

L-THIA LID:

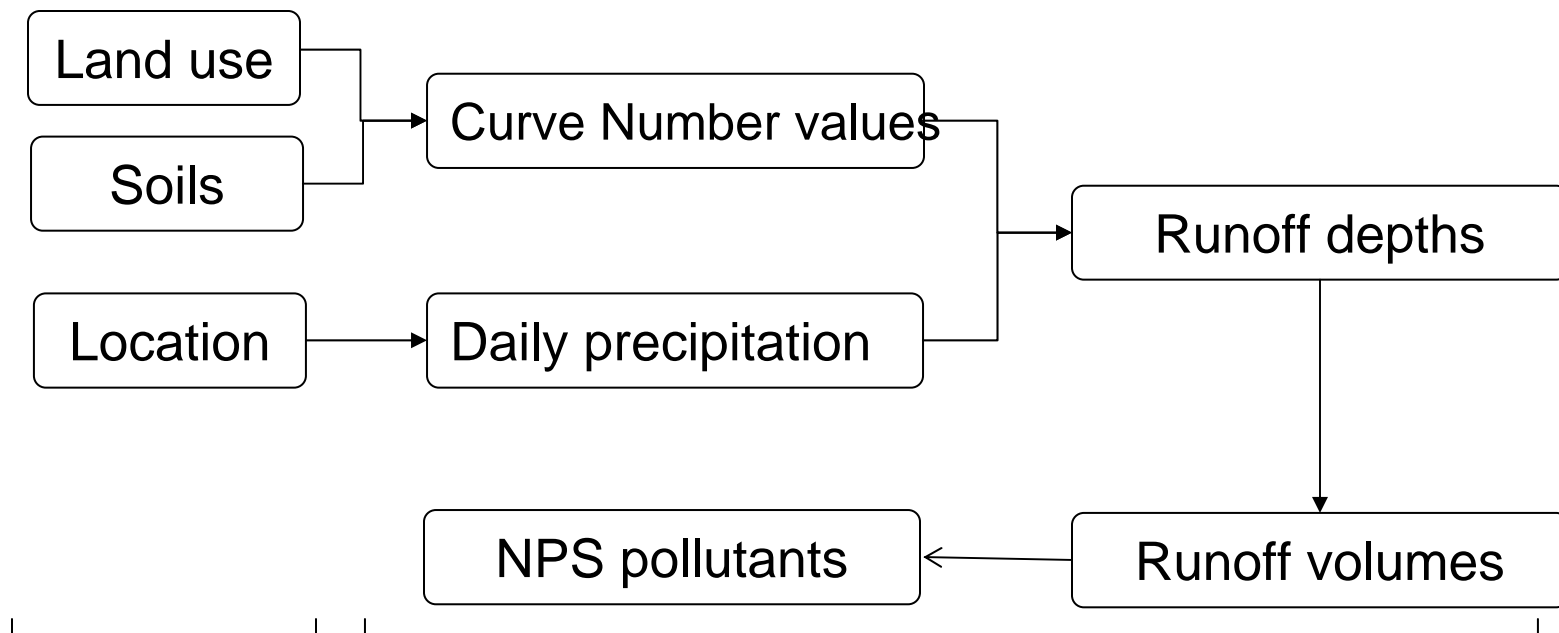
Web-based Low Impact Development
Decision Support and Planning Tool

L-THIA Model

- An overview / screening model
- User friendly tool
- Does not require detailed data input
- Identifies need for more detailed modeling
- Provides "What-If" alternatives evaluation scenarios

L-THIA Model

Data requirements and components for analysis in L-THIA



User supplied
information

Performed by L-THIA



L-THIA Basic Model

Introduction Location Land Use Change **Results** Interpreting the Results

Step Four

Runoff and Nonpoint Source Pollutant Results

Based on the information provided (see Summary of Scenarios), L-THIA estimates the following rates of runoff volume, runoff depth, and nonpoint source pollutants. Results can also be viewed in comparative bar graphs and pie charts by using the pull-down menus located at the top-left of each table.

Go to:

- SCENARIOS
- SCENARIOS
- RUNOFF RESULTS
- Runoff Volume
- Runoff Depth
- Runoff Depth(Landuse)
- NPS POLLUTANTS
- Nitrogen
- Phosphorous
- Suspended Solids**
- Lead
- Copper
- Zinc
- Cadmium
- Chromium
- Nickel
- BOD
- COD
- Oil and Grease
- Fecal Coliform
- Fecal Strep

Print Results

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SUSPENDED SOLIDS View as: Pie chart

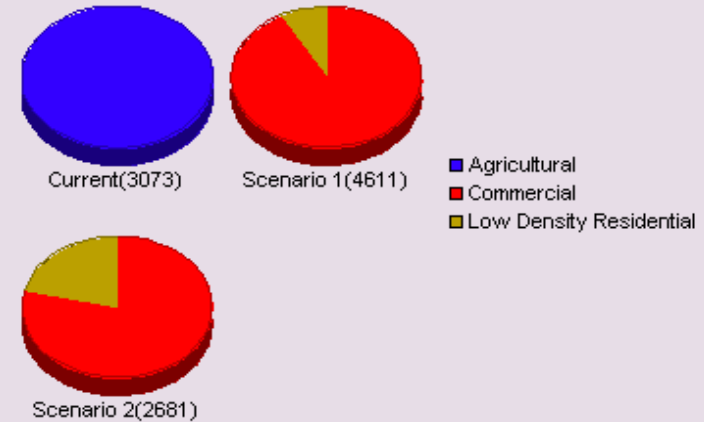
Source	Current	Scenario 1	Scenario 2
Agricultural	100	0	0
Commercial	0	50	25
Low Density Residential	0	50	75

Runoff Volume (acre-ft) View as: Select

Source	Current	Scenario 1	Scenario 2
Agricultural	10.54	0	0
Commercial	0	28.01	14.00
Low Density Residential	0	3.36	5.04
Total Annual Volume (acre-ft)	10.54	31.37	19.04

Also view [Annual Variation](#) and [Probability of Exceedence](#)

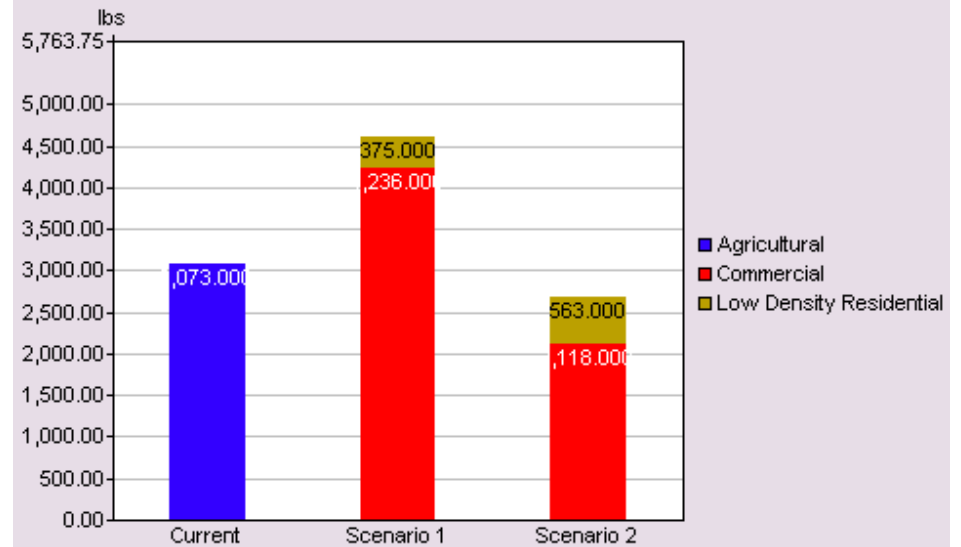
Average Annual Suspended Solids Losses in lbs



Close

Print Results

Average Annual Suspended Solids Losses in lbs



Low Impact Development (LID)

- An approach to land development to mimic the pre-development site hydrology to reduce runoff and NPS.
 - ❖ Conservation
 - Forest/Woods
 - Infiltrable Soils
 - ❖ Minimization
 - Reduce imperviousness
 - Soil Compaction
 - ❖ Storage, Detention & Filtration
 - Rain gardens
 - Drainage swales
 - Green roofs
 - Porous Pavement

<http://cobweb.ecn.purdue.edu/runoff/lthianew/lidIntro.htm>

L-THIA LID

Selection of
Location

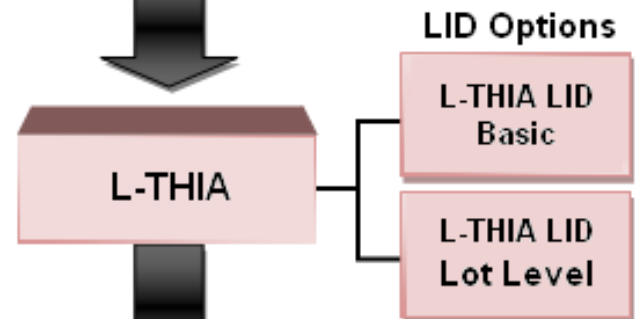
L-THIA Input

Model

Output

Choose county and state
from pull down pick lists

- User Specifies Land use
 - o Area (size) & Type (i.e. Commercial)
- Hydrologic Soil Groups
- 30-50 years of weather data



Tables
Graphs
Charts

L-THIA LID Basic

Application: Target preliminary goals at the watershed and site level

- Reduce imperviousness
- Conserve infiltratable soils
- Conserve functional / sensitive landscape
- Minimize land disturbances
- Anticipate need for other LID practices to reduce NPS and stormwater volume

Local Government Environmental Assistance Network

HOT TOPICS	WHAT'S NEW?	REGULATORY INFORMATION	TOOLS & RESOURCES	CALENDAR
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LOW IMPACT DEVELOPMENT

Introduction	Location	Land Use Change	Low Level LID	High Level LID	Results
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Introduction to L-THIA Low Impact Development

Low Impact Development (LID) practices aim to reduce the impacts of stormwater and pollutants from land development. The goal of LID is to maintain, as closely as possible, the predevelopment hydrologic regime for new developments or move toward the original hydrologic regime in existing urban areas.

L-THIA/LID is an easy to use screening tool that evaluates the benefits of LID practices. The Long-Term Hydrologic Impact Assessment (L-THIA) model estimates the average annual runoff and pollutant loads for land use configurations based on more than 30 years of daily precipitation data, soils, and land use data for an area. In this model of the L-THIA, users need only to input the follow:

- location (state and county)
- type of soil in the area where the land use change is to occur (available online if unknown)
- type and size of land use change that will occur (e.g., 100 acres of agricultural land converted to 50 acres high-density residential and 50 acres commercial).
- LID practice(s) to screen.

The L-THIA/LID model consists of two screening levels for the LID approach. Low-level screening allows the users to adjust the percent of imperviousness for particular landuses. High-level screening consists of a suite of LID practices such as bio-retention (rain gardens), porous pavement, narrowing impervious surfaces (streets, sidewalks and driveways) and vegetated rooftops. These practices intercept, redirect, and slow the movement of runoff and pollutants moving through a watershed.

L-THIA/LID will generate estimated runoff volumes, depths, and expected nonpoint source pollution loadings to waterbodies, based on the information provided by the user. Results can be displayed in tables, bar graphs, and pie charts.

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<http://cobweb.ecn.purdue.edu/runoff/lthianew/lidIntro.htm>



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Location of Land Use Change

Users must input the state and county where the land change will occur. This information is used to select the climate data specific to that area.

In what state is the proposed land use taking place?

In what county?

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L-THIA LID: Lot Level Screening Tool

Application: Target preliminary goals at the site or watershed level by adjusting lot level features

- Site Design & Development preparation
 - Narrowing impervious areas (sidewalks, driveways, roads)
 - Natural resource preservation
 - Heavy equipment use → compaction
 - Permeable paving materials
 - Vegetative roof systems
- Bioretention cells
- Vegetated swales /Filter strips
- Rain barrels
- Disconnect impervious areas



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Land Use Change Scenarios

Users must identify the current land use for a specific area, and can describe up to two land use change scenarios. Users can select as many land use descriptions as necessary to describe the current land use or land use change scenarios. Users must also describe each land use description's size and soil type. Size can be entered in either acres, square miles, hectares, or square kilometers. If unknown, soil types can be determined using the link below to search GIS maps of your region. Help is available by clicking on any of the question mark icons. (**Important:** The total area of the current land use and each of the land use change scenarios must be equal before L-THIA can run).

STEP 1: Specify units for area : ?

STEP 2: Enter the pre-developed land use and area

Land Use ?	Soil Type ?	Pre-Developed Area ?
(Use as many as necessary)	Check Map	
Grass/Pasture	A	100
SELECT LAND USE	A	
SELECT LAND USE	A	
SELECT LAND USE	A	
Total Area:		100

STEP 3: Enter the post-developed land use and area

Land Use [?]		Soil Type [?]	Post-Developed Area [?]	
(Use as many as necessary)		Check Map	Total	With LID area <input type="text"/>
1.	<input type="text" value="Commercial"/>	<input type="text" value="B"/>	<input type="text" value="50"/>	<input type="text" value="50"/>
2.	<input type="text" value="High Density Residential"/>	<input type="text" value="B"/>	<input type="text" value="25"/>	<input type="text" value="25"/>
3.	<input type="text" value="Low Density Residential"/>	<input type="text" value="B"/>	<input type="text" value="25"/>	<input type="text" value="25"/>
4.	<input type="text" value="SELECT LAND USE"/>	<input type="text" value="A"/>	<input type="text" value=""/>	<input type="text" value=""/>
5.	<input type="text" value="SELECT LAND USE"/>	<input type="text" value="A"/>	<input type="text" value=""/>	<input type="text" value=""/>
6.	<input type="text" value="SELECT LAND USE"/>	<input type="text" value="A"/>	<input type="text" value=""/>	<input type="text" value=""/>
Total Area:			<input type="text" value="100"/>	<input type="text" value="100"/>

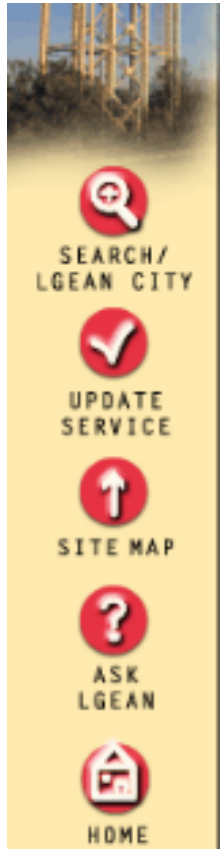
STEP 4: Select the level of LID screening you wish to perform.

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<input type="text" value="Basic LID Screening"/>
<input type="text" value="Basic LID Screening"/>
<input type="text" value="Lot Level LID Screening"/>



LOW IMPACT DEVELOPMENT

Introduction	Location	Land Use Change	Basic LID	Lot Level LID	Results
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Land Use	Impervious %	
	Default	Adjusted
Residential 1/8 acre	<input type="text" value="65"/>	<input type="range" value="65"/> 65
Residential 1/2 acre	<input type="text" value="25"/>	<input type="range" value="25"/> 25
Commercial	<input type="text" value="85"/>	<input type="range" value="85"/> 85

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Land Use	Impervious %	
	Default	Adjusted
Residential 1/8 acre	<input type="text" value="65"/>	<input type="range" value="50"/> 50
Residential 1/2 acre	<input type="text" value="25"/>	<input type="range" value="20"/> 20
Commercial	<input type="text" value="85"/>	<input type="range" value="70"/> 70

Runoff and Nonpoint Source Pollutant Results

Based on the information provided (see Summary of Scenarios), L-THIA estimates the following rates of runoff volume, runoff depth, and nonpoint source pollutants. Results can also be viewed in comparative bar graphs and pie charts by using the pull-down menus located at the top-left of each table.


Go to:

SCENARIOS 

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SUMMARY OF SCENARIOS

View as: 

State: **Indiana**

County: **Tippecanoe**

Land Use	Hydrologic Soil Group	Pre-Developed	acres Post-Developed W/o LID	Post-Developed With LID As Proposed
Grass/Pasture	B	100	-	-
Commercial	B	-	50	50
Residential 1/8 acre	B	-	25	25
Residential 1/2 acre	B	-	25	25

PERCENTAGE IMPERVIOUS

Land Use	Default	Adjusted
Residential 1/8 acre	65	50
Residential 1/2 acre	25	20
Commercial	85	70

COMPOSITE CURVE NUMBER

Current	Post-Developed W/o LID	Post-Developed With LID As Proposed
61	85	80

RUNOFF RESULTS ?

Avg. Annual Runoff Volume (acre-ft)

View as: 

Land Use	Current	Post Developed W/o LID	Post Developed With LID
Grass/Pasture	6.97	-	-
Commercial	-	50.00	30.62
High Density Residential	-	12.84	7.78
Low Density Residential	-	3.75	3.23
Total Annual Volume (acre-ft)	6.97	66.60	41.64

RUNOFF RESULTS ?

Avg. Annual Runoff Volume (acre-ft)

View as:

Land Use	Current	Post Developed W/o LID	
Grass/Pasture	6.97	-	
Commercial	-	50.00	30.62
High Density Residential	-	12.84	7.78
Low Density Residential	-	3.75	3.23
Total Annual Volume (acre-ft)	6.97	66.60	41.64

Also view [Annual Variation](#) and [Probability of Exceedence](#)

Avg. Annual Runoff Depth (in)

View as:

Current	Post-Developed W/o LID	Post-Developed With LID As Proposed
0.83	7.99	4.99

Avg. Runoff Depth by Landuse

View as:

Land Use	Hydrologic Soil group	Curve Number		Runoff
		W/o LID	With LID	W/o LID
Grass/Pasture	B	61	-	0.84
Commercial	B	92	87	12.05
Residential 1/8 acre	B	85	79	6.19
Residential 1/2 acre	B	70	68	1.81

Average Annual Rainfall Depth (in)

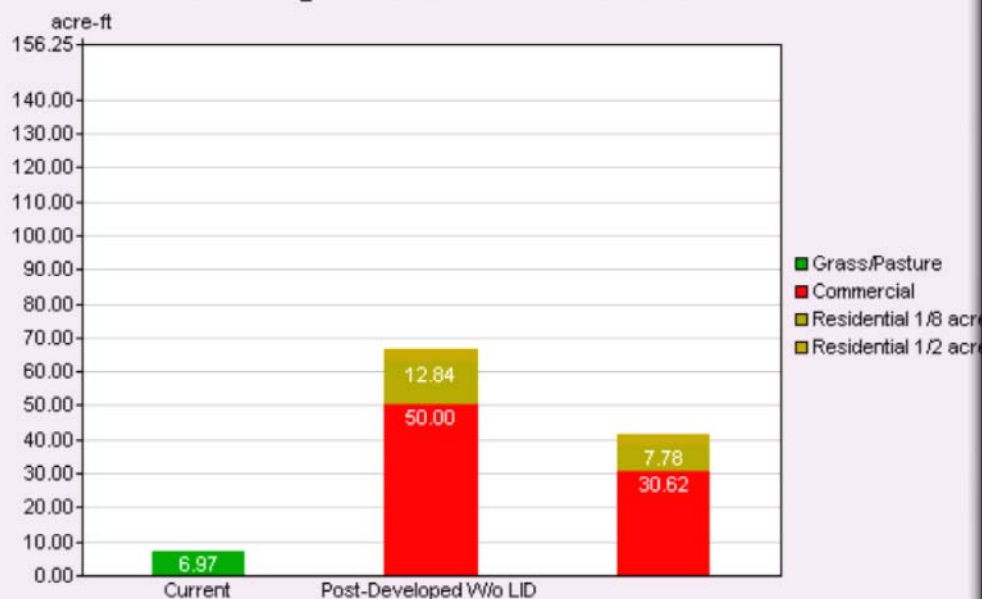
NONPOINT SOURCE POLLUTANT RESULTS ?

Nitrogen (lbs)

View as:

Land Use	Pre-Developed	Post-Developed W/o LID	Post-Developed With LID As Proposed

Average Annual Runoff Volume



Close

Print Results

NONPOINT SOURCE POLLUTANT RESULTS ?

Nitrogen (lbs)

View as: Bar graph ▾

Land Use	Pre-Developed	Post-Developed W/o LID	
Grass/Pasture	13	-	-
Commercial	-	182	111
High Density Residential	-	63	38
Low Density Residential	-	18	16
Total	13	263	165

- Select
- Bar graph
- Pie chart

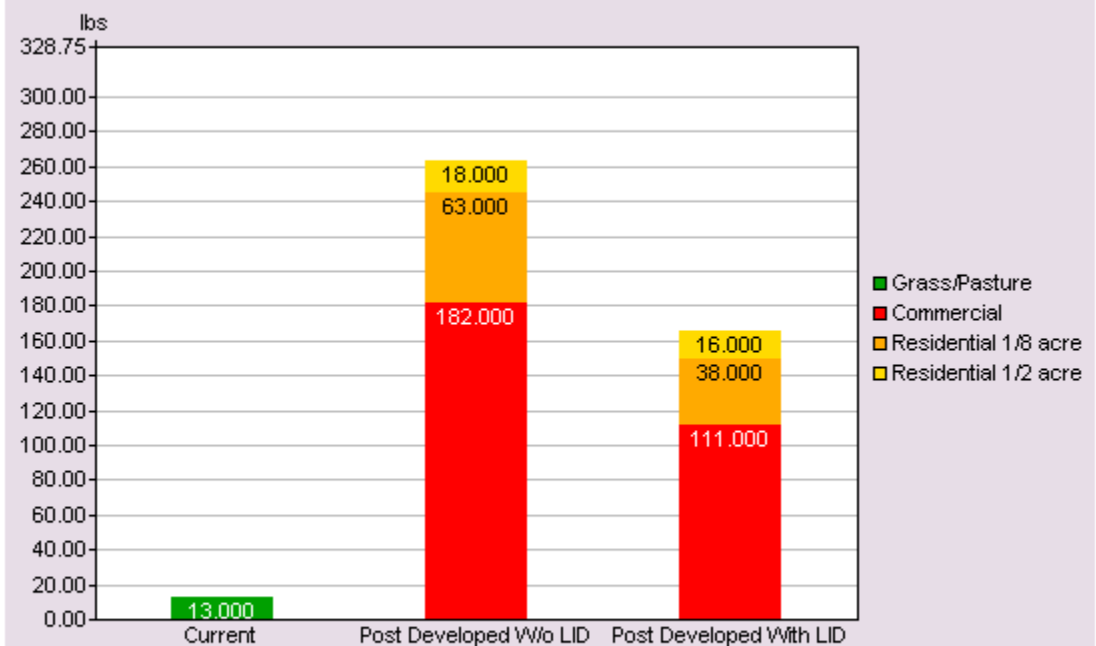
Phosphorous (lbs)

Land Use	Pre-Developed	Post-Developed LID
Grass/Pasture	0.189	-
Commercial	-	43
High Density Residential	-	19
Low Density Residential	-	5
Total	0.189	67

Suspended Solids (lbs)

Land Use	Pre-Developed	Post-Developed LID
Grass/Pasture	18	-
Commercial	-	7562
High Density Residential	-	1434
Low Density Residential	-	419
Total	18	9415

Average Annual Nitrogen Losses in lbs



Close

Print Results

STEP 3: Enter the post-developed land use and area

Land Use ?		Soil Type ?	Post-Developed Area ?	
(Use as many as necessary)		Check Map	Total	With LID area ▼
1.	Commercial ▼	B ▼	50	50
2.	Low Density Residential ▼	B ▼	25	25
3.	High Density Residential ▼	B ▼	25	25
4.	SELECT LAND USE ▼	A ▼		
5.	SELECT LAND USE ▼	A ▼		
6.	SELECT LAND USE ▼	A ▼		
Total Area:			100	100

STEP 4: Select the level of LID screening you wish to perform.

Basic LID Screening ▼
 Basic LID Screening
 Lot Level LID Screening

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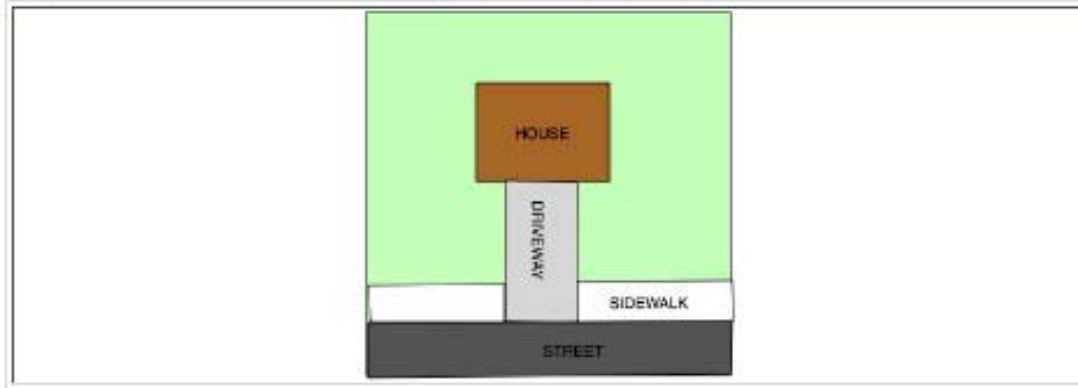
Lot Level
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Low Density Residential

Commercial

High Density Residential



+ LANDUSE 2 - 1/2 acre lot

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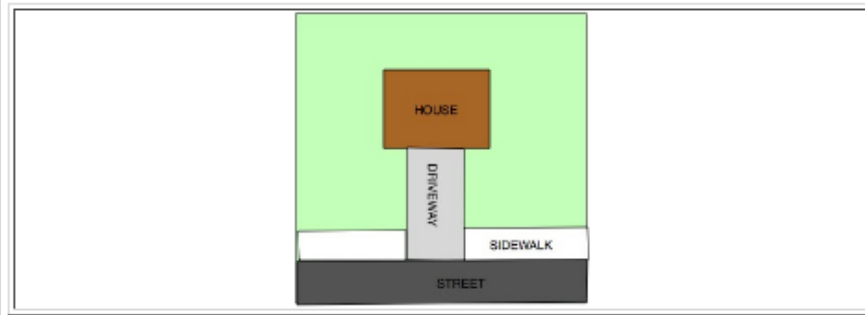
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Low Density Residential

Commercial

High Density Residential



+ LANDUSE 2 - 1/2 acre lot

Soil Group: B Total Area: 25 With LID: 25

+ Street/Roads

Width ft

- Conventional/curb & gutters/connected
- Curb and gutter & porous pavement/connected
- Swales/disconnection
- Swales & porous pavement/disconnection
- Disconnection

+ Buildings/Roofs

Building area Sq. ft

- Conventional
- Rain barrels
- Cisterns
- Green Roofs
- Downspout/Disconnection

+ Sidewalks

+ Parking/Driveway

+ Open Space/Lawn

Open space/Lawn area Sq. ft

Grass condition

- Bio-retention/raingarden

+ Natural Resource Conservation



LOW IMPACT DEVELOPMENT

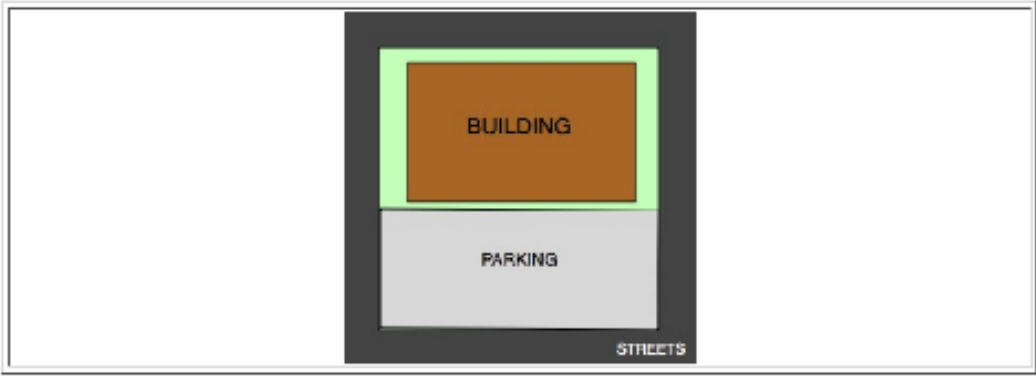
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Low Density Residential	Commercial	High Density Residential
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The diagram shows a rectangular lot boundary. Inside the lot, there is a brown square labeled 'BUILDING' and a grey rectangle labeled 'PARKING' below it. A light green border surrounds the building. The word 'STREETS' is written at the bottom right corner of the lot boundary.

+ LANDUSE 1

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+ LANDUSE 1

Soil Group: B Total Area: 50 With LID: 50

+ **Street/Roads**

+ **Buildings/Roofs**

- Conventional
- Rain barrels
- Cisterns
- Green Roofs
- Downspout/Disconnection

+ **Sidewalks**

+ **Parking/Driveway**

+ **Open Space/Lawn**

+ **Natural Resource Conservation**

For more information and a list of tools:

- <http://cobweb.ecn.purdue.edu/~watergen/>
 - L-THIA
 - L-THIA LID
 - Web-GIS tools (Online LTHIA) for Spatial Hydrologic Analysis

Potential Next Steps

- Additional LID practices
- Other BMPs
- Integration with web GIS tools for NW Indiana and Swan Creek