

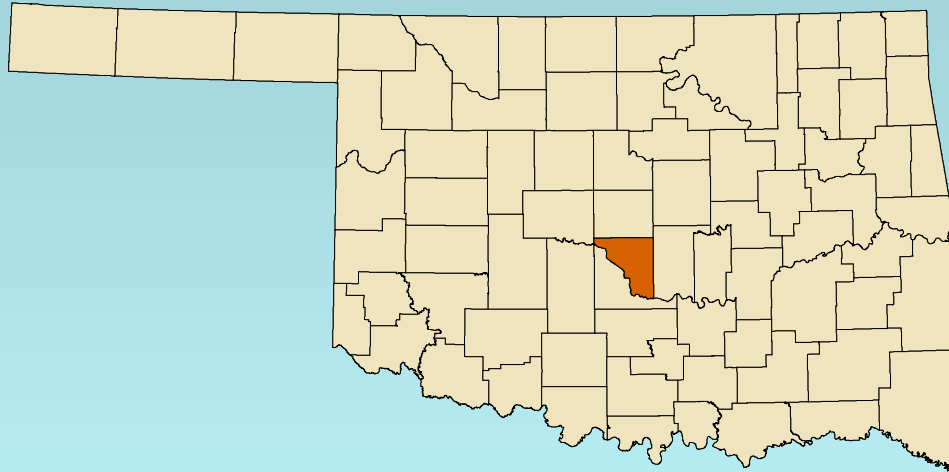
# Citywide Data Collection

To Support Stormwater Regulations  
And Management

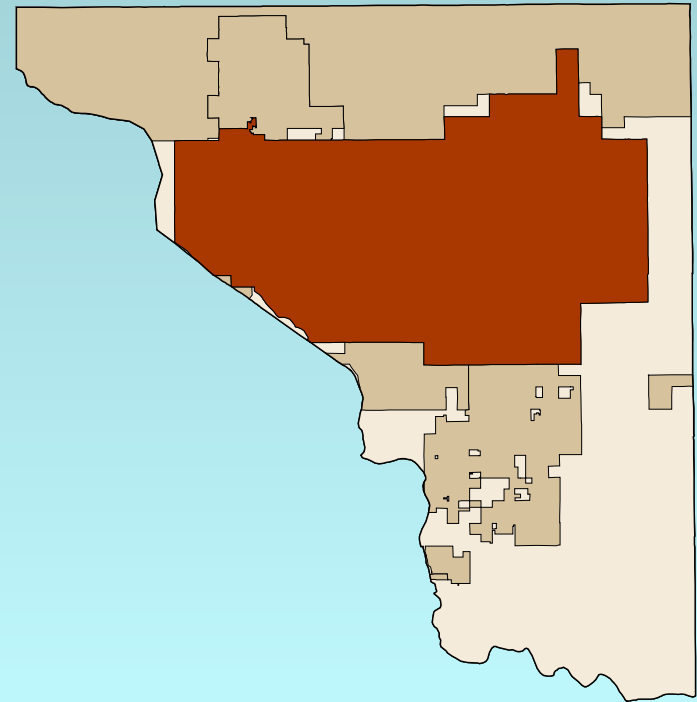
Joyce J. Green  
GIS Manager  
City of Norman

# The Setting...

Cleveland County in Oklahoma...



Norman in Cleveland County...



# The Setting

- Third largest city in Oklahoma
  - Land Area ~ 189.5 Square Miles
  - Population ~ 120,000
  - ESRI User Since 1992



# Core datasets

- Aerial photography/ Orthoimagery
- Planimetric Mapping of Impervious Surfaces
- LiDAR
- Contours
- FEMA Flood Insurance Rate Maps and Revisions
- Stream Planning Corridors
- Stormwater Infrastructure

# Orthoimagery

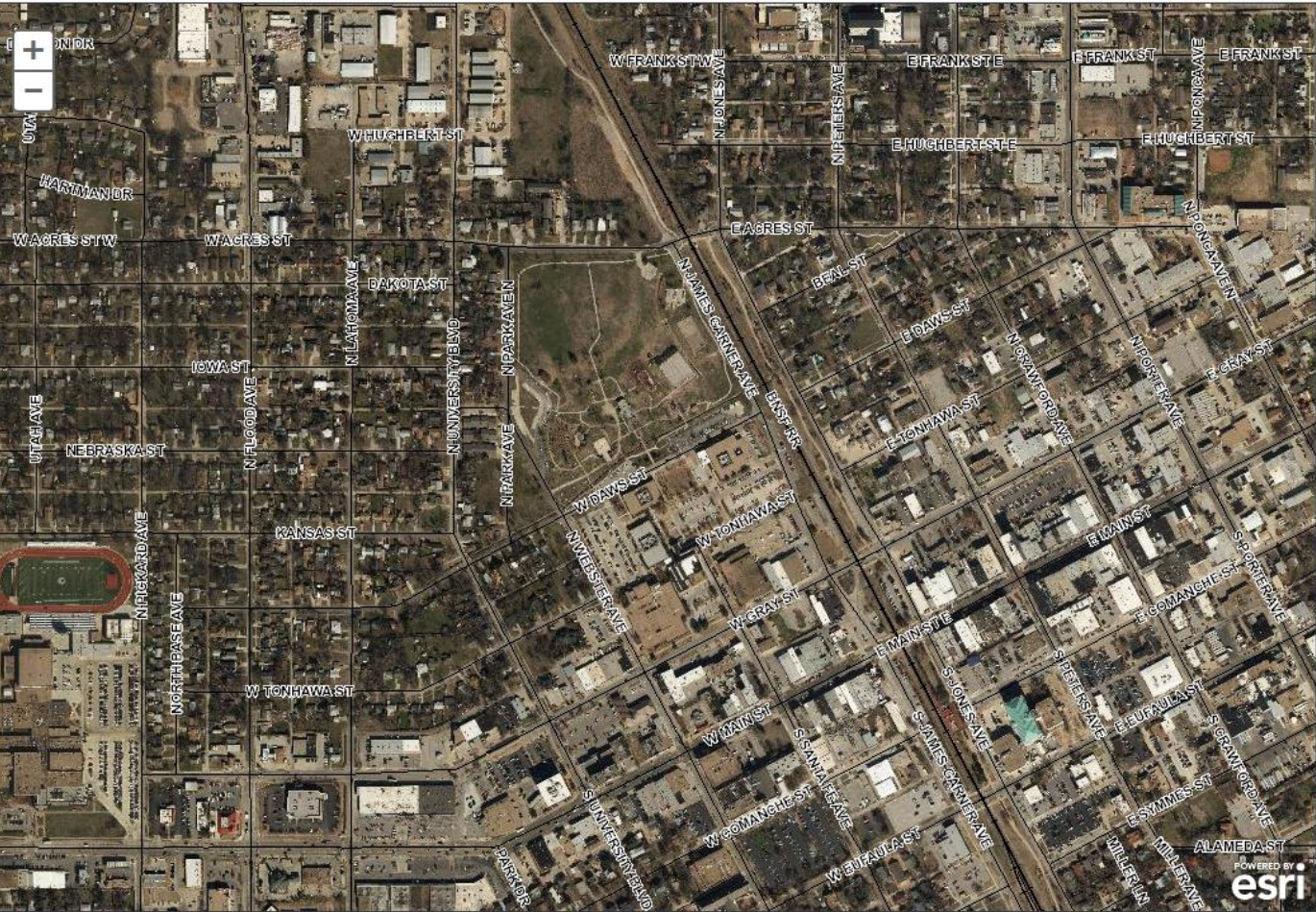
- Since 2010 3 inch Pixels in urbanized area 6 inch in Rural Area
- Fly in leaf off conditions
- Sun angle not less than 35 degrees
- Cloud free
- Snow free
- No standing water

# Norman Interactive Base Map

201 West Daws, Norman

[Help](#)

 Zoom In
  Zoom Out
  Prev Extent
  Next Extent
  Pan



## Select Map Layers

- |                                     |                          |                            |
|-------------------------------------|--------------------------|----------------------------|
| <input type="checkbox"/>            | <input type="checkbox"/> | City Council wards         |
| <input type="checkbox"/>            | <input type="checkbox"/> | SolidWasteDay              |
| <input type="checkbox"/>            | <input type="checkbox"/> | RecyclingRoutes            |
| <input type="checkbox"/>            | <input type="checkbox"/> | School                     |
| <input type="checkbox"/>            | <input type="checkbox"/> | School Attendance Boundary |
| <input type="checkbox"/>            | <input type="checkbox"/> | Floodplain (2013)          |
| <input type="checkbox"/>            | <input type="checkbox"/> | Stream Planning Corridors  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | City Boundary              |

## Imagery

- ☒ 2015-Citywide
- ☐ 2013-Citywide
- ☐ 2010-Citywide
- ☐ 2007-Urban
- ☐ 2005-Urban
- ☐ 2001-Urban
- ☐ 1997-Urban
- ☐ 2007-Rural
- ☐ 2005-Rural
- ☐ 2001-Rural
- ☐ 1997-Rural

### Legend

## Measurement Tools

## Drawing Tools

## Add Text

## Generate PDF

### Export GIS Layers



## Clear Graphics

# Planimetric

- Buildings
- Roads
- Parking
- Driveways
- Sidewalks
- Patios
- Pools
- Streams
- Waterbodies

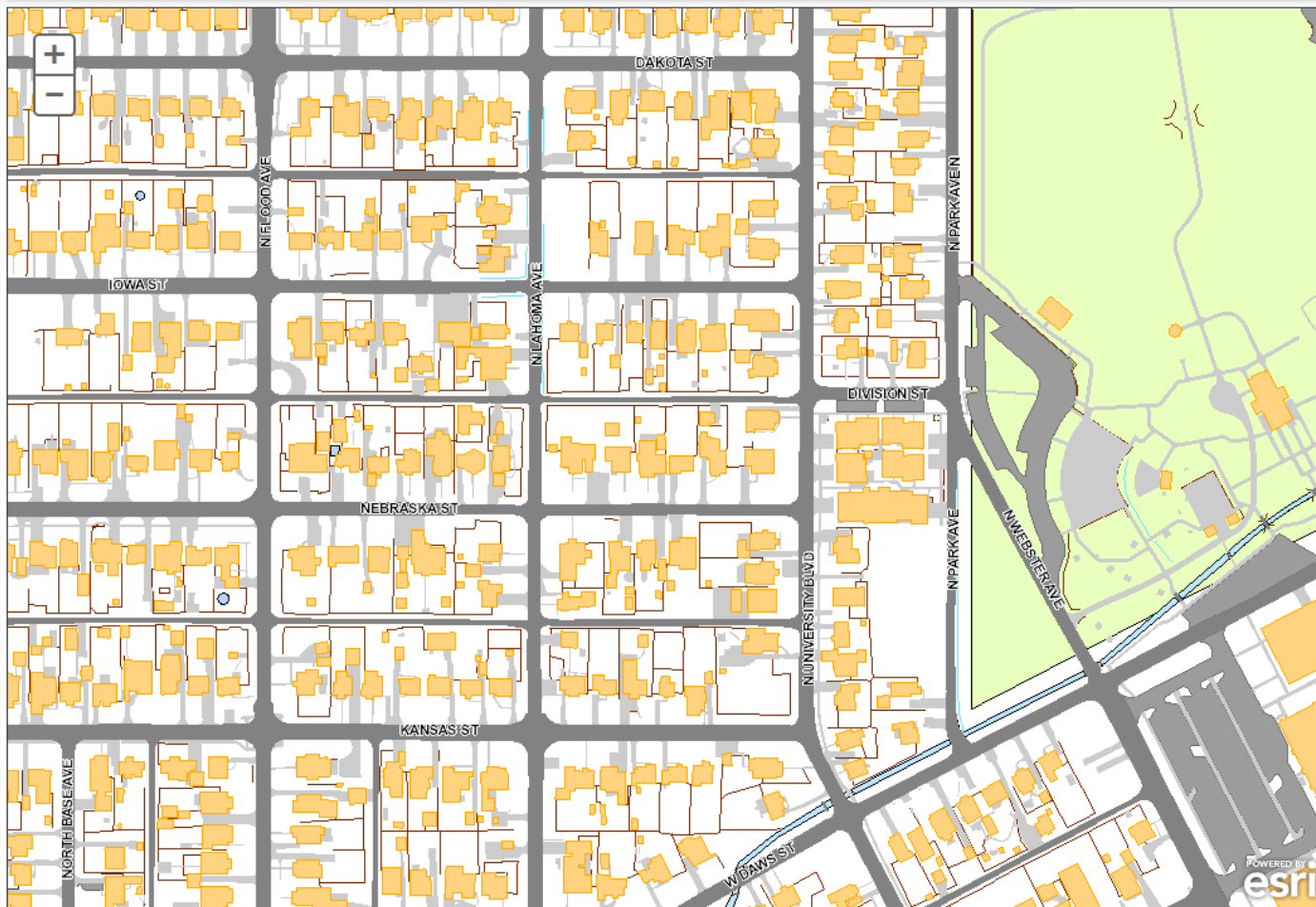
# Norman Interactive Base Map

201 West Daws, Norman

Locate

[Help](#)

Zoom In Zoom Out Prev Extent Next Extent Pan



## Select Map Layers

- ☐ Gravity Main
- ☐ Laterals

## Storm Drainage

Visible Active Layer

- ☐ Storm Drainage Points
- ☐ Storm Drainage Lines
- ☐ Storm Drainage Area

## Planimetric

Visible Active Layer

- ☐ Contour Urban 1 foot (2007)
- ☐ Contour Rural 2 foot (2007)
- ☒ Building
- ☒ Road
- ☒ Pavement
- ☒ Parking
- ☒ Pool
- ☒ Fences
- ☒ Lakes, Ponds, Major Streams
- ☒ Smaller streams, other draina

## Planning

Visible Active Layer

- ☐ Easement

## Legend

## Measurement Tools

## Drawing Tools

## Add Text

## Generate PDF

## Export GIS Layers

Clear Graphics



0 100 200ft

# LiDAR and derived data

- Hydro-flattened bare-earth raster digital elevation model (DEM). A DEM in ESRI format devoid of sinks with consistent water body surface elevations
- Vertical Accuracy Report
- Digital Terrain Model
- File geodatabase of topographic contours at 1 foot intervals (lines) in urban area and 2 foot intervals in rural
- Breaklines representing all hydrologically flattened features and edges in project
- Raw Point File

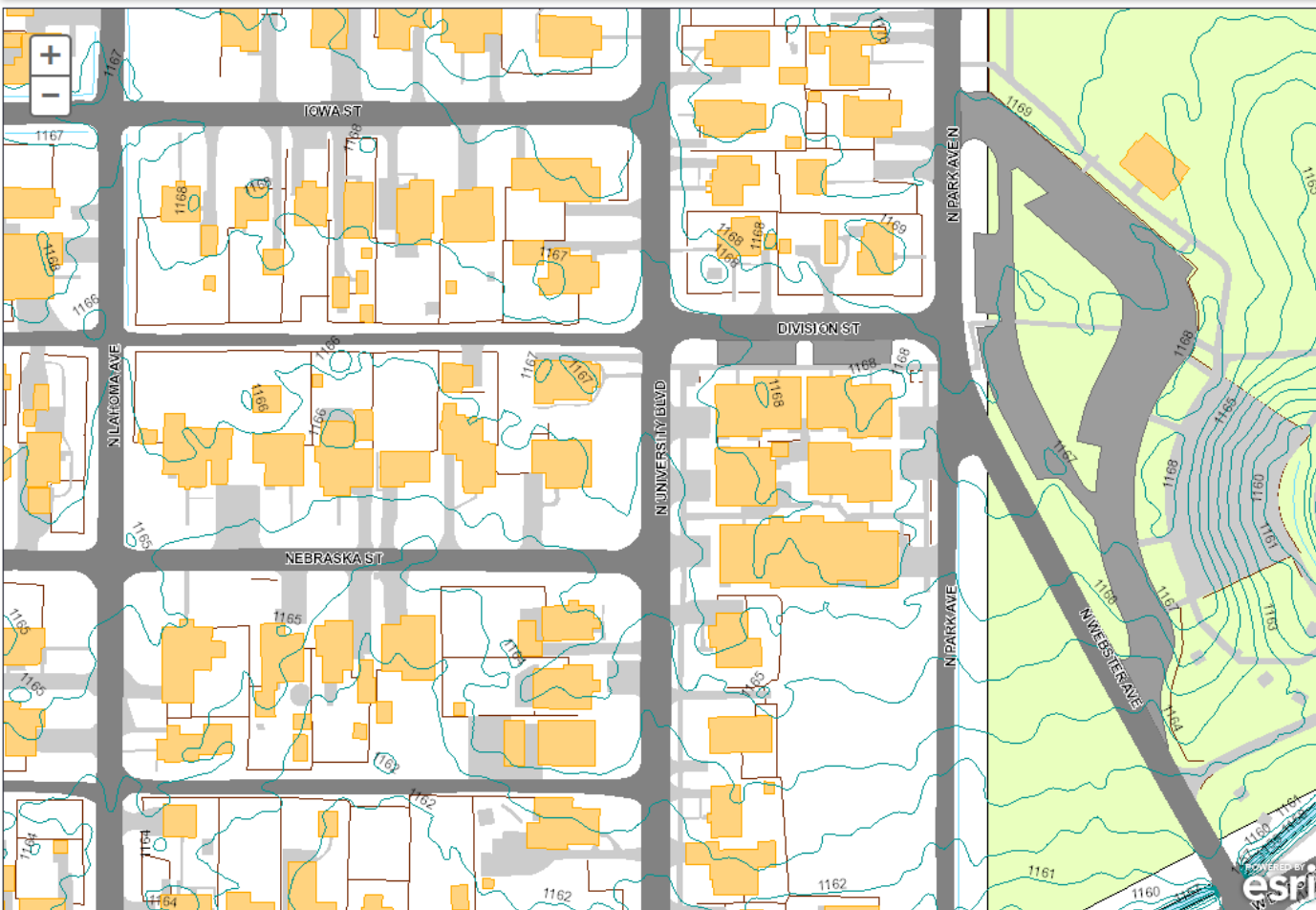
# Norman Interactive Base Map

201 West Daws, Norman

Locate

Zoom In Zoom Out Prev Extent Next Extent Pan

Help



## Select Map Layers

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- ☒ Lakes, Ponds, Major Streams
- ☒ Smaller streams, other draina

## Planning

Visible Active Layer

- ☐ Easement

## Legend

## Measurement Tools

## Drawing Tools

## Add Text

## Generate PDF

## Export GIS Layers



0 50 100ft

Clear Graphics

# Floodplain

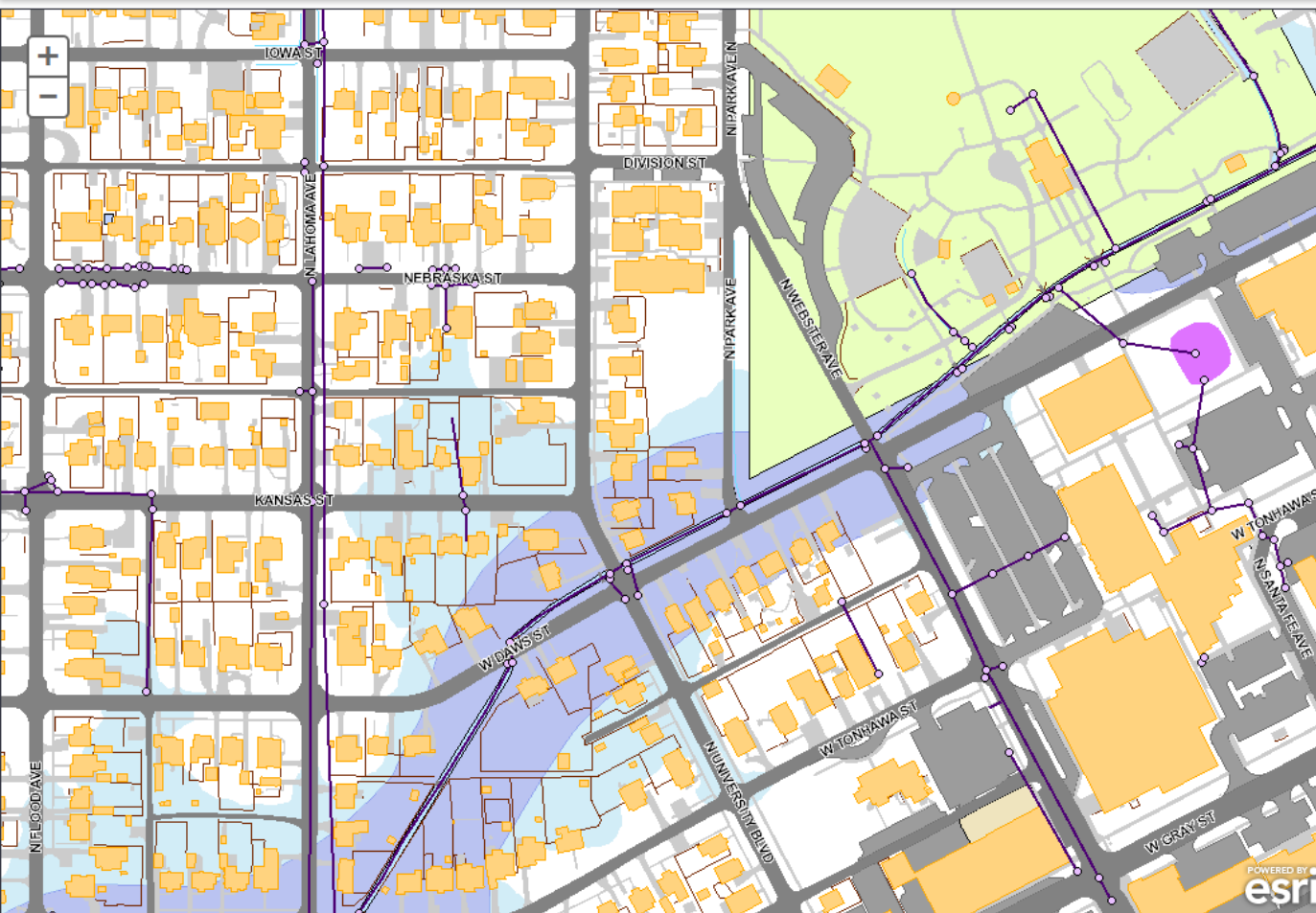
- FEMA
- Map Revisions
- Stream Planning Corridors

# Norman Interactive Base Map

201 West Daws, Norman

Locate

Zoom In Zoom Out Prev Extent Next Extent Pan

[Help](#)

## Select Map Layers

- ☐ Historic Districts
- ☐ Porter Commercial Limit
- ☐ CDBG Neighborhoods
- ☐ Core Area
- ☐ Enterprise Zone

## General Information

Visible Active Layer

- ☒ Streets
- ☒ Railroad
- ☒ Lake Thunderbird
- ☒ Park
- ☒ OU
- ☐ City Council Wards
- ☐ SolidWasteDay
- ☐ RecyclingRoutes
- ☐ School
- ☐ School Attendance Boundary
- ☒ Floodplain (2013)
- ☒ Stream Planning Corridors
- ☒ City Boundary

## Imagery

## Legend

## Measurement Tools

## Drawing Tools

## Add Text

## Generate PDF

## Export GIS Layers



0 100 200ft

Clear Graphics

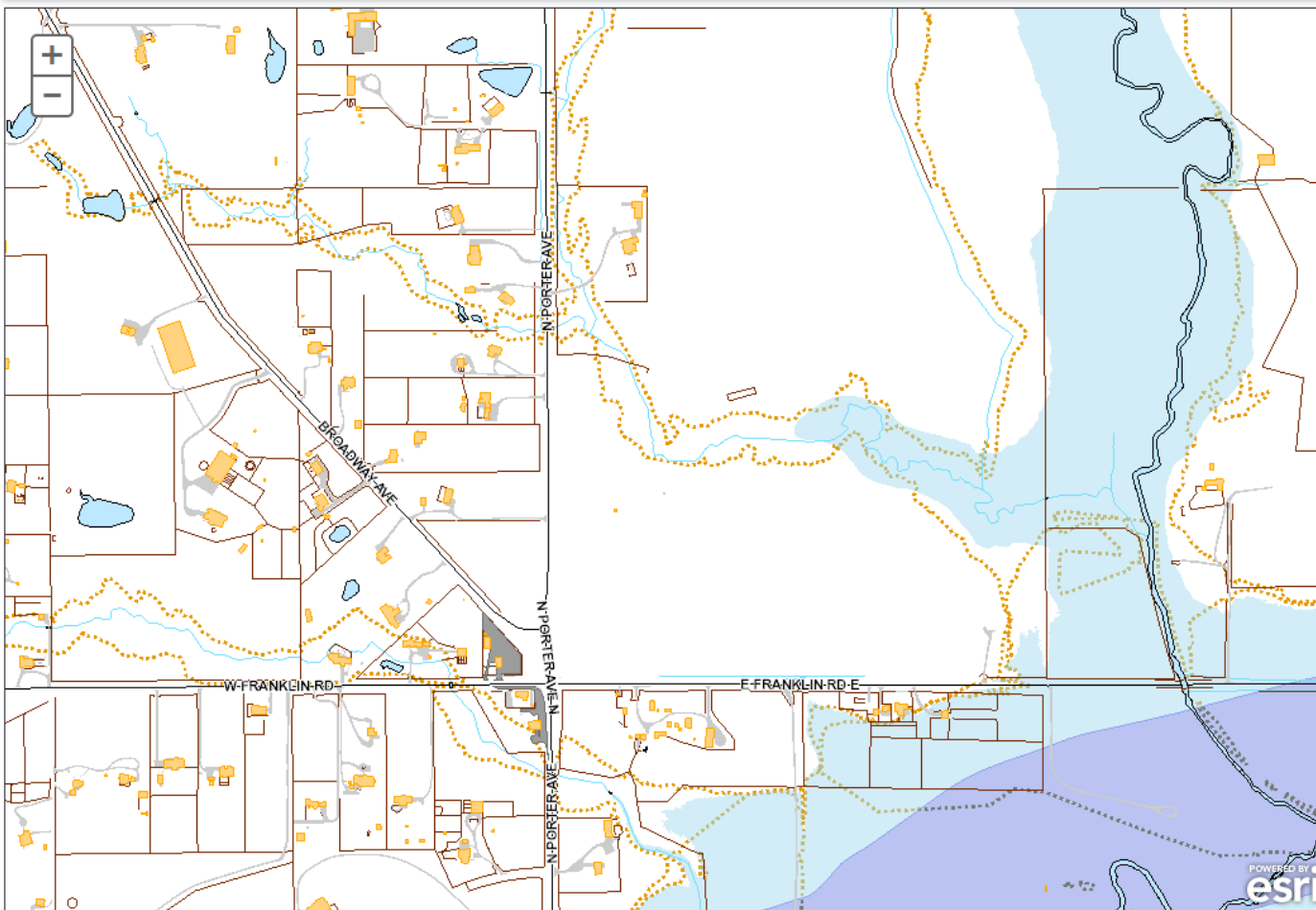
# Norman Interactive Base Map

201 West Daws, Norman

Locate

Zoom In Zoom Out Prev Extent Next Extent Pan

Help



## Select Map Layers

- ☐ Historic Districts
- ☐ Porter Commercial Limit
- ☐ CDBG Neighborhoods
- ☐ Core Area
- ☐ Enterprise Zone

## General Information

- | Visible                             | Active                   | Layer                      |
|-------------------------------------|--------------------------|----------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Streets                    |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Railroad                   |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Lake Thunderbird           |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Park                       |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | OU                         |
| <input type="checkbox"/>            | <input type="checkbox"/> | City Council Wards         |
| <input type="checkbox"/>            | <input type="checkbox"/> | SolidWasteDay              |
| <input type="checkbox"/>            | <input type="checkbox"/> | RecyclingRoutes            |
| <input type="checkbox"/>            | <input type="checkbox"/> | School                     |
| <input type="checkbox"/>            | <input type="checkbox"/> | School Attendance Boundary |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Floodplain (2013)          |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Stream Planning Corridors  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | City Boundary              |

## Imagery

## Legend

## Measurement Tools

## Drawing Tools

## Add Text

## Generate PDF

## Export GIS Layers



0 300 600ft

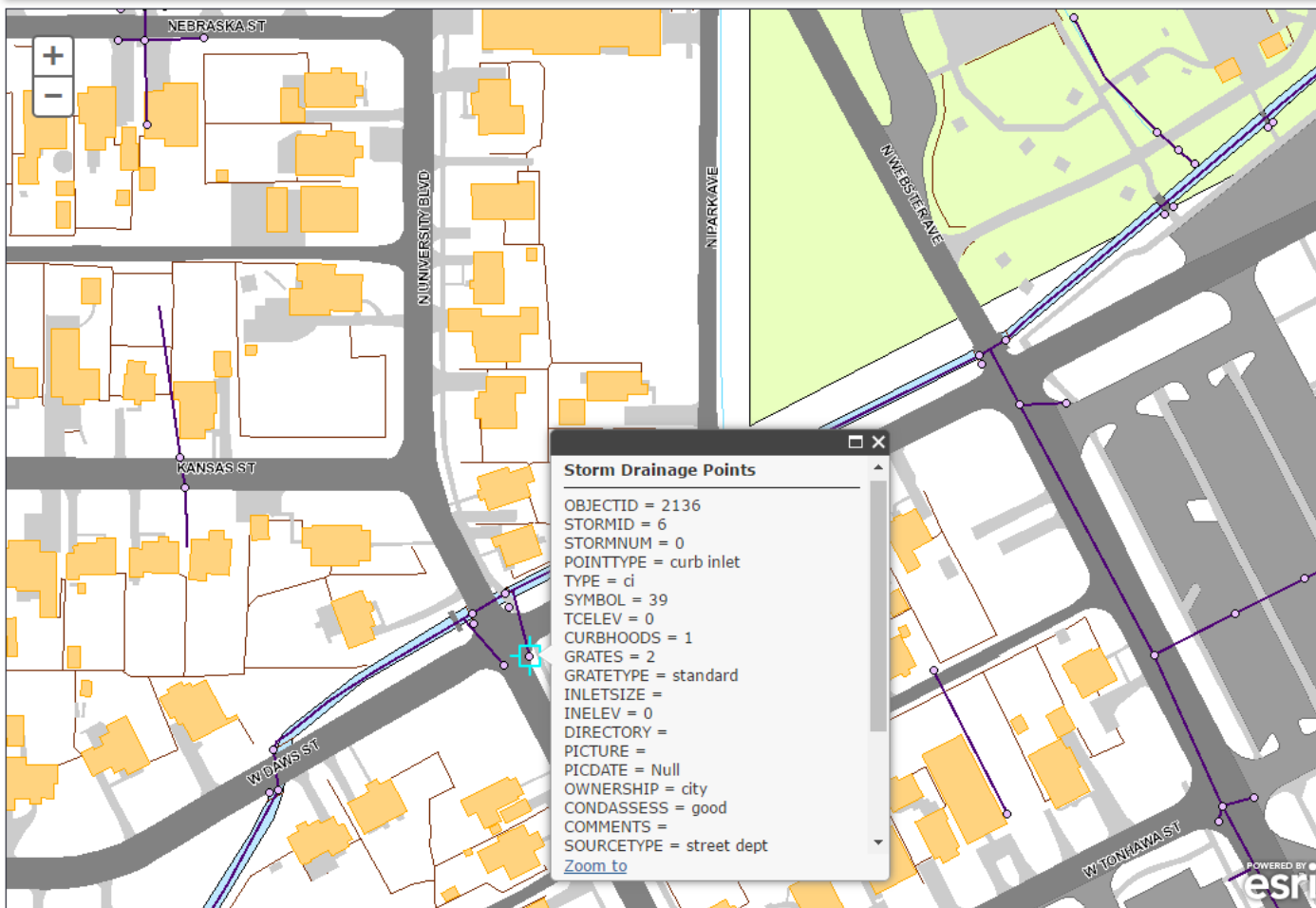
Clear Graphics

# Norman Interactive Base Map

201 West Daws, Norman [Locate](#)

[Help](#)

[Zoom In](#) [Zoom Out](#) [Prev Extent](#) [Next Extent](#) [Pan](#)



## Select Map Layers

- ☐ Gravity main
- ☐ Laterals

## Storm Drainage

Visible Active Layer

- ☒ ☒ Storm Drainage Points
- ☒ ☐ Storm Drainage Lines
- ☒ ☐ Storm Drainage Area

## Planimetric

Visible Active Layer

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- ☐ ☐ Contour Rural 2 foot (2007)
- ☒ ☐ Building
- ☒ ☐ Road
- ☒ ☐ Pavement
- ☒ ☐ Parking
- ☒ ☐ Pool
- ☒ ☐ Fences
- ☒ ☐ Lakes, Ponds, Major Streams
- ☒ ☐ Smaller streams, other drains

## Planning

Visible Active Layer

- ☐ ☐ Easement

## Legend

## Measurement Tools

## Drawing Tools

## Add Text

## Generate PDF

## Export GIS Layers

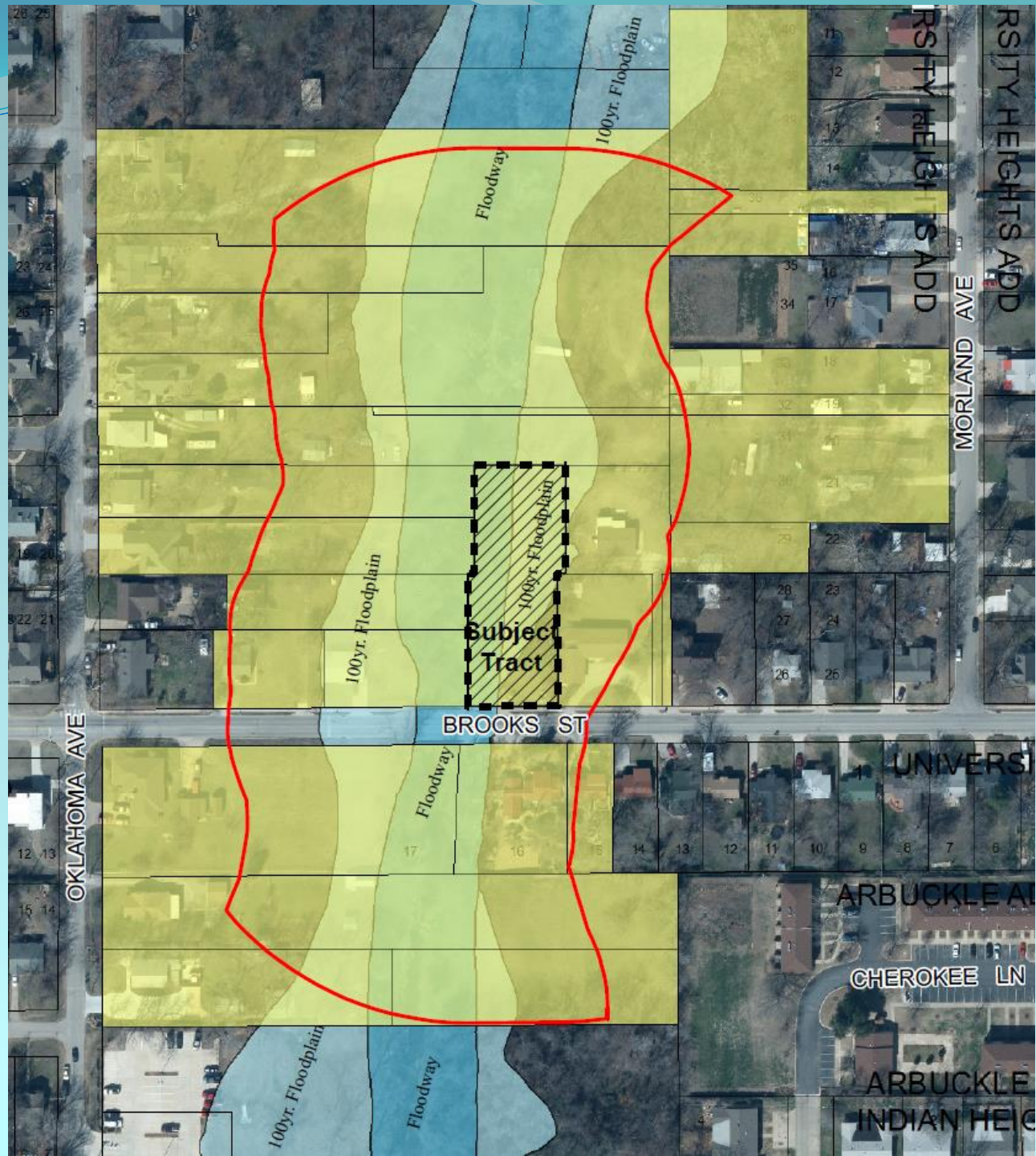


0 50 100ft

[Clear Graphics](#)

# Supported Business Practices

- Floodplain Permits
- Building Permits
- Storm Water Master Plan
- Water Quality Protection Zone
- Subdivision Regulations
- Stormwater Utility Scenario Planning



# Address Lists

Account	Parcel	Owner	PropertyAddress	MailingAddress
R0023267	NC29 9 2W 32 058	HARRIS CHRISTOPHER D / BILON KRYSTAL R	1517 OKLAHOMA AVE NORMAN 73071	1517 OKLAHOMA AVE NORMAN OK 73071
R0023268	NC29 9 2W 32 059	COALE SHERRI & DANE	1605 OKLAHOMA AVE NORMAN 73071	817 FLAMINGOAKS DR NORMAN OK 73026
R0023269	NC29 9 2W 32 060	WEAVER MONIQUE ANGELE-REV TRT	1609 OKLAHOMA AVE NORMAN 73071	3816 ST ANSBURY RD NORMAN OK 73072
R0023270	NC29 9 2W 32 061	WURST EVERETT ALDEN-REV LIV TRT / TRTEE-UND 1/2 INT	1613 OKLAHOMA AVE NORMAN 73071	1613 OKLAHOMA AVE NORMAN OK 73071
R0023274	NC29 9 2W 32 065	FITZGERALD MICHAEL E	1705 OKLAHOMA AVE NORMAN 73071	1705 OKLAHOMA AVE NORMAN OK 73071
R0023276	NC29 9 2W 32 067	WARD SOLOMAN W	0 OKLAHOMA AVE NORMAN 73071	1711 OKLAHOMA AVE NORMAN OK 730714664
R0023278	NC29 9 2W 32 069	NORGAARD CLIFTON A	607 E BROOKS ST NORMAN 73071	1209 CARDINAL AVE MCALLEN TX 78504
R0023279	NC29 9 2W 32 070	WEBB SARAH-REV TRT-TRTEE	611 E BROOKS ST NORMAN 73071	1502 C R 128 BURNET TX 78611
R0023280	NC29 9 2W 32 071	MORING ALAN & JANA	641 E BROOKS ST NORMAN 73071	712 E BROOKS ST NORMAN OK 730714639
R0023281	NC29 9 2W 32 072	AIRINGTON STEVEN RAY	647 E BROOKS ST NORMAN 73071	647 E BROOKS ST NORMAN OK 73071
R0023282	NC29 9 2W 32 073	JIA REN TRUST / MORRIS RONALD L & YAN-CO TRTEES	645 E BROOKS ST NORMAN 73071	C/O ACTION PROPERTY MGMT 523 HIGHLAND PARKWAY NORMAN OK 73069
R0023290	NC29 9 2W 32 085	SHIRLEY DORA MAE-LIFE ESTATE	1811 OKLAHOMA AVE NORMAN 73071	1811 OKLAHOMA AVE NORMAN OK 730714663
R0023291	NC29 9 2W 32 086	RYLAND MICHELE & M EDWARD	1815 OKLAHOMA AVE & 1/2 NORMAN 73071	1815 OKLAHOMA AVE NORMAN OK 73071
R0023292	NC29 9 2W 32 087	SHIRLEY DORA MAE-LIFE ESTATE	0 OKLAHOMA AVE NORMAN 73071	1811 OKLAHOMA AVE NORMAN OK 730714663
R0118839	NC29 9 2W 32 115	WOODWARD JOHNNY D	1617 OKLAHOMA AVE NORMAN 73071	1617 OKLAHOMA AVE NORMAN OK 730714620
R0118840	NC29 9 2W 32 116	FITE DENNIS C	1701 OKLAHOMA AVE NORMAN 73071	535 SHAWNEE ST NORMAN OK 73071
R0047636	NC29 UNIHT 2 15 002	CUMMINGS TERENCE L & JOY B		1500 MORLAND NORMAN OK 73071
R0047638	NC29 UNIHT 2 18 001	SILVER LEAF II LLC	1510 MORLAND AVE NORMAN 73071	1613 OKLAHOMA AVE NORMAN OK 73071
R0047639	NC29 UNIHT 2 19 001	SILVER LEAF II LLC	1512 MORLAND AVE NORMAN 73071	1613 OKLAHOMA AVE NORMAN OK 73071
R0047640	NC29 UNIHT 2 20 001	SILVER LEAF II LLC	1516 MORLAND AVE NORMAN 73071	1613 OKLAHOMA AVE NORMAN OK 73071
R0047647	NC29 UNIHT 2 28 001	AIRINGTON STEVEN RAY	647 E BROOKS NORMAN 73071	647 E BROOKS ST NORMAN OK 73071
R0047648	NC29 UNIHT 2 35 001	CUMMINGS TERENCE L & JOY B		1500 MORLAND NORMAN OK 73071
R0047649	NC29 UNIHT 2 37 001	CUMMINGS TERENCE L & JOY B	0 E BOYD NORMAN 73071	1500 MORLAND NORMAN OK 73071
R0047667	NC29 UNIVV 1 15 001	NELSON CHARLES T & LAURA M	642 E BROOKS NORMAN 73071	638 E BROOKS NORMAN OK 73071
R0047668	NC29 UNIVV 1 16 001	NELSON CHARLES T & LAURA M	638 E BROOKS NORMAN 73071	638 E BROOKS NORMAN OK 73071
R0047669	NC29 UNIVV 1 17 001	MOSES AMOS N JR-LIV-TRT	1801 S OKLAHOMA AVE NORMAN 73071	1801 OKLAHOMA AVE NORMAN OK 73071

# Storm Water Master Plan

- Completed in 2009
- GIS Data Collected Specifically for Plan
  - LiDAR
  - Contours
- GIS Data Produced
  - Basins
  - Subbasins
  - Stream planning corridors

# Water Quality Protection Zone

## -Purpose

- Improve the quality of stormwater before it reaches Lake Thunderbird
- Reduce flooding due to development along streams
- Reduce streamside erosion

# Water Quality Protection Zone

- A vegetative strip of land along a stream
- Located in Lake Thunderbird Watershed
- Is the greater of the following
  - 100 feet in width measured from the top of the stream bank
  - Width of the 100 year FEMA Floodplain
  - Width of Stream Planning Corridor

# EXAMPLE CITY OF KANSAS CITY, MO

-  Kansas City Outer Zone 75'
-  Kansas City Middle Zone
-  Kansas City Streamside Zone 25'

# CITY OF NORMAN

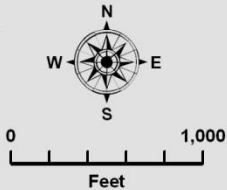






Map produced by the City of Norman  
Geographic Information System.

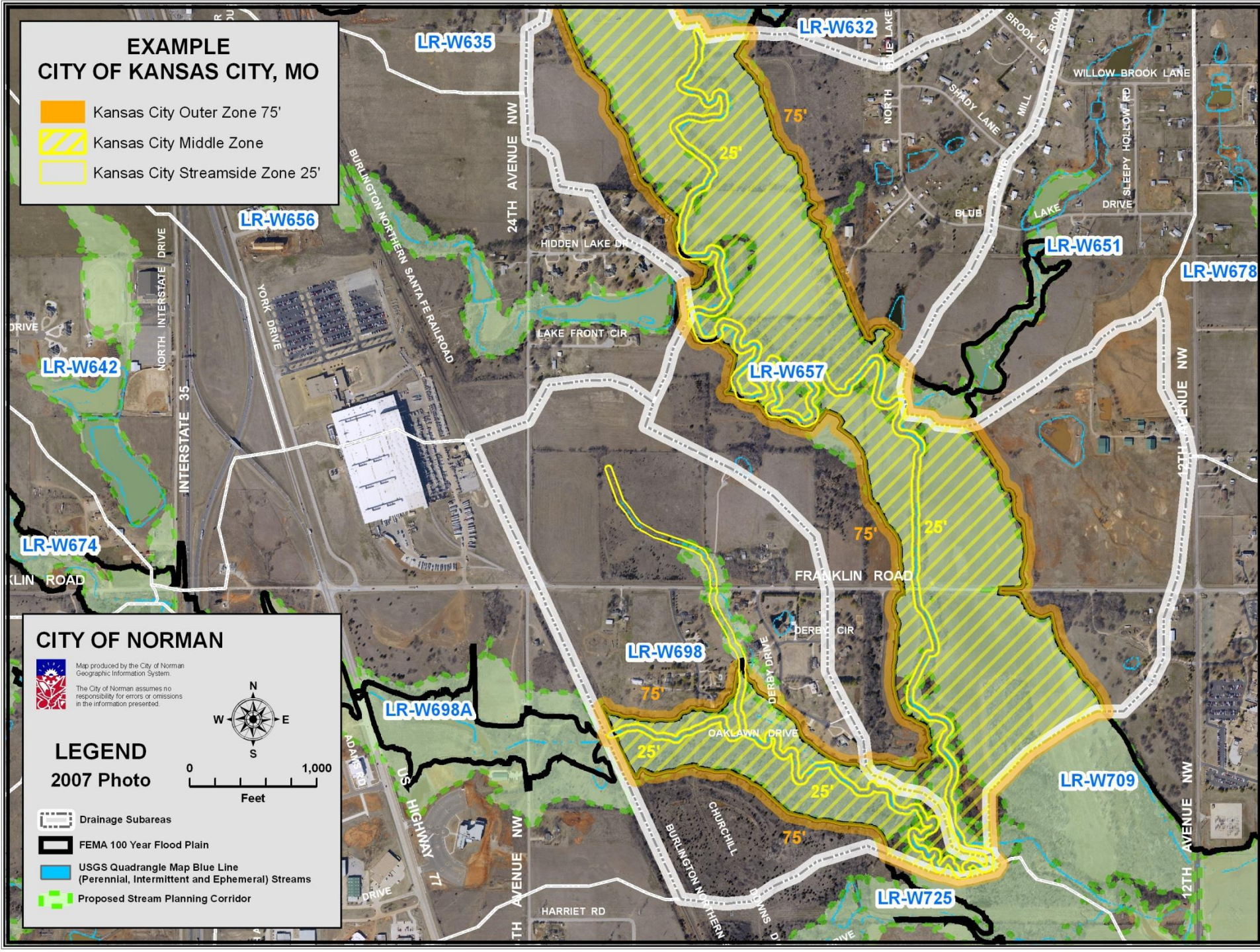
The City of Norman assumes no  
responsibility for errors or omissions  
in the information presented.

## LEGEND





2007 Photo

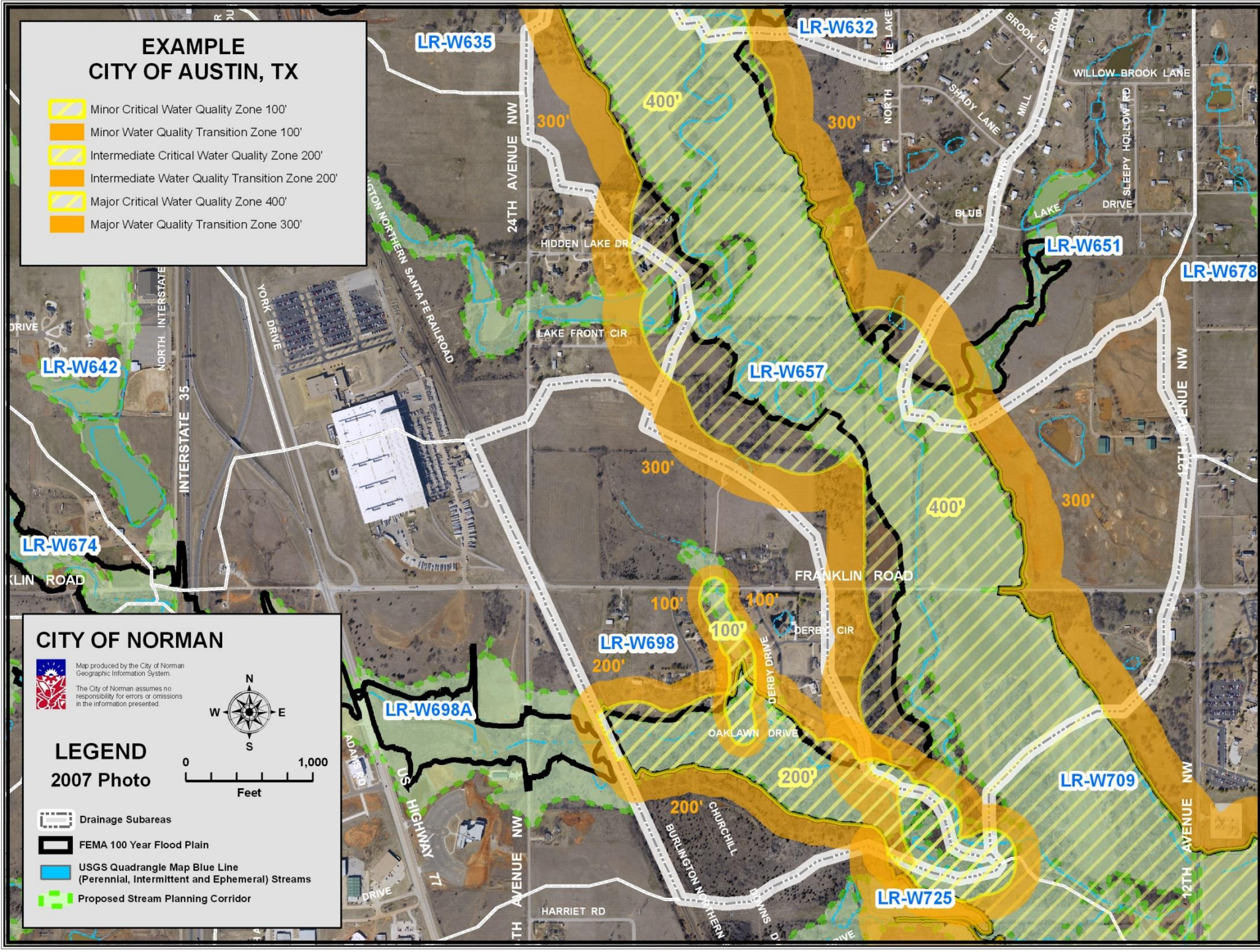


-  Drainage Subareas
-  FEMA 100 Year Flood Plain
-  USGS Quadrangle Map Blue Line  
(Perennial, Intermittent and Ephemeral) Streams
-  Proposed Stream Planning Corridor



## EXAMPLE CITY OF AUSTIN, TX

-  Minor Critical Water Quality Zone 100'
-  Minor Water Quality Transition Zone 100'
-  Intermediate Critical Water Quality Zone 200'
-  Intermediate Water Quality Transition Zone 200'
-  Major Critical Water Quality Zone 400'
-  Major Water Quality Transition Zone 300'



## CITY OF NORMAN



Map produced by the City of Norman  
Geographic Information System.





The City of Norman assumes no  
responsibility for errors or omissions  
in the information presented.



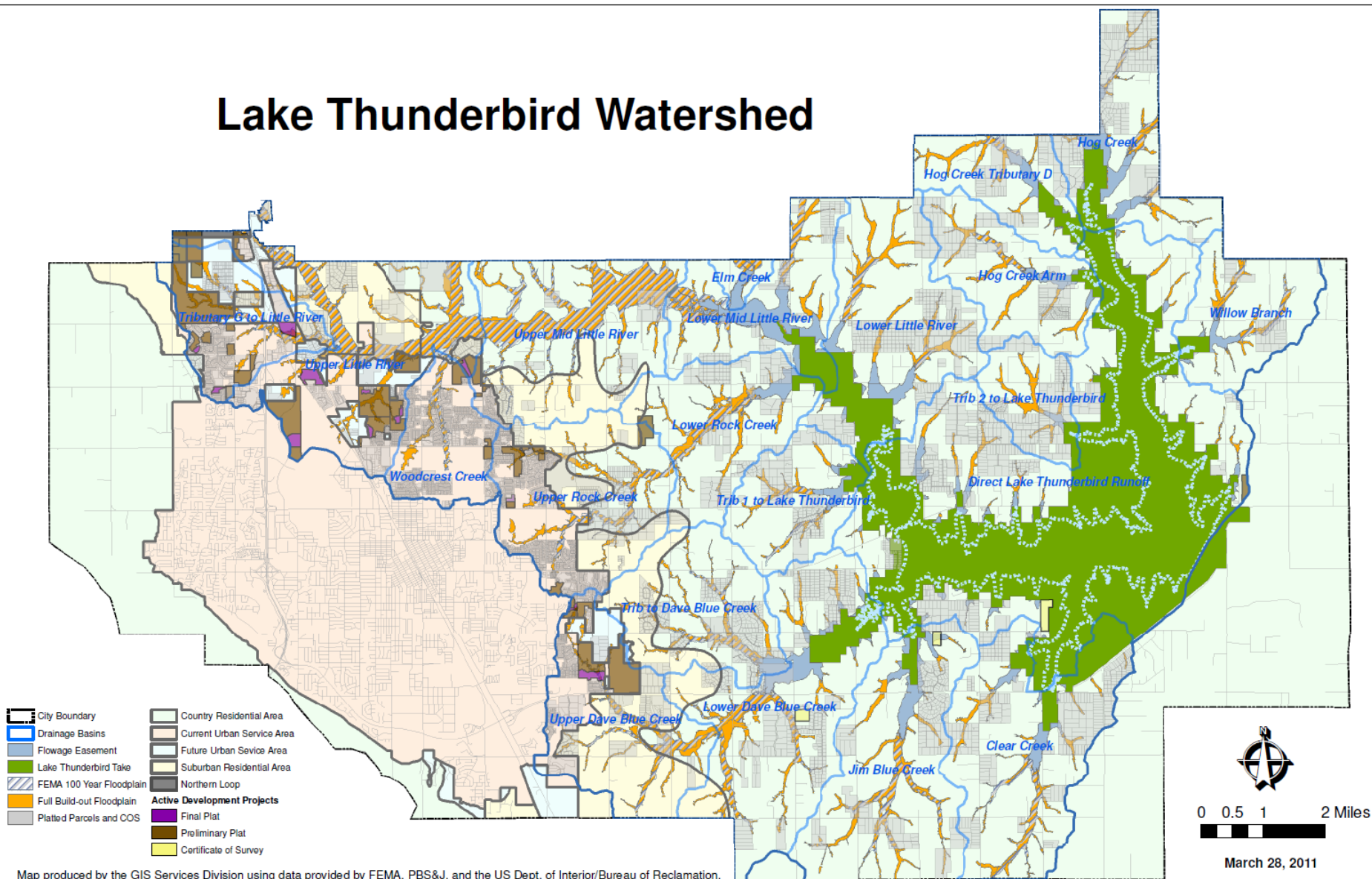
## LEGEND

2007 Photo



-  Drainage Subareas
-  FEMA 100 Year Flood Plain
-  USGS Quadrangle Map Blue Line  
(Perennial, Intermittent and Ephemeral) Streams
-  Proposed Stream Planning Corridor

# Lake Thunderbird Watershed



## Lake Thunderbird Watershed Floodplains by Drainage Basin

Drainage Basin*	FEMA DFIRM** Floodway & 100 Year Floodplain		Full Build-out Floodplain (FBF)**		Difference (FBF-FEMA)**		Lake Thunderbird Take		Lake Thunderbird Flowage Easement		Total Acreage of Drainage Basin*
	Acres	% of Drainage Basin	Acres	% of Drainage Basin	Acres	% of Drainage Basin	Acres	% of Drainage Basin	Acres	% of Drainage Basin	
Clear Creek	156.37	3.02%	310.52	5.99%	154.14	2.98%	565.67	10.92%	136.04	2.63%	5,180.97
Direct Thunderbird Runoff	11.36	0.07%	172.81	1.08%	161.45	1.01%	9869.62	61.60%	256.78	1.60%	16,022.46
Elm Creek	51.52	16.19%	45.44	14.28%	-6.08	-1.91%			70.15	22.04%	318.30
Hog Creek	118.61	3.70%	227.54	7.10%	108.93	3.40%	345.40	10.78%	263.99	8.24%	3,204.37
Hog Creek Arm	56.01	2.00%	216.26	7.73%	160.25	5.73%	81.91	2.93%	94.08	3.36%	2,797.24
Hog Creek Tributary D	53.19	2.50%	159.01	7.47%	105.81	4.97%	187.66	8.82%	89.28	4.19%	2,128.52
Jim Blue Creek	223.47	4.39%	459.88	9.04%	236.42	4.65%	112.97	2.22%	225.72	4.44%	5,085.95
Lower Dave Blue Creek	258.00	4.39%	535.77	9.11%	277.77	4.72%	402.76	6.85%	237.74	4.04%	5,881.89
Lower Little River	124.57	2.59%	384.57	7.99%	260.00	5.40%	559.74	11.63%	209.37	4.35%	4,811.33
Lower Mid Little River	302.97	9.97%	364.15	11.98%	61.18	2.01%	256.90	8.46%	456.64	15.03%	3,038.48
Lower Rock Creek	151.93	4.64%	345.26	10.54%	193.33	5.90%	55.46	1.69%	112.45	3.43%	3,274.46
Trib 1 to Lake Thunderbird	74.48	3.32%	152.43	6.80%	77.95	3.48%	93.39	4.17%	84.97	3.79%	2,241.94
Trib 2 to Lake Thunderbird	0.00	0.00%	127.32	8.44%	127.32	8.44%	91.03	6.04%	32.04	2.12%	1,508.22
Trib to Dave Blue Creek	141.65	4.23%	302.92	9.04%	161.27	4.81%			78.67	2.35%	3,352.39
Tributary G to Little River	120.81	4.93%	297.10	12.12%	176.29	7.19%					2,452.12
Upper Dave Blue Creek	226.93	5.80%	418.68	10.70%	191.75	4.90%					3,914.67
Upper Little River	967.87	16.44%	1243.19	21.12%	275.33	4.68%					5,886.23
Upper Mid Little River	1085.80	22.50%	1166.47	24.17%	80.67	1.67%					4,826.10
Upper Rock Creek	160.35	3.74%	416.29	9.72%	255.94	5.97%					4,283.58
Willow Branch	113.35	4.60%	182.57	7.42%	69.23	2.81%	95.41	3.88%	74.79	3.04%	2,461.82
Woodcrest Creek	100.72	5.22%	147.74	7.66%	47.02	2.44%					1,928.62
<b>Total</b>	<b>4499.95</b>	<b>5.32%</b>	<b>7675.91</b>	<b>9.07%</b>	<b>3175.96</b>	<b>3.75%</b>	<b>12717.93</b>	<b>15.03%</b>	<b>2422.70</b>	<b>2.86%</b>	<b>84,599.65</b>

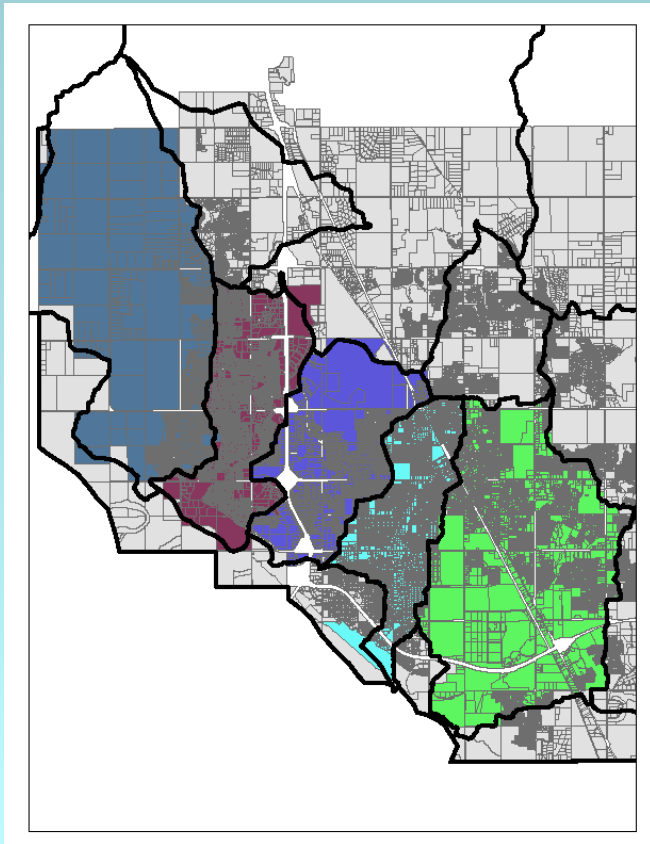
\* within the City of Norman

\*\*Outside of the take zone and area protected by US Bureau of Reclamation

Report generated by the GIS Services Division using data provided by FEMA, PBS&J, and the US Dept. of Interior/Bureau of Reclamation.

March 21, 2011

# Stormwater Utility



Basin	Number of Parcels	Number of Parcels with Impervious Area
Bishop Creek	8136	7751
Imhoff Creek	5481	5353
Merkle Creek	3216	3160
Brookhaven Creek	4661	4544
Ten Mile Flat Creek	2226	1853

	Square Feet	Rate Formula	Estimated Revenue	Percent of Category	Square Feet	Rate Formula	Estimated Revenue	Percent of Category	Estimated Revenue
Commercial	100,463,277	IA/3600*6	\$ 167,438.80	76%	31,445,967	IA/3600*6	\$ 52,409.94	24%	\$ 219,848.74
	Count	Rate Formula	Estimated Revenue		Count	Rate Formula	Estimated Revenue	Percent of Category	Estimated Revenue
<2000	2230	IA*3.5	\$ 7,805.00	73%	822	IA*3.5	\$ 2,877.00	27%	\$ 10,682.00
2001-3000	6465	IA*4.25	\$ 27,476.25	72%	2528	IA*4.25	\$ 10,744.00	28%	\$ 38,220.25
3001-4000	6158	IA*5.75	\$ 35,408.50	68%	2861	IA*5.75	\$ 16,450.75	32%	\$ 51,859.25
4001-5500	3801	IA*8	\$ 30,408.00	62%	2347	IA*8	\$ 18,776.00	38%	\$ 49,184.00
5501-6500	1086	IA*10.25	\$ 11,131.50	65%	590	IA*10.25	\$ 6,047.50	35%	\$ 17,179.00
6501-8000	856	IA*13	\$ 11,128.00	55%	711	IA*13	\$ 9,243.00	45%	\$ 20,371.00
>8000	994	IA*15	\$ 14,910.00	21%	3848	IA*15	\$ 57,720.00	79%	\$ 72,630.00
Subtotal	21590		\$ 138,267.25	53%	13707		\$ 121,858.25	47%	\$ 260,125.50
Total			\$ 305,706.05	64%			\$ 174,268.19	36%	\$ 479,974.24
Draft 7/24/2014									

# Stormwater Utility Fee Estimator

201 West Daws, Norman

Locate

Zoom In

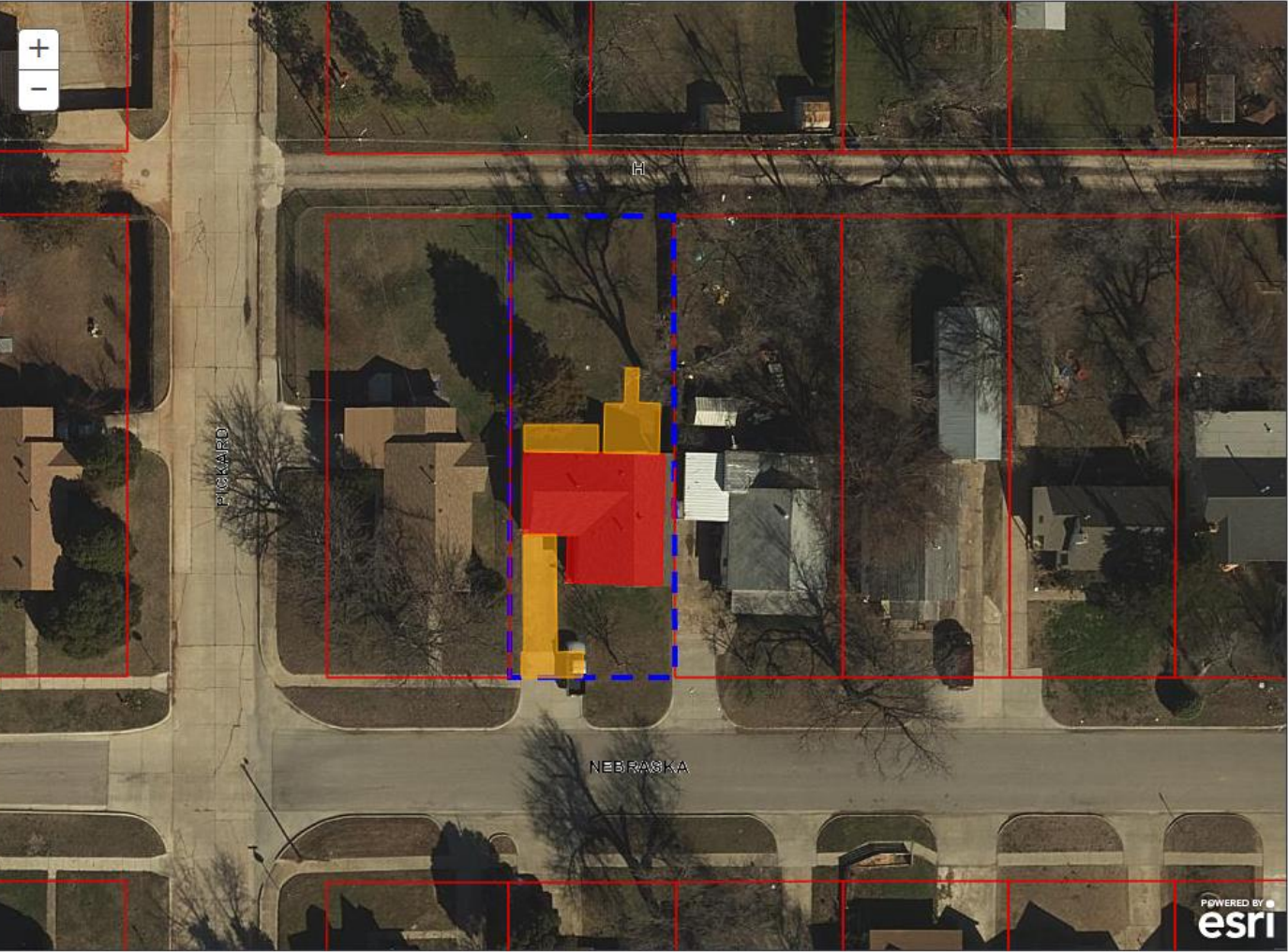
Zoom Out

Prev Extent

Next Extent

Pan

Full Extent



mouse pointer within a single parcel or over multiple parcels to indicate the properties for which you want to calculate the impervious area. The application will calculate the impervious area and display the values below. The results are a summary of all of the impervious area on the parcels you touched with the mouse pointer.

Select parcel(s)

### Results

Parcel Area: 6875 sf

Impermeable Surfaces

Structures: 1454 sf (21%)

Pavement: 964 sf (14%)

Parking Lots: 0 sf (0%)

Pools: 0 sf (0%)

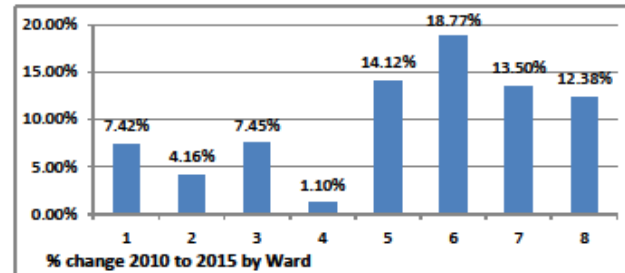
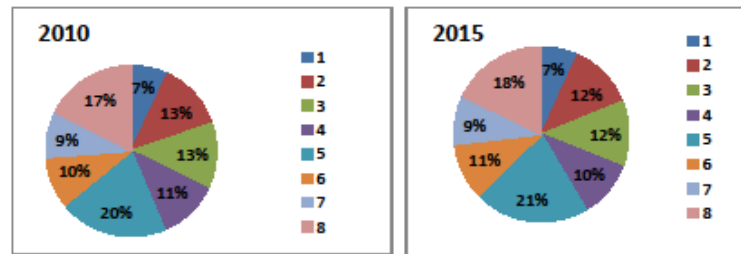
Total: 2418 sf (35%)

### Projected Fee

\$3.50

Note: This tool provides an estimate of the stormwater utility fee for the

# Comparison of 2010 and 2015 Impervious Area by Ward



## 2015 Impervious Area

Ward #	Square ft.	Acreage	% of impervious	% increase from 2010
1	21767192.13	499.706	6.8%	7.42%
2	38282229.06	878.839	12.0%	4.16%
3	38976976.90	894.788	12.2%	7.45%
4	33139148.55	760.770	10.4%	1.10%
5	67685414.09	1553.843	21.2%	14.12%
6	33302437.37	764.519	10.4%	18.77%
7	28807804.16	661.336	9.0%	13.50%
8	56781088.05	1303.514	17.8%	12.38%
<b>Total Acreage</b>	<b>318742290.31</b>	<b>7317.316</b>	<b>100.0%</b>	<b>10.17%</b>

## 2010 Impervious Area

Ward #	Square ft.	Acreage	% of impervious
1	20264557.39	465.210	7.0%
2	36754527.50	843.768	12.7%
3	36274154.31	832.740	12.5%
4	32777244.07	752.462	11.3%
5	59312861.58	1361.636	20.5%
6	28038278.07	643.670	9.7%
7	25380685.75	582.660	8.8%
8	50524618.62	1159.886	17.5%
<b>Total Acreage</b>	<b>289326927.29</b>	<b>6642.032</b>	

Only includes area with parcel numbers.

Includes Land Use Codes: comm, cres, flplain, hres, ind, inst, lres, mres, mu, office, vlres

# Future Considerations

- Modernizing our Stormwater Database
- Assisting the Stormwater Staff implement inspections in Cityworks
- Assisting Stormwater Maintenance implement Cityworks asset management and Work Order Software
- Strengthen the relationship between GIS and the Utility System

# Questions

Contact Information

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