/2016-25Urban Stormwater Policy Substitute