

City of Broken Arrow  
Living Green Program  
Low Impact Development  
Recommended Practices for Certification  
Manual

April 6, 2010

# TABLE OF CONTENTS

<b>Low Impact Development Introduction</b>	<b>4</b>
<b><u>Living Green</u> LID Certification Program Description</b>	<b>5</b>
<b>Low Impact Development Certification Levels</b>	<b>6</b>
<b>Residential Developments LID Practices Summary</b>	<b>7-8</b>
Tree Preservation – Planting\Landscaping Criteria	9-10
Minimized Clearing\Grading Criteria	11
Minimized Publicly Owned Impervious Area Criteria	12
Minimized Privately Owned Impervious Area Criteria	13
Good Housekeeping During Construction Criteria	14
Vegetated Swales Criteria	15
Detention Facility\Landscape Pond Water Quality Improvements Criteria	16
Private Open Space Maintenance Practices Criteria	17
Property Owners Maintenance Practices Criteria	18
Bio Retention Filters\Rain Gardens Criteria	19
Creek\Floodplain Setbacks Criteria	20
Impervious Surfaces Disconnection Criteria	21
<b>Non-residential Developments LID Practices Summary</b>	<b>22</b>
Tree Preservation – Planting\Landscaping Criteria	23-24
Good Housekeeping During Construction Criteria	25
Detention Facility\Landscape Pond Water Quality Improvements Criteria	26
Private Open Space Maintenance Practices Criteria	27
Property Owners Maintenance Practices Criteria	28
Bio Retention Filters\Rain Gardens\Sediment Basins Criteria	29
Impervious Surfaces Disconnection Criteria	30-31
Nationally Recognized Energy Conservation Program Criteria	32

<b>Existing Residential Developments LID Practices Summary</b>	<b>33</b>
Homeowners Association Criteria	34
Tree Preservation – Planting\Landscaping Criteria	35
Vegetated Swales Criteria	36
Detention Facility\Landscape Pond Water Quality Improvements Criteria	37
Private Open Space Maintenance Practices Criteria	38
Property Owners Maintenance Practices Criteria	39
Bio Retention Filters\Rain Gardens Criteria	40
Creek\Floodplain Setbacks Criteria	41
Impervious Surfaces Disconnection Criteria	42
<b>Existing Non-Residential Developments LID Practices Summary</b>	<b>43</b>
Tree Preservation – Planting\Landscaping Criteria	44
Private Storm Sewer System Water Quality Improvements Criteria	45
Private Open Space Maintenance Practices Criteria	46
Bio retention Filters\Rain Gardens\ Sediment Basins Criteria	47
Impervious Surfaces Disconnection Criteria	48-49
Nationally Recognized Energy Conservation Program Criteria	50
<b>Recommended Practices for Certification Manual Glossary of Terms</b>	<b>51-53</b>

# LOW IMPACT DEVELOPMENT INTRODUCTION

Low Impact Development (LID) is defined as a land development strategy that attempts to replicate the original pre-development hydrology conditions as best possible to reduce negative stormwater quality and quantity impacts. It is an innovative, ecosystem-based approach to land development and stormwater management that works with nature to manage stormwater as close to its source as possible. LID employs principles and practices that treat stormwater as a resource rather than a waste product. LID is a blend of measures that includes conservation, minimization of impacts, maintaining existing hydrology patterns, integrated management practices, and pollution prevention techniques.

The City of Broken Arrow encourages use of Low Impact Development and recommends that such practices be incorporated into existing and proposed site developments. Improvements to stormwater quality, open space, site aesthetics, sustainability, and quality of life are key long-range benefits of Low Impact Development. The City of Broken Arrow has prepared this Low Impact Development Recommended Practices for Certification Manual as a tool for Developers, Builders, Engineers, Planners, Landscape Architects, and other design professionals to use in LID planning of developments within the city. The science, engineering, methodologies, and technologies associated with LID are continually being developed and updated. This manual is not designed as a technical specifications reference for LID designs but rather as a general introduction to the LID practices that are emphasized by the City of Broken Arrow. For the LID best management practices (BMPs) suggested for consideration, refer to the United States Environmental Protection Agency (EPA) web site, the design criteria and engineering constructions standards of other communities, and recent publications by the City of Broken Arrow, trade organizations, and others.

This manual is also designed as a tool for property owners and Homeowners Association representatives that ultimately own and maintain the developments that are built. The City of Broken Arrow views LID as a strategy that can be applied to existing developments as well as proposed ones. The LID principles are capable of being implemented on existing developments with a minimum amount of resources. LID Certification through the City of Broken Arrow Living Green LID Certification Program as detailed in the next section can be obtained on both existing developments and proposed developments.

# CITY OF BROKEN ARROW

## LIVING GREEN

### LID CERTIFICATION PROGRAM DESCRIPTION

The City of Broken Arrow has created the City of Broken Arrow Living Green LID Certification Program as a method of providing incentive for design, construction, and operation of Low Impact Developments throughout the city. This voluntary program provides recognition of those developments where individuals have chosen to use LID principles to improve the long-term quality of the developments that act as places of business, recreation, worship, and residence of the citizens of Broken Arrow.

The City of Broken Arrow Living Green LID Certification Program is set up with four different types of development eligible for certification. Residential, Non-Residential, Existing Residential, and Existing Non-Residential are the four categories. Different LID practices are emphasized on the LID Practices Summary for each type of development. For instance, “vegetated swales” is a practice where certification points are offered on a residential development, but is not as appropriate or as common on non-residential developments where other practices are emphasized. A developer, existing business owner, or Homeowners Association Board can review the LID Practices Summary listed for their appropriate development type and choose from the practices listed. Some practices can be chosen and others not, based on the decisions of the certification applicant. If the applicant feels enough of the practices can be implemented through project design on new projects or through new actions or retrofits on existing developments, the points of each practice to be implemented are added and a development certification points total can be calculated. Varying levels of certification points total as reviewed and approved by the City of Broken Arrow lead to a Bronze, Silver, Gold, or Platinum LID Certification Level as shown on page 6. Different development types have varying minimum certification levels as shown.

A City of Broken Arrow Living Green LID Certification application form and application fee is required for a project to be considered and reviewed for certification by the City of Broken Arrow. Upon meeting the minimum requirements for certification as detailed by the City of Broken Arrow, the project will be issued a Silver, Bronze, Gold, or Platinum level Living Green certification. The certification will include a certificate, wall plaque, and site sign. Additional signs or plaques can be purchased at an extra cost. The project will be acknowledged on the City of Broken Arrow web site, in a “green” projects listing, and in other ways as appropriate to improve the marketing of the development as a “green” certified project.

## **Broken Arrow Green – Low Impact Development Certification Levels**

### **Residential Developments:**

Platinum Level 95 – 100 Points

Gold Level 90 Points

Silver Level 85 Points

Bronze Level 80 Points

### **Non – Residential Developments:**

Platinum Level 95 – 100 Points

Gold Level 90 Points

Silver Level 75 Points

Bronze Level 60 Points

### **Existing Residential Developments:**

Platinum Level 95 – 100 Points

Gold Level 90 Points

Silver Level 80 Points

Bronze Level 70 Points

### **Existing Non – Residential Developments:**

Platinum Level 95 – 100 Points

Gold Level 90 Points

Silver Level 75 Points

Bronze Level 60 Points

## **Broken Arrow LID Practices Summary for Residential Developments**

**15 Points**      **Tree Preservation-Planting\Landscaping** – If more than minimum landscape requirements are provided, existing trees left intact, etc.

**5 Points**      **Minimized Clearing\Grading** – Phased grading or project development to minimize exposed ground.

**10 Points**      **Minimized Publicly Owned Impervious Area** – Reduction of public street widths may be possible for certain developments. Meeting City of Broken Arrow Land Subdivision, Engineering, Fire, and other codes will be required.

**5 Points**      **Minimized Privately Owned Impervious Area** – Can include use of porous pavements for sidewalks-trails-parking areas, smaller private driveways-sidewalks- patios, cluster housing, community pools rather than multiple private pools, etc.

**10 Points**      **Good Housekeeping During Construction** - Pollution prevention practices above minimum SP3 and City Code requirements.

**5 Points**      **Vegetated Swales** – Overland stormwater drainage flow areas can work to filter out pollutants.

**5 Points**      **Detention Facility/Landscape Pond Water Quality Improvements** – Water quality design built into proposed landscape ponds or stormwater detention facilities. Aerators or fountains on wet ponds, pond inflow point settling basins, vegetation or subgrade options on dry detention facilities, outflow structure designs.

**5 Points**      **Private Open Space Maintenance Practices** - Can include reserve space maintenance and operations manual, native landscaping, low water use irrigation systems, integrated pest management practices, etc.

**15 Points**      **Property Owners Maintenance Practices** - Can include education packet to be distributed to new homeowners. Use of native plantings, low water use irrigation systems, integrated pest management, and rainwater collection systems would be encouraged.

**15 Points**      **Bio-Retention Filters\Rain Gardens** – Larger scale bio retention filters in subdivision sump points or on commercial parking area inverted landscape islands. Private property owner smaller scale rain gardens.

**5 Points**      **Creek\Floodplain Setbacks** – Extra setbacks from creeks or floodplains to provide extra water quality buffer from development and to reduce channel erosion impacts.

**5 Points**      **Impervious Surfaces Disconnection** - Could include directing roof discharges to vegetated areas, rain barrels, sheet flow sloping of pavement areas to vegetated areas, separation of impervious areas, etc.

**Incentives take the form of construction cost savings and Broken Arrow LID Certification including marketing efforts.**



# **Broken Arrow Living Green Tree Preservation-Planting\Landscaping for Residential Developments**

A total of **15 points** will be applied towards “Broken Arrow Living Green” certification for residential projects leaving existing trees intact or providing more trees or landscaping than is the minimum required by Broken Arrow Code.

Tree preservation can benefit water quality by keeping existing trees and vegetation intact. Trees act to intercept a certain amount of rainfall, provide root systems to infiltrate rainfall runoff into groundwater, and provide improved aesthetics to a site. Trees near creek areas can work to prevent erosion and can provide buffer between structures and adjacent properties or streets. Preservation of existing mature trees on a residential site can add aesthetic and financial value to the development.

Tree planting works in much the same way as tree preservation. Planting of extra trees or landscaping either within common reserve areas or on privately owned lots also provide the benefits described above. In some cases due to overhead power lines, utility conflicts, or space conflicts, smaller and shorter shrubs, bushes, or landscaping may be used instead of traditional tree plantings.

Meeting any **ONE** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. Preserving at least **one mature tree per gross acre of development**. Preserved trees must be at least 6” in diameter and shall not be ones deemed necessary for removal due to conflicts with proposed houses, utilities, facilities, roadways, drainage channels, detention facilities, drainage structures, or trails. Preserved trees must be healthy and in generally good condition. Preserved trees can be within privately owned residential lots, reserves or common areas, or utility easements. Preserved trees can not be within public street rights of way. Trees within the mapped Broken Arrow Regulatory Floodplain shall not count towards tree preservation numbers.
  
2. Providing tree plantings of at **least one tree per gross acre of development**. Tree plantings shall be provided within **all reserve or common areas over 0.25 acres in size** unless space or utility conflicts prevent planting. In the event that tree plantings are not feasible due to space constraints or utility conflicts, an approved planting of bushes, shrubs, or landscape area can be done in lieu of tree plantings. Tree plantings shall be two-inch (2”) caliper minimum and shall be on the City’s approved tree list.

3. Provide an agreement where each individual homebuilder within the development is required to **plant at least one tree on the lot** of the home at the time of completion of construction of the house. Tree plantings shall be outside of public street rights of way and shall not be within drainage easements unless approved in writing by the Engineering and Construction Department. Tree plantings shall be one and one half inch (1 ½") caliper minimum and shall be on the City's approved tree list.
4. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

## **Broken Arrow Living Green Minimized Clearing\Grading for Residential Developments**

A total of **5** points will be applied towards “Broken Arrow Living Green” certification for residential projects providing minimized vegetation clearing and earth grading during development.

Reduction of the overall areas within a development that are cleared of vegetation and graded to provide final design elevation can provide water quality benefits. Minimizing the amount of bare earth exposed to the elements and vulnerable to erosion and siltation affects from rainfall events during construction is a goal of any stormwater pollution prevention plan. Staged grading, staged construction, and phased development can work to reduce the amount of siltation transported to offsite properties or creeks during development. Where design allows, leaving areas at existing grade with existing trees or vegetation intact lessens the impact of development erosion and sediment transport. Un-disturbed areas that do not have compacted soil provide better infiltration of stormwater runoff.

Meeting any **ONE** of the following criteria is required for the **total 5 points** towards certification. No partial points are offered.

1. Providing **development phasing on overall residential or mixed use developments over 40 acres in size**. An overall development may be significantly larger than 40 acres, but if developed and platted in phases, the un-platted portion left for future development will not be disturbed except where is necessary to provide the required utilities, access, fill or borrow dirt, or drainage facilities necessary to serve the first phase of the development. Grading and construction on the future phase land will be minimized during the first phase development. Any proposed utilities, access, fill or borrow dirt areas, storage areas, or drainage facilities on the future phase area will be clearly identified during the early stages of engineering for the first phase of development. At least 50% of the future phase area must be left undisturbed to meet this criteria.
2. Providing clearly identified **“no earth disturbance areas”** on the engineering plans of the development. The “no earth disturbance areas” shall be at a minimum of **20% of the total gross area** of the development. These areas clearly identified on the engineering grading plans shall be marked in the field. No clearing, grading or material storage will take place on these areas. These areas will either be left in pre-development condition as a platted reserve or common area, or will be residential lots not to be graded or disturbed until home construction on the individual lot commences. Areas within the mapped Broken Arrow Regulatory Floodplain will not count towards the 20% total. Broken Arrow Regulatory Floodplain Areas shall be subtracted from the gross development area and at least 20% of the remaining area is required as a “no disturbance area” to meet this criteria.
3. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 5 points towards certification.

## **Broken Arrow Living Green Minimized Publicly Owned Impervious Area for Residential Developments**

A total of **10 points** will be applied towards “Broken Arrow Living Green” certification for residential projects providing more minimized publicly owned impervious area.

Reduction of publicly owned impervious area can benefit water quality by a reduction in peak stormwater flows draining to receiving creeks or streams. Reduced public street width can significantly reduce the overall impervious area within a residential development.

Meeting **ALL** of the following criteria is required for the **total 10 points** towards certification. No partial points are offered.

1. Reduction of street width from the standard roadway widths is possible for certain residential developments. Reduction of interior streets from a standard 26’ wide roadway section to a 24’ wide roadway section is possible for interior public or private streets within a residential subdivision. A pre-project subdivision and street layout meeting in conjunction with a required Planned Unit Development (P.U.D.) for the subdivision is required. Issues such as traffic circulation, emergency vehicle access, on street parking restrictions, street ROW width, storm sewer and other utilities layout, sidewalk layout, and lot setbacks in relation to the reduced street width would be addressed in the P.U.D. before final engineering design of the subdivision begins. No elimination of required sidewalks within the public street R.O.W. is proposed as a minimized publicly owned impervious area reduction practice at this time. Upon acceptance of the P.U.D. and of the final subdivision engineering plans, the 10 points towards certification would be granted.

## **Broken Arrow Living Green Minimized Privately Owned Impervious Area for Residential Developments**

A total of **10** points will be applied towards “Broken Arrow Living Green” certification for residential projects providing minimized privately owned impervious area.

Reduction of the overall impervious areas within a development including those on privately owned property can provide water quality benefits. Less hard cover on a site means more areas available for infiltration into natural ground, less concentration of pollutants within runoff, less volume of stormwater runoff from routine rainfall events, less peak stormwater runoff from large rainfall events, and slower overland travel times producing less potential for erosion and silt transport. Practices used to reduce privately owned impervious area include use of porous pavements for private trails or common parking areas, cluster housing, community pools that encourage less privately owned pools within a subdivision, narrower or wheel path separated driveways, and alternative hard surface materials for driveways, patios, or other paved areas.

Meeting any **ONE** of the following criteria is required for the **total 10 points** towards certification. No partial points are offered.

1. Use of porous pavements or alternative hard surface materials on private trails or reserve area parking areas. The total square footage of the alternative impervious area must be 1,000 square feet minimum to receive the points. Approval of the surface design by the Broken Arrow Engineering and Construction Department is required.
2. Design of a cluster housing development that provides a smaller net impervious area than a traditional single family residential development. The development layout must meet all zoning, planning, and engineering requirements of the City of Broken Arrow.
3. Providing a privately owned and maintained community pool within the residential development.
4. An agreement or covenants stating the requirements of alternative driveway materials, driveway maximum dimensions, or other minimized impervious area materials or dimensions that individual homebuilders shall construct for at least 20% of the total residential lots. The driveway materials and design must be approved by the Broken Arrow Engineering and Construction Department where it ties on to the public street.
5. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 10 points towards certification.

## **Broken Arrow Living Green Good Housekeeping During Construction for Residential Developments**

A total of **10 points** will be applied towards “Broken Arrow Living Green” certification for residential projects leaving providing good housekeeping during construction greater than the minimum ODEQ and City of Broken Arrow requirements for construction.

Good housekeeping during construction benefits water quality of downstream receiving waters by reducing the amount of erosion and silt transport, reduction of blowable trash, and containment of construction materials onsite that can become pollutants. Good housekeeping will reduce the amount of citizen complaints and code enforcement actions in a developing subdivision under construction. Good housekeeping needs to be practiced through all stages of a residential development. Preliminary earth clearing and grading, construction of public utilities and streets, laying of private underground utilities, and construction of individual homes to final build-out are the major phases of a development requiring good housekeeping practices. Good housekeeping practices above minimum ODEQ and Broken Arrow requirements can include submittal of OKR10 Construction Activities Stormwater Permit Inspection Forms to the City of Broken Arrow every two weeks during construction, providing a designated concrete wash area to be used and maintained throughout development, posting of the ODEQ NOI on a highly visible all-weather sign at the construction site, application of disk anchoring seed mixture or slab sod for vegetation rather than application of loose grass seed alone.

Meeting **both items 1 and 2** and **one other item below** is required for the **total 10 points** towards certification. No partial points are offered.

1. Completion and submittal of the ODEQ Stormwater Pollution Prevention Plan weekly inspection forms to the Broken Arrow Stormwater Manager every two weeks during construction of the project.
2. Provide seeding or slab sod applications to establish and maintain vegetation coverage on all disturbed areas during periods of inactivity longer than 14 days during construction and after construction activity is complete.
3. Posting of the ODEQ NOI or permit on a highly visible all-weather sign at the construction site.
4. Providing a designated concrete wash area to be used during construction. The location shall be shown on design plans and with site signage.
5. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 10 points towards certification.

## **Broken Arrow Living Green Vegetated Swales for Residential Developments**

A total of 5 points will be applied towards “Broken Arrow Living Green” certification for residential projects providing vegetated swales meeting the following guidelines.

Vegetated swales provide water quality benefits by providing overland drainage across grass or other vegetation where stormwater pollutants can be filtered or diluted before flows reach receiving streams. Meeting any **ONE** of the following criteria is required for the **total 5 points** towards certification. No partial points are offered.

1. Vegetated swales are provided in designated drainage easements or reserve areas. The vegetated swales shall convey overland drainage from areas greater than the maximum 4 residential lots of drainage that can be conveyed through a side or back yard without requiring an easement per Broken Arrow Stormwater Criteria. A minimum of 20% of the total subdivision drainage area shall be conveyed through vegetated swales to receive this credit. Vegetated swales shall be shown on the subdivision grading and drainage plans in conjunction with the development stormwater conveyance system design. Vegetated swales shall be platted within an overland drainage easement or reserve area and maintenance requirements shall be specified in the subdivision covenants. Detention facility low flow channels, large open flow channels, and arterial roadway borrow ditches shall not count towards the 20% drainage area requirement.
2. Any residential subdivision designed and constructed with non-curbed streets with borrow ditch conveyance on lot frontages where allowed by Broken Arrow Zoning and Land Subdivision requirements.
3. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 5 points towards certification.

## **Broken Arrow Living Green Detention Facility/Landscape Pond Water Quality Improvements for Residential Developments**

A total of 5 points will be applied towards “Broken Arrow Living Green” certification for residential projects providing detention facility or landscape pond water quality improvements.

Water quality design features built into stormwater detention facilities or landscape ponds can provide water quality benefits by removal or reduction of pollutants within the pond areas both during peak storm events and during everyday low-flows. Meeting any **ONE** of the following criteria is required for the **total 5 points** towards certification. No partial points are offered.

1. Providing and maintaining a siltation forebay at a concentrated flow inflow point to either a wet or dry pond or detention facility. The forebay area allows silt, trash, or other pollutants within stormwater inflows to drop out or dissipate before entering the larger pond area.
2. Aerators or fountains provided in wet ponds. They work to reduce algae growth and improve pond circulation during critical dry weather months.
3. Dry detention facility designed subgrade system within the low flow channel portion of the dry pond. The subgrade system would allow infiltration into groundwater of low flows draining through the pond.
4. Underground detention systems also equipped with a means of siltation, pollutants, or floatables removal as a routine maintenance practice.
5. Wet or dry pond outflow system designs that provide pollution removal benefits besides required permanent erosion control measures. Practices can be structural, vegetative, or ground treatment oriented.
6. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 5 points towards certification.



# **Broken Arrow Living Green Private Open Space Maintenance Practices for Residential Developments**

A total of **5 points** will be applied towards “Broken Arrow Living Green” certification for residential projects providing specified private open space maintenance practices criteria.

Private open space maintenance practices by a homeowners association on open spaces or reserve areas can provide water quality benefit by reduction of pollution sources associated with vegetation maintenance, pesticide and fertilizer use, wet pond maintenance, irrigation practices, etc. Routine and long term maintenance of open spaces can have significant impacts on water quality within nearby receiving streams.

Meeting **ONE** of the following criteria is required for the **total 5 points** towards certification. No partial points are offered.

1. A City of Broken Arrow approved reserve space maintenance and operations manual detailing routine and long-term maintenance actions shall be prepared by the developer and distributed to the homeowners association responsible for maintenance. The operations and maintenance manual prepared by the developer’s design consultant shall detail required open space maintenance of trees, mowing, ponds, channels, etc. The manual would also encourage native plantings, low water irrigation systems, low impact pesticide and fertilizer uses, and other maintenance actions to minimize negative impacts on water quality. No binding language will require homeowners associations to follow specific maintenance practices unless specifically outlined in subdivision covenants or actions enforceable by city code.
2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 5 points towards certification.

# **Broken Arrow Living Green Property Owners Maintenance Practices for Residential Developments**

A total of **15 points** will be applied towards “Broken Arrow Living Green” certification for residential projects providing specified property owners maintenance practices criteria.

Residential private lot maintenance practices by homeowners can provide water quality benefit by reduction of pollution sources associated with home, automobile, lawn, and vegetation maintenance. Pesticide and fertilizer use, vehicle washings, pet waste, and irrigation practices are some of the many residential lot practices that have direct impacts on water quality within nearby receiving streams.

Meeting **ONE** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. A City of Broken Arrow approved property owners maintenance practices packet of educational brochures will be distributed to all new homeowners within a residential development. The brochures cover a variety of water quality issues affecting homeowners such as pesticide and fertilizer use, integrated pest management, native plantings, pet waste, car washing practices, low water irrigation systems, etc. The packet can be distributed by individual homebuilders at the time of property transfer or separately by the developer or homeowners association. A form signed by each homeowner receiving the packet is encouraged to be kept on file. No binding language will require homeowners to follow specific maintenance practices unless specifically outlined in subdivision covenants or actions enforceable by city code.
2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

## **Broken Arrow Living Green Bio Retention Filters\Rain Gardens for Residential Developments**

A total of **15** points will be applied towards “Broken Arrow Living Green” certification for residential projects providing bio retention filters or rain gardens.

Bio retention filters and rain gardens can provide water quality benefits by treating first flush stormwater runoff closest to the source of possible pollutants. Fertilizers, pesticides, automobile fluids, etc. from streets and residential yards drain through vegetation and under-drain systems designed to infiltrate low flow runoffs into the ground. Deep rooted vegetation aids in infiltration and provides aesthetic value to individual yards or to common areas.

Meeting any **ONE** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. Provide one bio retention filter or rain garden per 20 acres of the platted residential development. The bio retention filters or rain gardens would typically be in reserve areas owned and maintained by the subdivision homeowners association. Bio retention filters or rain gardens designed in areas within street rights of way or utility easements would require approval of the Engineering and Construction Department. The location and design specifications of bio retention filters or rain gardens shall be shown on the subdivision grading and drainage plans in conjunction with the development stormwater conveyance system design. Subdivision covenants would address maintenance requirements of the bio retention filters or rain gardens by the homeowners association or open space owners. This section applies to both single-family residential as well as multi-family residential developments.
2. An agreement provided by the land owner, developer, and participating builders that individual rain gardens would be designed and constructed on 20% of the total residential lots.
3. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

# Broken Arrow Living Green

## Creek\Floodplain Setbacks for Residential Developments

A total of **5 points** will be applied towards “Broken Arrow Living Green” certification for residential projects providing more than minimum setbacks between development and creeks or floodplain areas.

Creeks\floodplain setbacks can benefit water quality by keeping existing trees and vegetation intact. Vegetation provides a stormwater filtering buffer between houses and receiving creeks. The vegetation in the setback area also acts as an extra buffer between creek erosion and residential fences, out buildings, and houses. Preservation of existing vegetation and trees in setback areas on a residential site can add aesthetic and financial value to the development.

Meeting **ONE** of the following criteria is required for the **total 5 points** towards certification. No partial points are offered.

1. All stormwater detention facilities, natural drainage channels, and improved drainage channels within the development shall be platted within a reserve area containing an easement to be maintained by the subdivision homeowners association. Back yard or side yard swales draining no more than 4 lots of overland flow do not count as improved drainage channels. All Regulatory Floodplain Areas of Broken Arrow shall be within areas dedicated to the City of Broken Arrow or else maintained by the subdivision homeowners association per City of Broken Arrow Regulatory Flood Area Management Program Policy. None of these areas shall be platted for ownership and maintenance by individual residential lot owners. **An extra 5 feet of setback between the regulatory floodplain boundary and the adjacent lot lines shall be provided.**
2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 5 points towards certification.

## **Broken Arrow Living Green Impervious Surfaces Disconnection for Residential Developments**

A total of **5** points will be applied towards “Broken Arrow Living Green” certification for residential projects providing impervious surfaces disconnection.

Impervious surfaces disconnection is a water quality design that provides water quality benefits by directing the conveyance of concentrated stormwater flows from impervious areas to areas of vegetation before discharge to receiving streams. Traditional methods of conveying all stormwater flows directly to receiving streams through tight-lined roof drain systems, overland paved areas, storm sewers, and concrete lined channels effectively speeds pollutants within stormwater directly to the receiving stream without a chance for dilution or infiltration to occur. Providing extra length of conveyance across grassed or natural vegetative areas allows infiltration and vegetative filtering of pollutants within the stormwater. Meeting any **TWO** of the following criteria is required for the **total 5 points** towards certification. No partial points are offered.

1. Sheet flow of private parking or other paved areas owned by a homeowners association across vegetative surfaces before discharge to a storm sewer system or receiving stream. A minimum of 500 square feet of impervious area would be required. Trails or sidewalks would not count for this practice.
2. An agreement provided by the land owner, developer, and participating builders that roofs will be designed with their discharge points disconnected from impervious areas on at least 20% of the total residential lots.
3. An agreement provided by the land owner, developer, and participating builders that rain barrels, cisterns, or other rainwater collection devices would be installed on at least 20% of the total residential lots. Gray water collection systems for reuse of wash water from the house would not count for this practice.
4. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 5 points towards certification.

## **Broken Arrow LID Practices Summary for Non-Residential Developments**

**20 Points**      **Tree Preservation-Planting/Landscaping** – If more than minimum landscape requirements are provided, existing trees left intact, etc.

**15 Points**      **Good Housekeeping During Construction** - Pollution prevention practices above minimum SP3 and City Code requirements.

**5 Points**      **Detention Facility/Landscape Pond Water Quality Improvements** – Water quality design built into proposed landscape ponds or stormwater detention facilities. Aerators or fountains on wet ponds, pond inflow point settling basins, vegetation or subgrade options on dry detention facilities, outflow structure designs.

**10 Points**      **Private Open Space Maintenance Practices** - Can include reserve space maintenance and operations manual, native landscaping, low water use irrigation systems, integrated pest management practices, etc.

**15 Points**      **Property Owners Maintenance Practices** - Can include education packet to be distributed to new building owners or tenants. Use of native plantings, low water use irrigation systems, integrated pest management, and rainwater collection systems would be encouraged.

**15 Points**      **Bio-Retention Filters\Rain Gardens\Sediment Basins** – Larger scale bio retention filters in subdivision sump points or on commercial parking area inverted landscape islands. Private property owner smaller scale rain gardens. Sediment basins as filters where rocky conditions exist and infiltration is not likely.

**5 Points**      **Impervious Surfaces Disconnection** - Could include directing roof discharges to vegetated areas, rain barrels, roof water holding for irrigation use, sheet flow sloping of pavement areas to vegetated areas, separation of impervious areas, etc.

**15 Points**      **Nationally Recognized Energy Conservation Program** - Energy efficient building design with Energy Star, LEED, Green Globe, or other certifications.

**Incentives take the form of construction cost savings and Broken Arrow LID Certification including marketing efforts.**

## **Broken Arrow Living Green Tree Preservation-Planting\Landscaping for Non - Residential Developments**

A total of **20 points** will be applied towards “Broken Arrow Living Green” certification for non - residential projects leaving existing trees intact or providing more trees or landscaping than is the minimum required by Broken Arrow Code.

Tree preservation can benefit water quality by keeping existing trees and vegetation intact. Trees act to intercept a certain amount of rainfall, provide root systems to infiltrate rainfall runoff into groundwater, and provide improved aesthetics to a site. Trees near creek areas can work to prevent erosion and can provide buffer between structures and adjacent properties or streets. Preservation of existing mature trees on a non - residential site can add aesthetic and financial value to the development.

Tree planting works in much the same way as tree preservation. Planting of extra trees or landscaping either within common reserve areas or on privately owned lots also provide the benefits described above. In some cases due to overhead power lines, utility conflicts, or space conflicts, smaller and shorter shrubs, bushes, or landscaping may be used instead of traditional tree plantings.

Meeting any **ONE** of the following criteria is required for the **total 20 points** towards certification. No partial points are offered.

1. Preserving at least **two mature trees per gross acre of development**. Preserved trees must be at least 6” in diameter and shall not be ones deemed necessary for removal due to conflicts with proposed structures, utilities, facilities, roadways, drainage channels, detention facilities, or drainage structures. Preserved trees must be healthy and in generally good condition. Preserved trees can be within privately owned lots, reserves or common areas, or utility easements. Preserved trees can not be within public street rights of way. Trees within the mapped Broken Arrow Regulatory Floodplain shall not count towards tree preservation numbers.
  
2. In the case of a single-lot development, **provide at minimum 25% more trees than the minimum number of trees required per the City of Broken Arrow landscape code requirements**. Tree plantings shall be outside of public street rights of way and shall not be within drainage easements unless approved in writing by the Engineering and Construction Department. Tree plantings shall be one and one half inch (1 ½”) caliper minimum and shall be on the City’s approved tree list. Trees shall be maintained and replaced if damaged.

3. In the case of a multiple-lot development, **provide an agreement where each lot owner will provide at minimum 25% more trees than the minimum number of trees required per the City of Broken Arrow landscape code requirements.** Tree plantings shall be outside of public street rights of way and shall not be within drainage easements unless approved in writing by the Engineering and Construction Department. Tree plantings shall be one and one half inch (1 ½") caliper minimum and shall be on the City's approved tree list.
  
4. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 20 points towards certification.



## **Broken Arrow Living Green Good Housekeeping During Construction for Non - Residential Developments**

A total of **15 points** will be applied towards “Broken Arrow Living Green” certification for non - residential projects leaving providing good housekeeping during construction greater than the minimum ODEQ and City of Broken Arrow requirements for construction.

Good housekeeping during construction benefits water quality of downstream receiving waters by reducing the amount of erosion and silt transport, reduction of blowable trash, and containment of construction materials onsite that can become pollutants. Good housekeeping will reduce the amount of citizen complaints and code enforcement actions in a developing subdivision under construction. Good housekeeping needs to be practiced through all stages of a commercial development. Preliminary earth clearing and grading, construction of public utilities and streets, laying of private underground utilities, and completion of commercial building structures are the major phases of a development requiring good housekeeping practices. Good housekeeping practices above minimum ODEQ and Broken Arrow requirements shall include submittal of OKR10 Construction Activities Stormwater Permit Inspection Forms to the City of Broken Arrow every two weeks during construction, and posting of the ODEQ NOI on a highly visible all-weather sign at the construction site.

Meeting **TWO** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. Completion and submittal of the ODEQ Stormwater Pollution Prevention Plan weekly inspection forms to the Broken Arrow Stormwater Manager every two weeks during construction of the project.
2. Posting of the ODEQ NOI on a highly visible all-weather sign at the construction site.
3. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

## **Broken Arrow Living Green Detention Facility/Landscape Pond Water Quality Improvements for Non - Residential Developments**

A total of 5 points will be applied towards “Broken Arrow Living Green” certification for non - residential projects providing detention facility or landscape pond water quality improvements.

Water quality design features built into stormwater detention facilities or landscape ponds can provide water quality benefits by removal or reduction of pollutants within the pond areas both during peak storm events and during everyday low-flows. Meeting any **ONE** of the following criteria is required for the **total 5 points** towards certification. No partial points are offered.

1. Providing and maintaining a siltation forebay at a concentrated flow inflow point to either a wet or dry pond or detention facility. The forebay area allows silt, trash, or other pollutants within stormwater inflows to drop out or dissipate before entering the larger pond area.
2. Aerators or fountains provided in wet ponds. They work to reduce algae growth and improve pond circulation during critical dry weather months.
3. Dry detention facility designed subgrade system within the low flow channel portion of the dry pond. The subgrade system would allow infiltration into groundwater of low flows draining through the pond.
4. Underground detention systems also equipped with a means of siltation, pollutants, or floatables removal as a routine maintenance practice.
5. Wet or dry pond outflow system designs that provide pollution removal benefits besides required permanent erosion control measures. Practices can be structural, vegetative, or ground treatment oriented.
6. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 5 points towards certification.

## **Broken Arrow Living Green Private Open Space Maintenance Practices for Non - Residential Developments**

A total of **10 points** will be applied towards “Broken Arrow Living Green” certification for non - residential projects providing specified private open space maintenance practices criteria.

Private open space maintenance practices by a private property owner on open spaces, reserve areas, or private landscape areas can provide water quality benefit by reduction of pollution sources associated with vegetation maintenance, pesticide and fertilizer use, wet pond maintenance, irrigation practices, etc. Routine and long term maintenance of open spaces can have significant impacts on water quality within nearby receiving streams.

Meeting **ONE** of the following criteria is required for the **total 10 points** towards certification. No partial points are offered.

1. A City of Broken Arrow approved reserve space maintenance and operations manual detailing routine and long-term maintenance actions shall be prepared by the developer and distributed to the property owner responsible for maintenance of open spaces on the development. The operations and maintenance manual prepared by the developer’s design consultant shall detail required open space maintenance of trees, mowing, ponds, channels, etc. The manual would also encourage native plantings, low water irrigation systems, low impact pesticide and fertilizer uses, and other maintenance actions to minimize negative impacts on water quality. No binding language will require property owners to follow specific maintenance practices unless specifically outlined in final plat covenants or actions enforceable by city code.
2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 10 points towards certification.

# **Broken Arrow Living Green Property Owners Maintenance Practices for Non - Residential Developments**

A total of **15 points** will be applied towards “Broken Arrow Living Green” certification for non - residential projects providing specified property owners maintenance practices criteria.

Non - residential private lot maintenance practices by property owners or tenants can provide water quality benefit by reduction of pollution sources associated with building, parking lot, automobile fleet, and solid waste disposal maintenance and practices. Parking lot washing and de-icing, grease trap maintenance, trash dumpster maintenance, and materials storage are some of the non - residential site practices that have direct impacts on water quality within nearby receiving streams.

Meeting **ONE** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. A City of Broken Arrow approved property owners maintenance practices packet of educational brochures will be distributed to all new property owners or tenants of a non-residential development by the developer. The brochures cover a variety of water quality issues affecting office buildings, commercial sites, or industrial sites. Examples would include solid waste disposal practices, food service waste disposal practices, parking lot washing practices, and materials and chemicals storage practices. An approved packet of brochures will be given to the developer at the time of project planning and design. The developer will distribute the packet to the property owner or tenant at time of issuance of occupancy of the facility or at time of sale of the lot in multiple lot developments. No binding language will require property owners or tenants to follow specific maintenance practices unless specifically outlined in final plat covenants or actions enforceable by city code.
2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

# **Broken Arrow Living Green Bio Retention Filters\Rain Gardens\Sediment Basins for Non - Residential Developments**

A total of **15** points will be applied towards “Broken Arrow Living Green” certification for residential projects providing bio retention filters or rain gardens.

Bio retention filters, rain gardens, and sediment basins can provide water quality benefits by treating first flush stormwater runoff closest to the source of possible pollutants. Fertilizers, pesticides, automobile fluids, etc. from paved parking lots and lawn areas drain through vegetation and under-drain systems designed to infiltrate low flow runoffs into the ground. Deep rooted vegetation aids in infiltration and provides aesthetic value to individual yards or to common areas. Permanent sediment basins can act as pollutant filters in areas of rocky soil conditions where infiltration is not likely. Meeting any **ONE** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. In the case of a single - lot development, provide at least one bio retention filter, rain garden, or sediment basin feature for each 10 gross acres of development. At least one of these features shall be provided on sites smaller than 10 gross acres. The features would typically be on privately owned open space or landscape space and will be maintained by the property owner. Features proposed in areas within street rights of way or utility easements would require review and approval of the Engineering and Construction Department and would require an agreement detailing maintenance responsibilities. The location and design specifications of these features shall be shown on the site development grading and drainage plans in conjunction with the development stormwater conveyance system design.
2. In the case of multiple – lot developments, provide at least one bio retention filter, rain garden, or sediment basin feature for each 10 gross acres of development. At least one feature shall be provided on sites smaller than 10 gross acres. Features can be constructed on common parking area islands, reserve areas, or other common space areas. Final plat covenants would address the maintenance responsibilities of the features. Features proposed in areas within street rights of way or utility easements would require review and approval of the Engineering and Construction Department and would require an agreement detailing maintenance responsibilities.
3. In the case of multiple – lot developments, an agreement provided by the developer or final plat covenants would require construction by lot owners of at least one bioretention filter, rain garden, or sediment basin on each lot. Final plat covenants would address the maintenance responsibilities of the features.
4. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

## **Broken Arrow Living Green Impervious Surfaces Disconnection for Non - Residential Developments**

A total of **5** points will be applied towards “Broken Arrow Living Green” certification for non - residential projects providing impervious surfaces disconnection.

Impervious surfaces disconnection is a water quality design that provides water quality benefits by directing the conveyance of concentrated stormwater flows from impervious areas to areas of vegetation before discharge to receiving streams. Traditional methods of conveying all stormwater flows directly to receiving streams through tight-lined roof drain systems, overland paved areas, storm sewers, and concrete lined channels effectively speeds pollutants within stormwater directly to the receiving stream without a chance for dilution or infiltration to occur. Providing extra length of conveyance across grassed or natural vegetative areas allows infiltration and vegetative filtering of pollutants within the stormwater. Meeting any **TWO** of the following criteria is required for the **total 5 points** towards certification. No partial points are offered.

1. In the case of a single – lot development, sheet flow of private parking or other paved areas across vegetative surfaces before discharge to a storm sewer system or receiving stream. A minimum of 500 square feet of impervious area sheet flowing in this manner would be required. Sheet flow drainage of the paved areas would require design to minimize permanent erosion and siltation effects. Trails or sidewalks would not count for this practice.
2. In the case of a single – lot development, design of roof downspouts directing discharges to vegetative areas disconnected from impervious areas.
3. In the case of a single- lot development, construction of rain barrels, cisterns, or other rainwater collection devices would be performed. Gray water collection systems for reuse of wash water from the building would not count for this practice.
4. In the case of multiple – lot developments, an agreement provided by the developer or final plat covenants would require sheet flow of private parking or other paved areas across vegetative surfaces before discharge to a storm sewer system or receiving stream. A minimum of 500 square feet of impervious area sheet flowing in this manner would be required per lot. Sheet flow drainage of the paved areas would require design to minimize permanent erosion and siltation effects. Trails or sidewalks would not count for this practice.
5. In the case of a multiple – lot developments, an agreement provided by the developer or final plat covenants would require design of roof downspouts directing discharges to vegetative areas disconnected from impervious areas on each lot.

6. In the case of multiple – lot developments, an agreement provided by the developer or final plat covenants would require construction of rain barrels, cisterns, or other rainwater collection devices on each lot. Gray water collection systems for reuse of wash water from the building would not count for this practice.
7. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 5 points towards certification.

# **Broken Arrow Living Green Nationally Recognized Energy Conservation Program for Non - Residential Developments**

A total of **15 points** will be applied towards “Broken Arrow Living Green” certification for non - residential projects providing energy efficient building designs with Energy Star, LEED, Green Globe, or other nationally recognized energy conservation and sustainable design program guidelines.

Energy conservation and sustainability conscious designs on building structures can provide multiple environmental and sustainability benefits over the life of a building. Improved water quality, air quality, water conservation, working environment, site aesthetics, pedestrian access, energy consumption, and structure life are some of the benefits of designing to the above listed program design guidelines.

Meeting any **ONE** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. Design of the building structure(s) to meet any one of the below non-residential energy efficient building design certification programs.

Energy Star

LEED

Green Globe

NAHB Model Green Home Building Guidelines

Other nationally recognized energy conservation and sustainable design programs.

The developer shall show that the proposed building structure(s) on the site meet certification criteria for the program claimed for credit.

2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.



## Broken Arrow LID Practices Summary for Existing Residential Developments

**15 Points Homeowners Association** – Existing subdivisions with an organized and operational Homeowners Association can oversee various LID practices required for certification.

**15 Points Tree Preservation-Planting\Landscaping** – If more than minimum landscape requirements are provided, dead or diseased trees are replaced, etc.

**5 Points Vegetated Swales** – Overland stormwater drainage flow areas can work to filter out pollutants.

**10 Points Detention Facility/Landscape Pond Water Quality Improvements** – Water quality design enhancements to existing or proposed landscape ponds or stormwater detention facilities. Aerator fountains on wet ponds, pond inflow point settling basins, vegetation or subgrade options on dry detention facilities, outflow structure revisions.

**15 Points Private Open Space Maintenance Practices** - Can include reserve space maintenance and operations manual, native landscaping, low water use irrigation systems, integrated pest management practices, etc.

**15 Points Property Owners Maintenance Practices** - Can include education packet to be distributed to existing homeowners. Use of native plantings, low water use irrigation systems, integrated pest management, and rainwater collection systems would be encouraged.

**10 Points Bio-Retention Filters\Rain Gardens** – Larger scale bio retention filters in subdivision sump points. Private property owner smaller scale rain gardens.

**5 Points Creek\Floodplain Setbacks** – Extra setbacks from creeks or floodplains to provide extra water quality buffer from development and to reduce channel erosion impacts.

**10 Points Impervious Surfaces Disconnection** - Could include directing roof discharges to vegetated areas, rain barrels, sheet flow sloping of pavement areas to vegetated areas, separation of impervious areas, etc.

**Incentives take the form of Broken Arrow LID Certification and recognition.**

## **Broken Arrow Living Green Homeowners Association for Existing Residential Developments**

A total of **15 points** will be applied towards “Broken Arrow Living Green” certification for existing residential neighborhoods operating an active Homeowners Association.

Existing neighborhoods benefit from an organized and active Homeowners Association to oversee the various Low Impact Development practices within the neighborhood. The Homeowners Association promotes good environmental practices on both Homeowners Association owned property and private properties.

Meeting **TWO** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. Maintain a legally formed Homeowners Association with detailed membership requirements and bylaws.
2. Register the Homeowners Association leadership members and contact information with the City of Broken Arrow for the citywide Master Homeowners Association list.
3. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

## **Broken Arrow Living Green Tree Preservation-Planting\Landscaping for Existing Residential Developments**

A total of **15 points** will be applied towards “Broken Arrow Living Green” certification for existing residential neighborhoods maintaining existing trees or planting and maintaining new trees on open space within the neighborhood.

Tree preservation can benefit water quality by keeping existing trees and vegetation intact. Trees act to intercept a certain amount of rainfall, provide root systems to infiltrate rainfall runoff into groundwater, and provide improved aesthetics to a site. Trees near creek areas can work to prevent erosion and can provide buffer between structures and adjacent properties or streets. Preservation of existing mature trees in a residential neighborhood can add aesthetic and financial value.

Tree planting works in much the same way as tree preservation. Planting of extra trees or landscaping within common open space areas can also provide the benefits described above. In some cases due to overhead power lines, utility conflicts, or space conflicts, smaller and shorter shrubs, bushes, or landscaping may be used instead of traditional tree plantings.

Meeting any **THREE** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered. The Homeowners Association shall demonstrate that an active program is in place to perform some or all of the following.

1. Irrigate, fertilize, and maintain existing trees and shrubs planted during the development of the neighborhood or planted separately at a later date.
2. Replace damaged or dying trees and shrubs planted during the development of the neighborhood or planted separately at a later date.
3. Add tree canopy in open spaces or parks within the neighborhood.
4. Maintain native groves of trees within open spaces or floodplain areas in the neighborhood.
5. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

## **Broken Arrow Living Green Vegetated Swales for Existing Residential Developments**

A total of 5 points will be applied towards “Broken Arrow Living Green” certification for existing residential neighborhoods containing vegetated swales meeting the following guidelines.

Vegetated swales provide water quality benefits by providing overland drainage across grass or other vegetation where stormwater pollutants can be filtered or diluted before flows reach receiving streams. Meeting any **ONE** of the following criteria is required for the **total 5 points** towards certification. No partial points are offered.

1. Vegetated swales draining area from more than two residential lots exist within easements or reserve areas in the neighborhood. The vegetated swales are maintained either by the Homeowners Association or individual property owners. Typical side yard swales draining shared stormwater flows from two residential lots shall not count towards this criteria. Detention facility low flow channels, large open flow channels, and arterial roadway borrow ditches shall not count towards this criteria.
2. Any existing residential subdivision containing non-curbed streets with borrow ditch conveyance on lot frontages meets the vegetated swale criteria.
3. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 5 points towards certification.

## **Broken Arrow Living Green Detention Facility/Landscape Pond Water Quality Improvements for Existing Residential Developments**

A total of 10 points will be applied towards “Broken Arrow Living Green” certification for existing residential neighborhoods containing existing or providing proposed detention facility or landscape pond water quality improvements.

Water quality design features built into stormwater detention facilities or landscape ponds can provide water quality benefits by removal or reduction of pollutants within the pond areas both during peak storm events and during everyday low-flows. Meeting any **ONE** of the following criteria is required for the **total 10 points** towards certification. No partial points are offered.

1. Providing and maintaining a siltation forebay at a concentrated flow inflow point to either a wet or dry pond or detention facility. The forebay area allows silt, trash, or other pollutants within stormwater inflows to drop out or dissipate before entering the larger pond area.
2. Aerators or fountains provided in wet ponds. They work to reduce algae growth and improve pond circulation during critical dry weather months.
3. Dry detention facility designed subgrade system within the low flow channel portion of the dry pond. The subgrade system would allow infiltration into groundwater of low flows draining through the pond.
4. Wet or dry pond outflow system designs that provide pollution removal benefits besides required permanent erosion control measures. Practices can be structural, vegetative, or ground treatment oriented.
5. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 10 points towards certification.

# Broken Arrow Living Green Private Open Space Maintenance Practices for Existing Residential Developments

A total of **15 points** will be applied towards “Broken Arrow Living Green” certification for existing residential neighborhoods providing specified private open space maintenance practices criteria.

Private open space maintenance practices by a homeowners association on open spaces or reserve areas can provide water quality benefit by reduction of pollution sources associated with vegetation maintenance, pesticide and fertilizer use, wet pond maintenance, irrigation practices, etc. Routine and long term maintenance of open spaces can have significant impacts on water quality within nearby receiving streams.

Meeting **ONE** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. A City of Broken Arrow approved open space or reserve area operations and maintenance manual detailing routine and long-term maintenance actions shall be prepared by the Homeowners Association. The manual can be prepared by a landscape architect, engineer, or other individual familiar with land management and maintenance practices. The operations and maintenance manual shall show the open space within the neighborhood to be maintained and detail required open space maintenance of trees, mowing, ponds, channels, etc. The manual would also encourage native plantings, low water irrigation systems, low impact pesticide and fertilizer uses, and other maintenance actions to minimize negative impacts on water quality. No binding language will require homeowners associations to follow specific maintenance practices unless specifically outlined in subdivision covenants or actions enforceable by city code.
2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

## **Broken Arrow Living Green Property Owners Maintenance Practices for Existing Residential Developments**

A total of **15 points** will be applied towards “Broken Arrow Living Green” certification for existing residential neighborhoods providing specified property owners maintenance practices criteria.

Residential private lot maintenance practices by homeowners can provide water quality benefit by reduction of pollution sources associated with home, automobile, lawn, and vegetation maintenance. Pesticide and fertilizer use, vehicle washings, pet waste, and irrigation practices are some of the many residential lot practices that have direct impacts on water quality within nearby receiving streams.

Meeting **ONE** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. A City of Broken Arrow approved property owners maintenance practices packet of educational brochures will be given to the Homeowners Association. The Homeowners Association will provide copies of the brochures packet to all Homeowners Association members. The Homeowners Association will keep a copy of the brochures packet and will periodically distribute copies to new homeowners moving to the neighborhood. The brochures cover a variety of water quality issues affecting homeowners such as pesticide and fertilizer use, integrated pest management, native plantings, pet waste, car washing practices, low water irrigation systems, etc. No binding language will require homeowners to follow specific maintenance practices unless specifically outlined in subdivision covenants, homeowners association bylaws, or actions enforceable by city code.
2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

## **Broken Arrow Living Green Bio Retention Filters\Rain Gardens for Existing Residential Developments**

A total of **10** points will be applied towards “Broken Arrow Living Green” certification for existing residential neighborhoods maintaining or proposing bio retention filters or rain gardens.

Bio retention filters and rain gardens can provide water quality benefits by treating first flush stormwater runoff closest to the source of possible pollutants. Fertilizers, pesticides, automobile fluids, etc. from streets and residential yards drain through vegetation and under-drain systems designed to infiltrate low flow runoffs into the ground. Deep rooted vegetation aids in infiltration and provides aesthetic value to individual yards or to common areas. Meeting any **ONE** of the following criteria is required for the **total 10 points** towards certification. No partial points are offered.

1. Provide and maintain one bio retention filter or rain garden per 20 acres of the residential neighborhood. The bio retention filters or rain gardens would typically be in reserve areas owned and maintained by the homeowners association. Bio retention filters or rain gardens proposed in areas within street rights of way or easement areas would require review and approval of the Engineering and Construction Department and would require agreements detailing maintenance responsibilities. This section applies to both single-family residential as well as multi-family residential developments.
2. Show proof that private rain gardens have been constructed on a minimum of 10% of the residential lots within the neighborhood. The rain gardens would be owned and maintained by individual lot owners on private property.
3. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 10 points towards certification.



# **Broken Arrow Living Green Creek\Floodplain Setbacks For Existing Residential Developments**

A total of **5 points** will be applied towards “Broken Arrow Living Green” certification for existing residential neighborhoods providing more than minimum setbacks between development and creeks or floodplain areas.

Creeks\floodplain setbacks can benefit water quality by keeping existing trees and vegetation intact. Vegetation provides a stormwater filtering buffer between houses and receiving creeks. The vegetation in the setback area also acts as an extra buffer between creek erosion and residential fences, out buildings, and houses. Preservation of existing vegetation and trees in setback areas on a residential site can add aesthetic and financial value to the development.

Meeting **ONE** of the following criteria is required for the **total 5 points** towards certification. No partial points are offered.

1. All stormwater detention facilities, natural drainage channels, and improved drainage channels within the development are platted within a reserve area containing an easement to be maintained by the homeowners association. All Regulatory Floodplain Areas of Broken Arrow shall be within areas dedicated to the City of Broken Arrow or else maintained by the homeowners association per City of Broken Arrow Regulatory Flood Area Management Program Policy. **An extra 5 feet of setback between the regulatory floodplain boundary and the adjacent lot lines exists on a minimum of 50% of the lots adjacent to the regulatory floodplain boundary.**
2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 5 points towards certification.

# **Broken Arrow Living Green Impervious Surfaces Disconnection for Existing Residential Developments**

A total of **10** points will be applied towards “Broken Arrow Living Green” certification for existing residential neighborhoods containing impervious surfaces disconnection.

Impervious surfaces disconnection is a water quality design that provides water quality benefits by directing the conveyance of concentrated stormwater flows from impervious areas to areas of vegetation before discharge to receiving streams. Traditional methods of conveying all stormwater flows directly to receiving streams through tight-lined roof drain systems, overland paved areas, storm sewers, and concrete lined channels effectively speeds pollutants within stormwater directly to the receiving stream without a chance for dilution or infiltration to occur. Providing extra length of conveyance across grassed or natural vegetative areas allows infiltration and vegetative filtering of pollutants within the stormwater. Meeting any **ONE** of the following criteria is required for the **total 10 points** towards certification. No partial points are offered.

1. Sheet flow of private parking or other paved areas owned by the homeowners association across vegetative surfaces before discharge to a storm sewer system or receiving stream. A minimum of 500 square feet of impervious area would be required. Trails or sidewalks would not count for this practice.
2. Proof that a minimum of 20% of the existing residential lots contain roofs with flows disconnected from impervious areas and directed through vegetated areas before flowing to the street, public storm sewer, or adjacent creeks.
3. Proof that a minimum of 10% of the existing residential lots contain rain barrels, cisterns, or other rainwater collection devices. Gray water collection systems for reuse of wash water from the house would not count for this practice.
4. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 10 points towards certification.

## **Broken Arrow LID Practices Summary for Existing Non-Residential Developments**

**20 Points**      **Tree Preservation-Planting/Landscaping** – If more than minimum landscape requirements are provided, extra trees are planted, existing trees on site were left intact, etc.

**15 Points**      **Private Storm Sewer System Water Quality Improvements** – Storm sewer inlet filter systems, erosion prevention at storm sewer outlet structures, swale or borrow ditch improvements, detention facility features etc.

**25 Points**      **Private Open Space Maintenance Practices** - Can include open space or reserve area operations and maintenance manual which will provide detailed maintenance requirements and promote native landscaping, low water use irrigation systems, integrated pest management practices, etc.

**10 Points**      **Bio-Retention Filters\Rain Gardens\Sediment Basins** – Larger scale bio retention filters in subdivision sump points or on commercial parking area inverted landscape islands. Private property owner smaller scale rain gardens. Sediment basins as filters where rocky conditions exist and infiltration is not likely.

**10 Points**      **Impervious Surfaces Disconnection** - Could include directing roof discharges to vegetated areas, rain barrels, roof water holding for irrigation use, sheet flow sloping of pavement areas to vegetated areas, separation of impervious areas, etc.

**20 Points**      **Nationally Recognized Energy Conservation Program** – Energy efficient building design or renovation with Energy Star, LEED, Green Globe, or other certifications.

**Incentives take the form of Broken Arrow LID Certification including marketing efforts.**

## **Broken Arrow Living Green Tree Preservation-Planting\Landscaping for Existing Non - Residential Developments**

A total of **20 points** will be applied towards “Broken Arrow Living Green” certification for existing non - residential developments maintaining existing trees or planting and maintaining new trees on green space within the development.

Tree preservation can benefit water quality by keeping existing trees and vegetation intact. Trees act to intercept a certain amount of rainfall, provide root systems to infiltrate rainfall runoff into groundwater, and provide improved aesthetics to a site. Trees near creek areas can work to prevent erosion and can provide buffer between structures and adjacent properties or streets. Preservation of existing mature trees on a non - residential site can add aesthetic and financial value to the development.

Tree planting works in much the same way as tree preservation. Planting of extra trees or landscaping in green spaces within the development also provides the benefits described above. In some cases due to overhead power lines, utility conflicts, or space conflicts, smaller and shorter shrubs, bushes, or landscaping may be used instead of traditional tree plantings.

Meeting any **ONE** of the following criteria is required for the **total 20 points** towards certification. No partial points are offered.

1. Irrigate, fertilize, and maintain existing trees and shrubs planted during the development of the site or planted at a later date. At least 25% more trees than the minimum number required per City of Broken Arrow landscape code requirements exist on the site and are maintained.
2. Maintain native groves of trees within the development.
3. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 20 points towards certification.

# **Broken Arrow Living Green Private Storm Sewer System Water Quality Improvements For Existing Non - Residential Developments**

A total of **15 points** will be applied towards “Broken Arrow Living Green” certification for existing non - residential developments providing and maintaining private storm sewer system water quality improvements on the site.

Private storm sewer water quality improvements can benefit water quality by treating and removing stormwater pollutants at the source before they are conveyed to receiving streams through streets and public storm sewer systems. Examples of private storm sewer water quality improvements are storm sewer inlet filter systems, erosion protection systems at storm sewer pipe discharge points, vegetated swale or borrow ditch improvements, and detention facility improvements.

Meeting any **ONE** of the following criteria is required for the **total 15 points** towards certification. No partial points are offered.

1. Maintain storm sewer inlet filter systems on private storm sewer inlets on the site. At minimum 50% of private inlets shall permanently be equipped with stormwater filtering or trash removal filter systems. Pollutant filtering or trash removal systems on any underground detention facilities can count towards this criteria also.
2. Provide and maintain permanent erosion protection systems at private storm sewer pipe outlet structures discharging to open channels or borrow ditches.
3. Provide and maintain vegetative or manufactured erosion protective armoring systems on borrow ditches or open channels on the site.
4. Provide and maintain detention facility water quality improvement methods on sites where detention is provided. Sediment settling areas, filtration improvements, wet pond aerators, and other detention improvements designed to improve water quality can count towards this criteria.
5. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 15 points towards certification.

# **Broken Arrow Living Green Private Open Space Maintenance Practices For Existing Non - Residential Developments**

A total of **25 points** will be applied towards “Broken Arrow Living Green” certification for existing non - residential developments providing specified private open space maintenance practices criteria.

Private open space maintenance practices by a private property owner on open spaces, reserve areas, or private landscape areas can provide water quality benefit by reduction of pollution sources associated with vegetation maintenance, pesticide and fertilizer use, wet pond maintenance, irrigation practices, etc. Routine and long term maintenance of open spaces can have significant impacts on water quality within nearby receiving streams.

Meeting **ONE** of the following criteria is required for the **total 25 points** towards certification. No partial points are offered.

1. A City of Broken Arrow approved open space or reserve area operations manual detailing routine and long-term maintenance actions shall be prepared by the property owner. The manual can be prepared by a landscape architect, engineer, or other individual familiar with land management and maintenance practices. The operations and maintenance manual shall show the open space to be maintained and detail required open space maintenance of trees, mowing, ponds, channels, etc. The manual would also encourage native plantings, low water irrigation systems, low impact pesticide and fertilizer uses, and other maintenance actions to minimize negative impacts to water quality. No binding language will require the property owner or tenant to follow specific maintenance practices unless outlined in final plat covenants or actions enforceable by city code.
  
2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 25 points towards certification.

## **Broken Arrow Living Green Bio Retention Filters\Rain Gardens\Sediment Basins for Existing Non - Residential Developments**

A total of **10** points will be applied towards “Broken Arrow Living Green” certification for existing non-residential developments providing and maintaining bio retention filters, rain gardens, or sediment basins.

Bio retention filters, rain gardens, and sediment basins can provide water quality benefits by treating first flush stormwater runoff closest to the source of possible pollutants. Fertilizers, pesticides, automobile fluids, etc. from paved parking lots and lawn areas drain through vegetation and under-drain systems designed to infiltrate low flow runoffs into the ground. Deep rooted vegetation aids in infiltration and provides aesthetic value to green spaces. Permanent sediment basins can act as pollutant filters in areas of rocky soil conditions where infiltration is not likely. Meeting any **ONE** of the following criteria is required for the **total 10 points** towards certification. No partial points are offered.

1. In the case of a single - lot development, provide at least one bio retention filter, rain garden, or sediment basin feature for each 10 gross acres of development. At least one of these features shall be provided on sites smaller than 10 gross acres. The features would typically be on privately owned open space or landscape space and will be maintained by the property owner. Features proposed in areas within street rights of way or utility easements would require review and approval of the Engineering and Construction Department and would require agreements detailing maintenance responsibilities.
2. In the case of multiple – lot developments, provide at least one bio retention filter, rain garden, or sediment basin feature for each 10 gross acres of development. At least one feature shall be provided on sites smaller than 10 gross acres. Features can be constructed on common parking area islands, reserve areas, or other common space areas. Features proposed in areas within street rights of way or utility easements would require review and approval of the Engineering and Construction Department and would require an agreement detailing maintenance responsibilities.
3. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 10 points towards certification.

# Broken Arrow Living Green

## Impervious Surfaces Disconnection for Existing Non - Residential Developments

A total of **10** points will be applied towards “Broken Arrow Living Green” certification for non - residential developments providing impervious surfaces disconnection.

Impervious surfaces disconnection is a water quality design that provides water quality benefits by directing the conveyance of concentrated stormwater flows from impervious areas to areas of vegetation before discharge to receiving streams. Traditional methods of conveying all stormwater flows directly to receiving streams through tight-lined roof drain systems, overland paved areas, storm sewers, and concrete lined channels effectively speeds pollutants within stormwater directly to the receiving stream without a chance for dilution or infiltration to occur. Providing extra length of conveyance across grassed or natural vegetative areas allows infiltration and vegetative filtering of pollutants within the stormwater. Meeting any **TWO** of the following criteria is required for the **total 10 points** towards certification. No partial points are offered.

1. In the case of a single – lot development, sheet flow of private parking or other paved areas across vegetative surfaces before discharge to a storm sewer system or receiving stream. A minimum of 500 square feet of impervious area sheet flowing in this manner would be required. Sheet flow drainage of the paved areas would require design to minimize permanent erosion and siltation effects. Trails or sidewalks would not count for this practice.
2. In the case of a single – lot development, design of roof downspouts directing discharges to vegetative areas disconnected from impervious areas.
3. In the case of a single- lot development, construction of rain barrels, cisterns, or other rainwater collection devices would be performed. Gray water collection systems for reuse of wash water from the building would not count for this practice.\
4. In the case of multiple – lot developments, a minimum of 50% of the individually owned lots shall provide sheet flow of private parking or other paved areas across vegetative surfaces before discharge to a storm sewer system or receiving stream. A minimum of 500 square feet of impervious area sheet flowing in this manner would be required per each lot counted. Trails or sidewalks would not count for this practice.
5. In the case of a multiple – lot developments, a minimum of 50% of the individually owned lots shall provide roof downspouts directing discharges to vegetative areas disconnected from impervious areas.



6. In the case of multiple – lot developments, a minimum of 50% of the individually owned lots shall provide rain barrels, cisterns, or other rainwater collection devices. Gray water collection systems for reuse of wash water from the building would not count for this practice.
7. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 10 points towards certification.

## **Broken Arrow Living Green Nationally Recognized Energy Conservation Program for Existing Non - Residential Developments**

A total of **20 points** will be applied towards “Broken Arrow Living Green” certification for existing non - residential developments providing energy efficient building designs with Energy Star, LEED, Green Globe, or other nationally recognized energy conservation and sustainable design program guidelines.

Energy conservation and sustainability conscious designs or retrofits on building structures can provide multiple environmental and sustainability benefits over the life of a building. Improved water quality, air quality, water conservation, working environment, site aesthetics, pedestrian access, energy consumption, and structure life are some of the benefits of designing to the above listed program design guidelines.

Meeting any **ONE** of the following criteria is required for the **total 20 points** towards certification. No partial points are offered.

1. Design or retrofit of the building structure(s) on the site to meet any one of the below non-residential energy efficient building design certification programs.

Energy Star

LEED

Green Globe

Other nationally recognized energy conservation and sustainable design programs.

The property owner shall show that the existing building structure(s) on the site meet certification criteria for the program claimed for credit.

2. Other proposed methods of meeting the intent and goals of this practice will also be considered for approval of the 20 points towards certification.

# RECOMMENDED PRACTICES FOR CERTIFICATION

## MANUAL GLOSSARY OF TERMS

**Aerator** – An apparatus used for aerating or circulating pond waters.

**Best Management Practice (BMP)** – Schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, structural designs, and other management practices to prevent the discharge of pollutants directly or indirectly to stormwater, receiving waters, or stormwater conveyance systems.

**Bioretention Filter** – An engineered shallow planted depression designed to retain or detain stormwater before it is infiltrated into groundwater or discharges overland downstream.

**Broken Arrow Landscape Code** – The latest and most current version of the landscape requirements within the “Landscaping, Trees, Screening, and Fencing” portion of the City of Broken Arrow Zoning Ordinance.

**Builder** – The individual or company contracted for construction of the residential or non-residential building structure on a lot or development.

**City** – The City of Broken Arrow.

**Detention Pond\Facility** – A wet or dry open area designed for holding and peak flow rate reduction of stormwater flows from a development area.

**Developer** – The individual or group responsible for development of a property. Development typically includes meeting planning and permitting requirements, private and public improvements design and construction, and project management until land within the development is sold to private individuals.

**Easement** – An interest in land owned by another that entitles its holder to a specific limited use or enjoyment. Typical easements include utility easements, overland drainage easements, access easements, and detention easements.

**Forebay Area** – A shallow inflow portion of a wet pond where a depression and vegetation allows dropping out of trash and pollutants from a concentrated stormwater inflow discharge.

**Fountain** – An apparatus producing an above-water artificially produced jet of water within a pond or lake.

**Good Housekeeping During Development** – The practice of erosion, siltation, and pollution control during the construction phase of a development.

**Grove Of Existing Trees** – For the purposes of this manual, a natural and existing group of five or more trees left intact on a development.

Homeowners Association – A legally formed group of homeowners charged with enforcing private covenants and maintaining open spaces and improvements dedicated to the homeowners association on a subdivision plat.

Impervious Area - Any hard surfaced area which prevents or retards the entry of water into the soil in the manner and extent that such water entered the soil under natural conditions, causing water to run off the surface in greater quantities or at an increased rate of flow than was present under natural conditions. Examples include but are not limited to rooftops, asphalt or concrete sidewalks, pavement, driveways and parking lots, walkways, patio areas, storage areas, gravel areas, and oiled macadam or other surfaces which similarly affect the natural infiltration or runoff patterns of real property in its natural state.

Impervious Surface Disconnection – The development and construction practice of separating impervious surfaces with a vegetated or pervious surface in between them to reduce negative impacts of developed runoff.

Infiltration – The act of stormwater passing through vegetation and soil into groundwater beneath the surface of the earth.

Low Impact Development – A land development strategy that attempts to replicate the original pre-development hydrology conditions as best possible to reduce negative stormwater quality and quantity impacts.

Notice of Intent (N.O.I.) – The Notice of Intent Form on an Oklahoma Department of Environmental Quality General Permit OKR10 for Stormwater discharges from construction activities within the state of Oklahoma.

ODEQ – Oklahoma Department of Environmental Quality.

Open Space – Land which is free of structures or impervious surfaces which are not directly related to the use of the open space.

Pollutants – Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes, refuse, rubbish, garbage, litter, or other discarded or abandoned objects; floatables; pesticides, insecticides, herbicides, and fertilizers; hazardous substances and wastes; sewage; fecal coliform; pathogens; dissolved and particulate metals; animal wastes; sediment, wastes and residues that result from constructing a building or structure and/or altering premises; and noxious or offensive matter of any kind.

Property Owner – The person or entity that legally owns or holds a property. In the course of a development, the owner can include developers, builders, real estate companies, or residents.

Rain Garden - A shallow planted depression designed to retain or detain stormwater before it is infiltrated into groundwater or discharges overland downstream. Rain gardens typically contain native plants with deep root systems that encourage infiltration of stormwater into the ground.

Reserve Area – The area within a platted development that is typically kept as open space or is reserved for specific uses by a Homeowners Association.

Right-Of-Way – A strip of land over which is built a public road or public utility.

Regulatory Floodplain Map of Broken Arrow (RFMBA) – The official map on which the Regulatory Flood Area is depicted, using the Regulatory Flood Elevations. The Regulatory Flood Area depicts lands having a one percent (1%) chance of occurring in any one (1) year based upon projected, ultimate urbanized conditions. The Regulatory Flood Area may contain FEMA Flood Insurance Rate Map Base Flood Areas and Broken Arrow Regulatory Flood Fringe Areas.

Sediment Basin – A temporary or permanent depression designed to capture sediment from construction or permanent developed areas. Sediment basins settle out sediment from stormwater flows before it discharges to receiving channels or streams.

Sheet Flow – Stormwater runoff that flows as a sheet of water across a ground surface as opposed to a concentrated open channel flow.

Stormwater Drainage System – Any facility, structure, improvement, development, equipments, property or interest therein, including structural and nonstructural elements, which are made, constructed, used or acquired for the purpose of collecting, containing, storing, conveying, and controlling stormwater wherever; this is located including, but not limited to, storm sewers, conduits, natural and human-made channels, roadways, pipes, culverts, detention facilities, and floodplains whether publicly or privately owned.

Stormwater Pollution Prevention Plan (SP3) – The plan document that details the best management practices to be implemented at a construction site requiring an ODEQ General Permit OKR10. The SP3 shall describe and ensure the implementation of practices that will be used to reduce the pollutants in stormwater discharges associated with construction activity at the development.

Tenant – One who occupies or has temporary possession of property of another.

Vegetated Swale – An open channel with vegetated channel bottom and side slopes. Typically designed for small stormwater discharges at non-erosive velocities.