COLLEGE OF CHARLESTON

The Potential Effects to Infrastructure and Population of a Meteor Impact in the Charleston Metropolitan Region

A GIS report

Nathan Bailey

4/29/2011

[This document is a summary of the effects of two types of meteors, stony and metallic, striking in three possible locations; one urban, one suburban, and one rural.]

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Geology 449- 001
Spring 2011
KC Bolide Meteor Impact Emergency
Dr. Doyle

Executive Summary:

This document is a summary of the effects of two types of meteors, stony and metallic, striking in three possible locations; one urban, one suburban, and one rural. It is intended to compare the damage done by the two different types of meteors to determine the worst possible outcomes. The Data is displayed in Maps and Tables that are intended to be compared. Most of the data was retrieved from the ESRI.com website or is housed on College Of Charleston Servers. The effects of the metallic meteor are more hazardous than those of the stony meteor due to the higher dispersal rate from the impact, meaning that the debris from the metallic impact spread further damaging more area than the debris from the stony meteor.

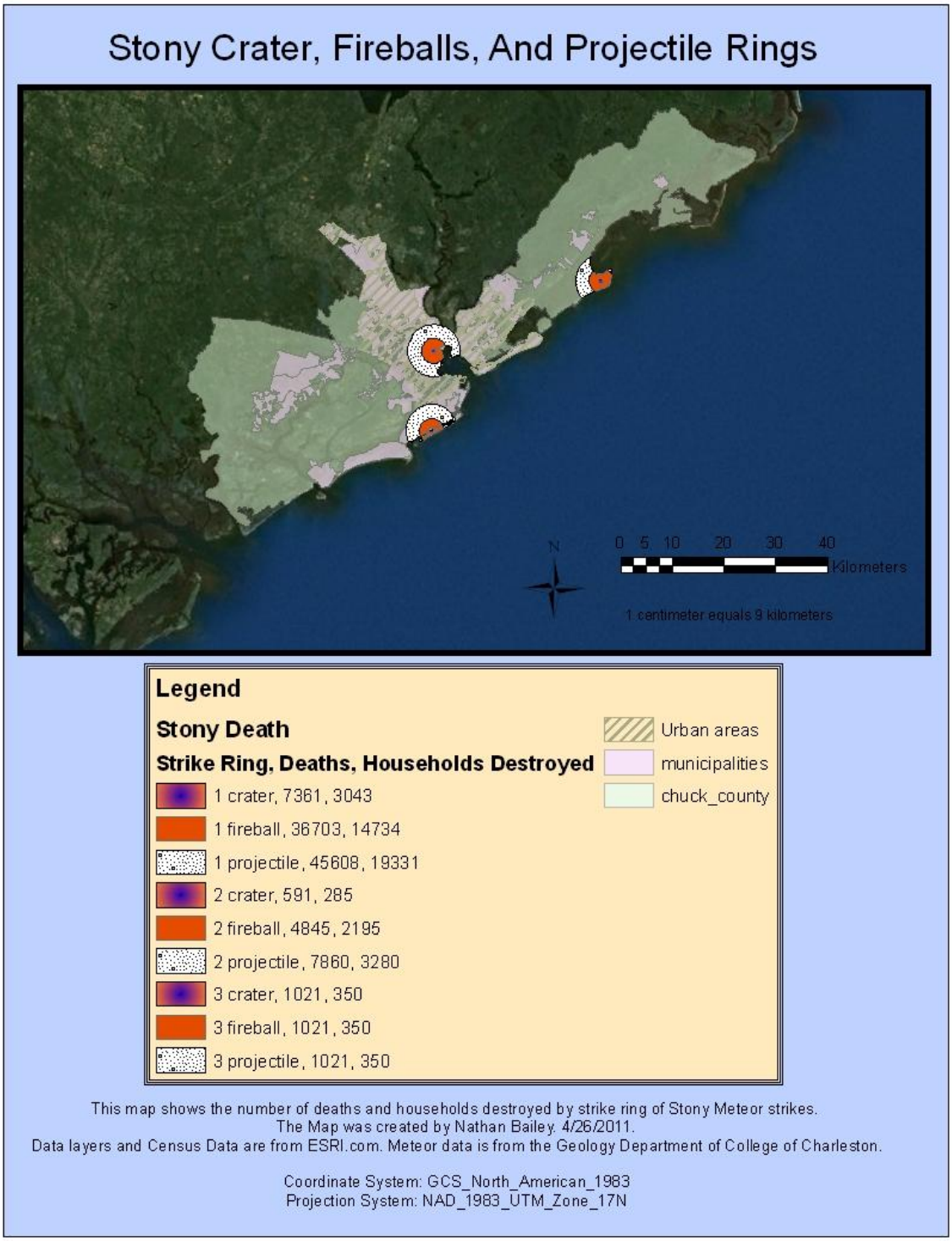
Model Used:

The model used county maps, major road maps, rivers, and census information for population as affected by; (**1**) a stony meteor with a density of 2.3 grams (g) per cubic centimeter (cc) [stony = 2.3g/cc], and (**2**) a metallic meteor with a density of 3.5 grams (g) per cubic centimeter (cc) [metallic=3.5g/cc] ; where the crater radius (r) in meters (m) is proportional to .0001 times the mass in Kilograms (kg) of the respective meteor type [Crater (r)= (.0001)*(Mass of Meteor)] and the volume of a sphere from the radius given was used to determine the crater diameter. [Crater (D) = (4/3)*pi*(r = (.0001)*(Mass of

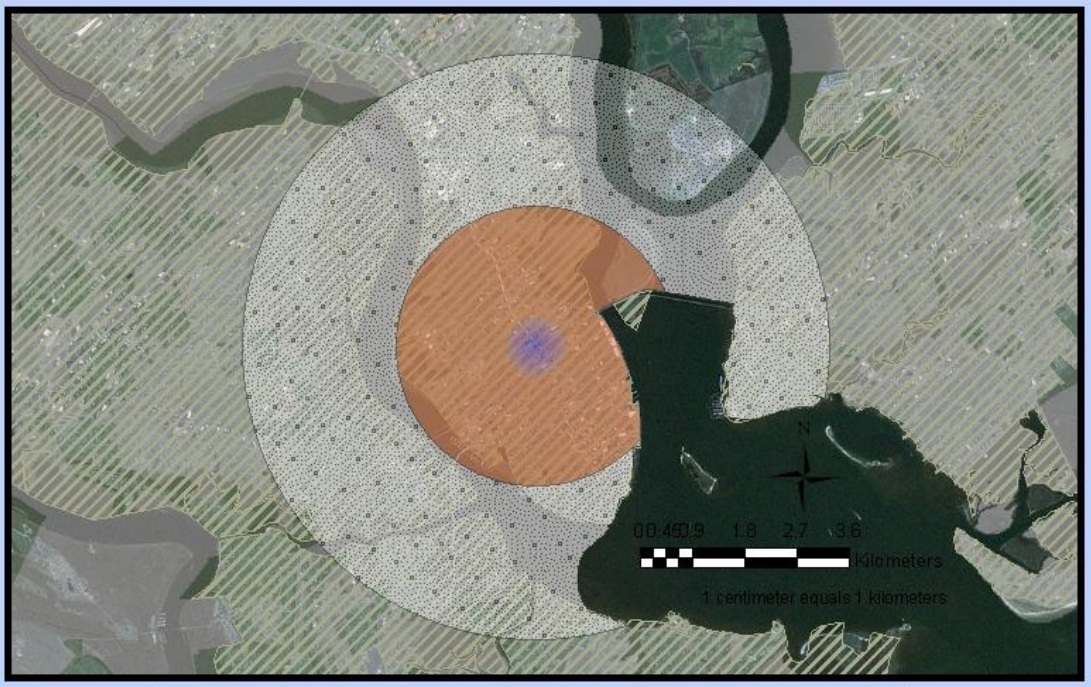
Meteor))^{3}]. The Fireball ring is then 5 km for every km of the crater radius; and the Projectile ring is 10.5 km for every km of radius for the crater.

Populations Destroyed (by Meteor Type and Impact Number)

Stony Meteor Results to Population:



Stony Impact 1: Crater, Fireballs, And Projectile Rings



Legend

Stony Death

Strike Ring, Deaths, Households Destroyed

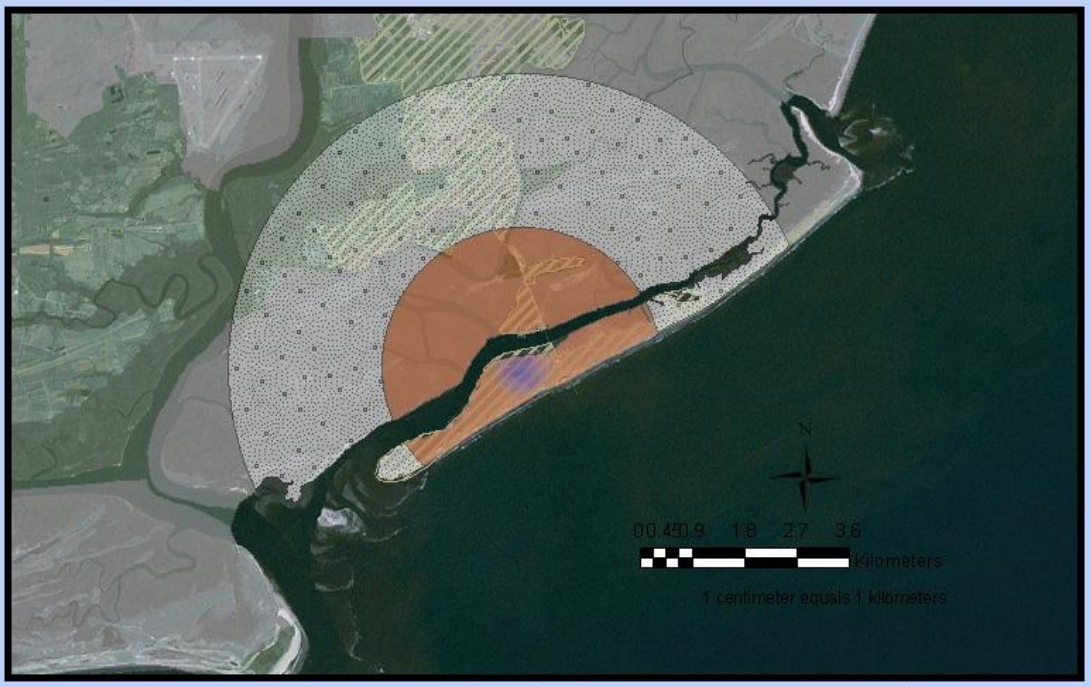
- 1 crater, 7361, 3043
- 1 fireball, 36703, 14734
- 1 projectile, 45608, 19331
- 2 crater, 591, 285
- 2 fireball, 4845, 2195
- 2 projectile, 7860, 3280
- 3 crater, 1021, 350
- 3 fireball, 1021, 350
- 3 projectile, 1021, 350

- Urban areas
- municipalities
- chuck_county

This map shows the number of deaths and households destroyed by strike ring of Stony Meteor strikes.
The Map was created by Nathan Bailey. 4/26/2011.
Data layers and Census Data are from ESRI.com. Meteor data is from the Geology Department of College of Charleston.

Coordinate System: GCS_North_American_1983
Projection System: NAD_1983_UTM_Zone_17N

Stony Impact 2: Crater, Fireballs, And Projectile Rings



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Stony Impact 3: Crater, Fireballs, And Projectile Rings

Legend

Stony Death

Strike Ring, Deaths, Households Destroyed

- 1 crater, 7361, 3043
- 1 fireball, 36703, 14734
- 1 projectile, 45608, 19331
- 2 crater, 591, 285
- 2 fireball, 4845, 2195
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- Urban areas
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Breakdown of Population Destroyed by Stony Meteors:

Strike Ring	POP2000	POP2004	WHITE	BLACK	AMERINDIAN	ASIAN
1 crater	7361.00	8069.00	1549.00	5715.00	5.00	15.00
1 fireball	36703.00	37301.00	17448.00	18483.00	35.00	245.00
1 projectile	45608.00	47121.00	34128.00	10435.00	67.00	419.00
2 crater	591.00	638.00	575.00	8.00	1.00	1.00
2 fireball	4845.00	5314.00	3537.00	1212.00	15.00	10.00
2 projectile	7860.00	8973.00	4851.00	2805.00	26.00	21.00
3 crater	1021.00	1381.00	343.00	665.00	3.00	1.00
3 fireball	1021.00	1381.00	343.00	665.00	3.00	1.00
3 projectile	1021.00	1381.00	343.00	665.00	3.00	1.00

Strike Ring	HAWN PI	OTHER	MULT R	HISPAN	MALES	FEMALE
1 crater	2.00	22.00	53.00	119.00	3459.00	3902.00
1 fireball	10.00	153.00	329.00	500.00	17450.00	19253.00
1 projectile	24.00	160.00	375.00	682.00	22249.00	23359.00
2 crater	0.00	1.00	5.00	5.00	294.00	297.00
2 fireball	0.00	15.00	56.00	54.00	2324.00	2521.00
2 projectile	10.00	74.00	73.00	262.00	3794.00	4066.00
3 crater	1.00	3.00	5.00	4.00	478.00	543.00
3 fireball	1.00	3.00	5.00	4.00	478.00	543.00
3 projectile	1.00	3.00	5.00	4.00	478.00	543.00

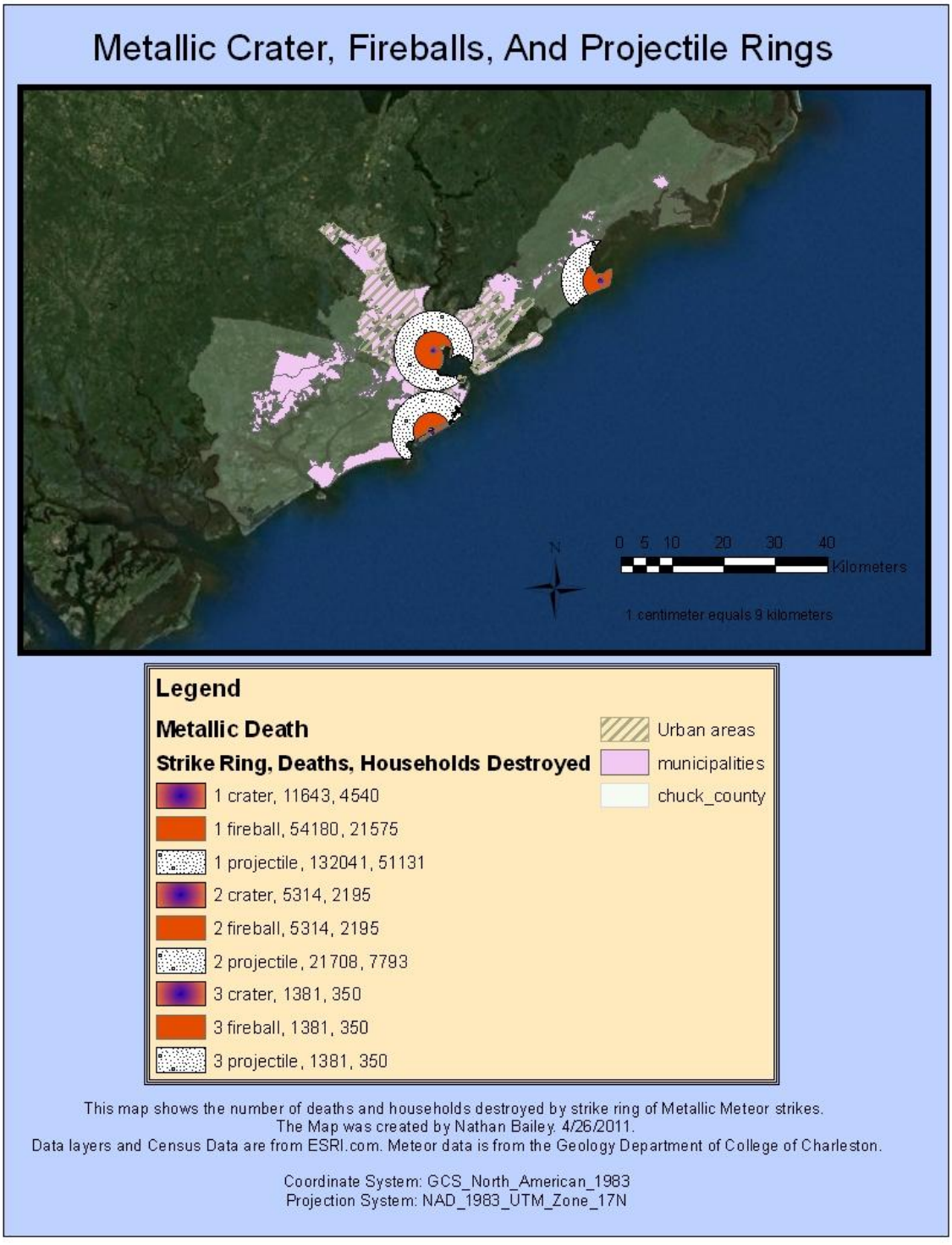
Strike Ring	UNDER 5	AGE 5-17	AGE 18-21	AGE 22-29	AGE 30-39	AGE 40-49
1 crater	437.00	1360.00	1189.00	808.00	865.00	934.00
1 fireball	1635.00	4958.00	6908.00	5296.00	3947.00	3958.00
1 projectile	2234.00	6463.00	3503.00	6550.00	5861.00	6147.00
2 crater	24.00	43.00	29.00	84.00	78.00	135.00
2 fireball	169.00	548.00	218.00	572.00	626.00	801.00
2 projectile	331.00	1090.00	370.00	853.00	1084.00	1306.00
3 crater	67.00	225.00	38.00	74.00	163.00	144.00
3 fireball	67.00	225.00	38.00	74.00	163.00	144.00
3 projectile	67.00	225.00	38.00	74.00	163.00	144.00

Strike Ring	AGE 50-64	AGE 65 AND UP	MEAN AGE	MEAN AGE M	MEAN AGE F	HOUSEHOLDS
1 crater	839.00	929.00	33.07	30.03	35.84	3043.00
1 fireball	4708.00	5293.00	34.02	31.77	36.41	14734.00
1 projectile	7288.00	7562.00	38.67	36.77	40.66	19331.00

2 crater	142.00	56.00	42.30	42.20	42.80	285.00
2 fireball	877.00	1034.00	43.65	43.25	44.23	2195.00
2 projectile	1417.00	1409.00	41.85	40.85	42.73	3280.00
3 crater	192.00	118.00	36.70	38.10	35.90	350.00
3 fireball	192.00	118.00	36.70	38.10	35.90	350.00
3 projectile	192.00	118.00	36.70	38.10	35.90	350.00

Strike Ring	MEAN HH SIZE	VACANT	SUM SHPLENGTH	SUM Shapearea	Shape Leng	Shape Area
1 crater	2.40	588.00	10198.32	728990.53	3026.68	728990.54
1 fireball	2.22	2293.00	114590.07	15629405.63	19736.04	15629405.62
1 projectile	2.23	1765.00	198890.11	50903099.97	49071.35	50903099.97
2 crater	2.07	226.00	2773.77	540861.28	2773.77	540861.28
2 fireball	2.10	762.00	34609.00	9779512.63	25388.49	9779512.59
2 projectile	2.33	911.00	58802.50	31897015.77	41053.54	31897015.77
3 crater	2.92	52.00	3026.68	728992.40	3026.68	728992.40
3 fireball	2.92	52.00	18798.52	11368680.51	18798.52	11368680.51
3 projectile	2.92	52.00	23104.69	18030191.23	23104.69	18030191.23

Metallic Meteor Results to Population:



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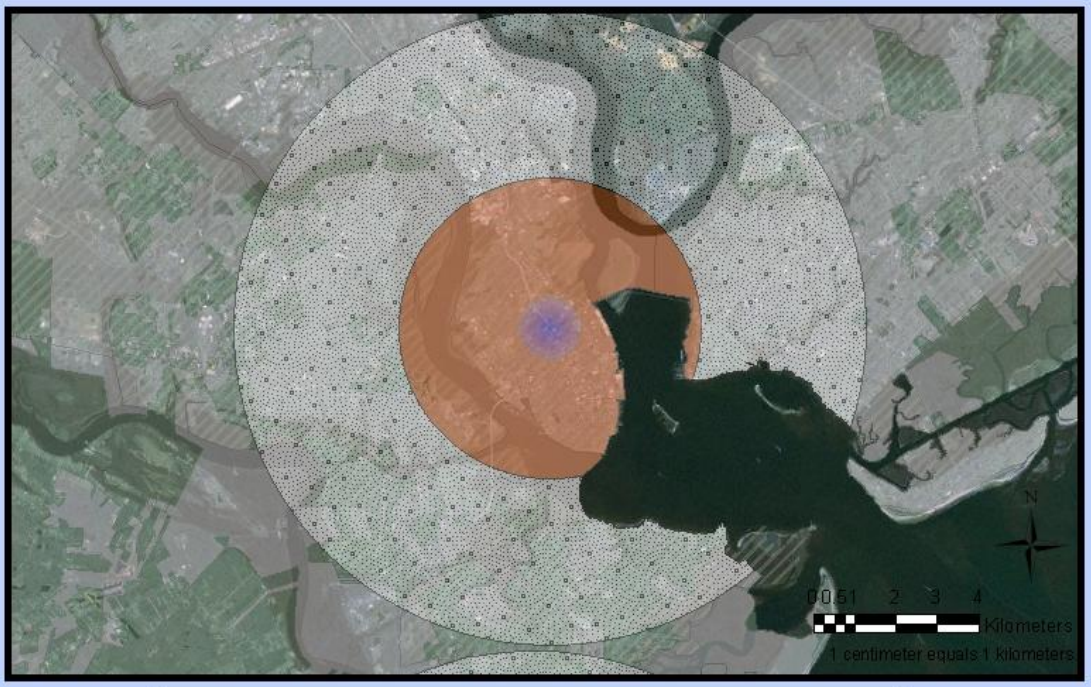

Legend

Metallic Death

Strike Ring, Deaths, Households Destroyed

- 1 crater, 11643, 4540
- 1 fireball, 54180, 21575
- 1 projectile, 132041, 51131
- 2 crater, 5314, 2195
- 2 fireball, 5314, 2195
- 2 projectile, 21708, 7793
- 3 crater, 1381, 350
- 3 fireball, 1381, 350
- 3 projectile, 1381, 350

- Urban areas
- municipalities
- chuck_county

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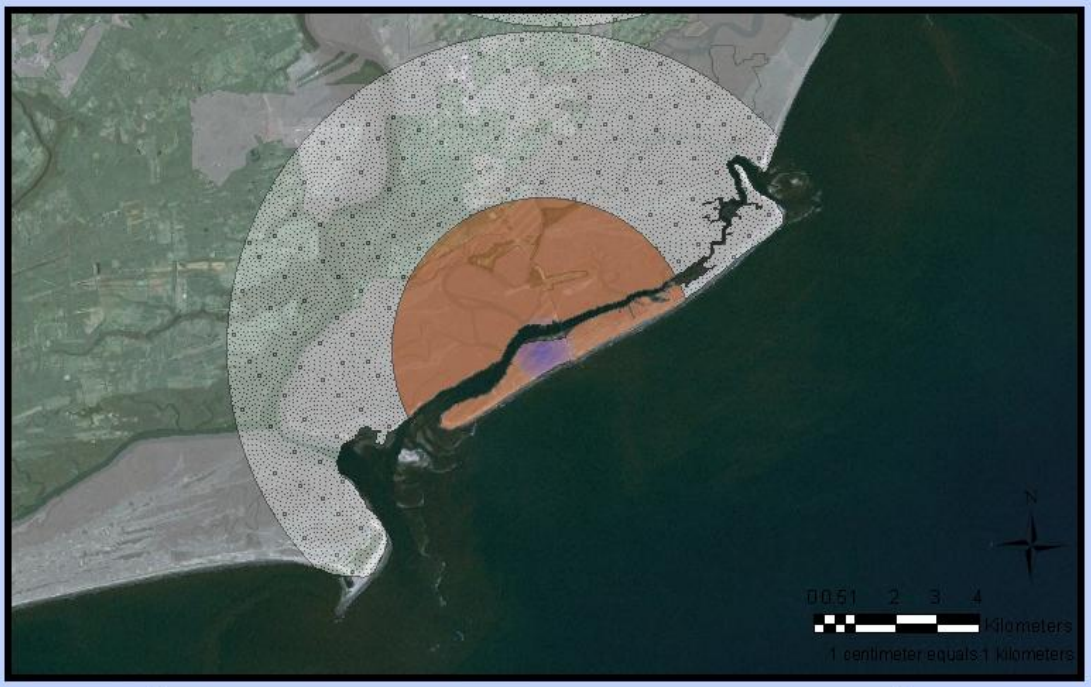

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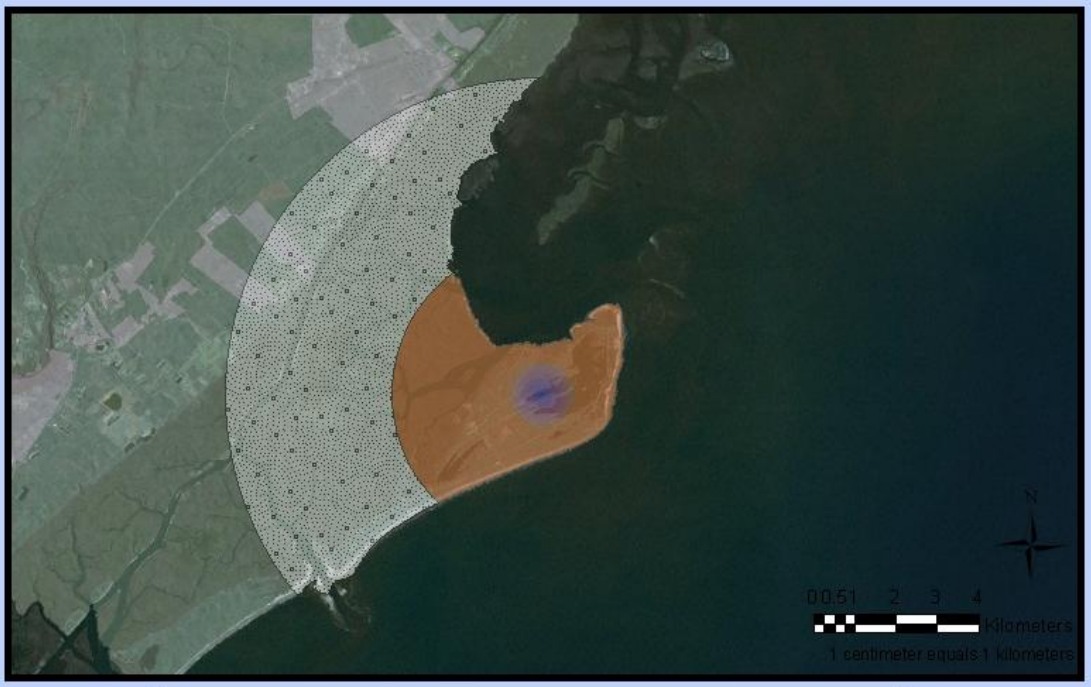

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Metallic Death

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Breakdown of Population Destroyed By Metallic Meteors:

Strike Ring	POP2000	POP2004	WHITE	BLACK	AMERINDIAN	ASIAN
1 crater	11203.00	11643.00	3372.00	7657.00	7.00	37.00
1 fireball	52064.00	54180.00	30043.00	20922.00	57.00	409.00
1 projectile	124808.00	132041.00	86668.00	34684.00	204.00	1334.00
2 crater	4845.00	5314.00	3537.00	1212.00	15.00	10.00
2 fireball	4845.00	5314.00	3537.00	1212.00	15.00	10.00
2 projectile	19407.00	21708.00	13009.00	5867.00	39.00	91.00
3 crater	1021.00	1381.00	343.00	665.00	3.00	1.00
3 fireball	1021.00	1381.00	343.00	665.00	3.00	1.00
3 projectile	1021.00	1381.00	343.00	665.00	3.00	1.00

Strike Ring	HAWN PI	OTHER	MULT RACIAL	HISPAN	MALES	FEMALE
1 crater	3.00	35.00	92.00	191.00	4992.00	6211.00
1 fireball	16.00	187.00	430.00	647.00	24610.00	27454.00
1 projectile	69.00	652.00	1197.00	1990.00	60177.00	64631.00
2 crater	0.00	15.00	56.00	54.00	2324.00	2521.00
2 fireball	0.00	15.00	56.00	54.00	2324.00	2521.00
2 projectile	13.00	181.00	207.00	516.00	9395.00	10012.00
3 crater	1.00	3.00	5.00	4.00	478.00	543.00
3 fireball	1.00	3.00	5.00	4.00	478.00	543.00
3 projectile	1.00	3.00	5.00	4.00	478.00	543.00

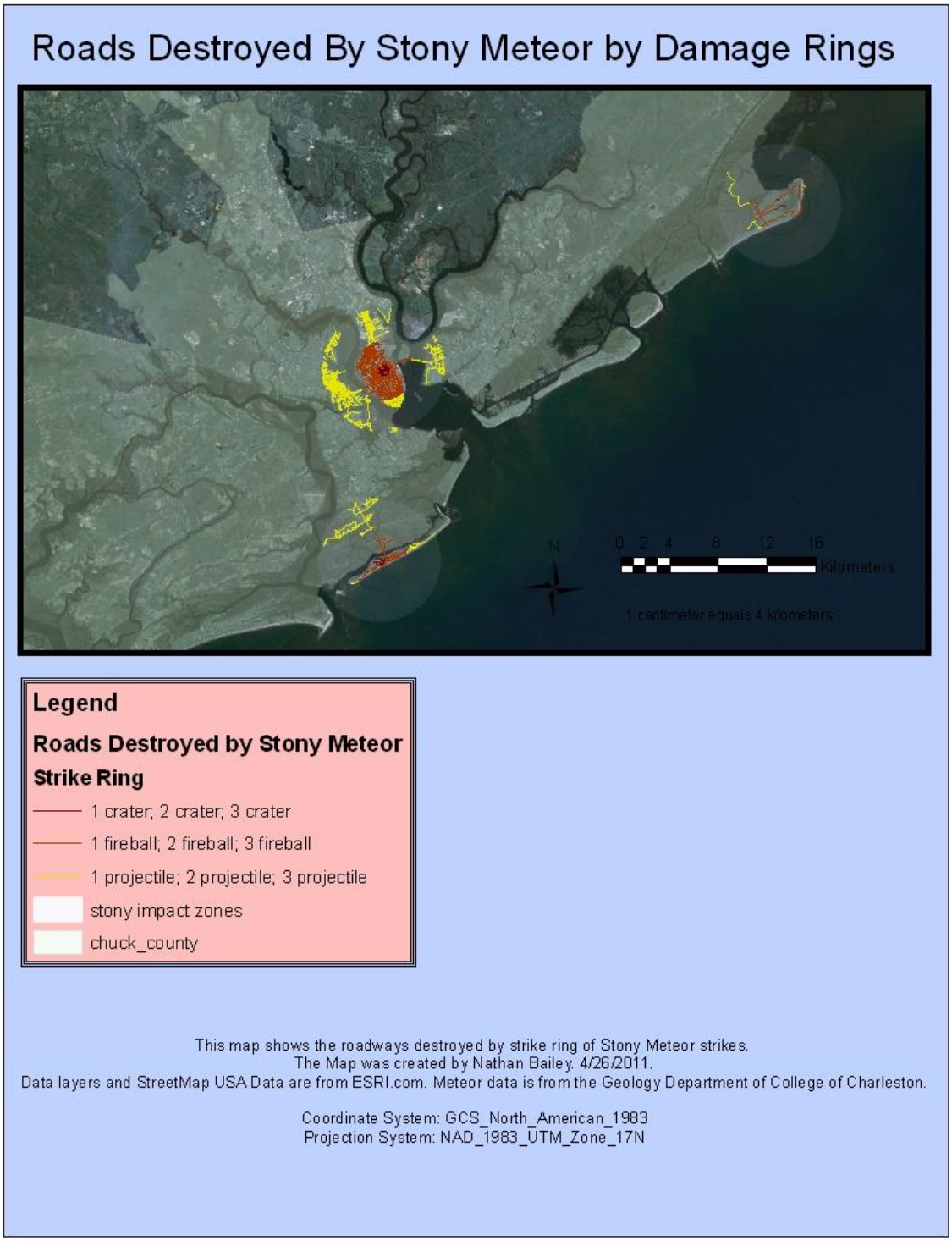
Strike Ring	UNDER 5	AGE 5-17	AGE 18-21	AGE 22-29	AGE 30-39	AGE 40-49
1 crater	592.00	1758.00	2470.00	1413.00	1209.00	1256.00
1 fireball	2450.00	7274.00	7531.00	7465.00	6030.00	6284.00
1 projectile	7237.00	20712.00	6810.00	16360.00	19032.00	19100.00
2 crater	169.00	548.00	218.00	572.00	626.00	801.00
2 fireball	169.00	548.00	218.00	572.00	626.00	801.00
2 projectile	961.00	3103.00	879.00	1970.00	2871.00	3113.00
3 crater	67.00	225.00	38.00	74.00	163.00	144.00
3 fireball	67.00	225.00	38.00	74.00	163.00	144.00
3 projectile	67.00	225.00	38.00	74.00	163.00	144.00

Strike Ring	AGE 50-64	65 AND UP	MEAN AGE	MEAN AGE M	MEAN AGE F	HOUSEHOLDS
1 crater	1203.00	1302.00	31.57	29.01	34.32	4540.00
1 fireball	7333.00	7697.00	35.19	33.28	37.19	21575.00
1 projectile	18779.00	16778.00	37.44	35.48	39.31	51131.00
2 crater	877.00	1034.00	43.65	43.25	44.23	2195.00
2 fireball	877.00	1034.00	43.65	43.25	44.23	2195.00
2 projectile	3587.00	2923.00	41.09	39.62	42.38	7793.00
3 crater	192.00	118.00	36.70	38.10	35.90	350.00
3 fireball	192.00	118.00	36.70	38.10	35.90	350.00
3 projectile	192.00	118.00	36.70	38.10	35.90	350.00

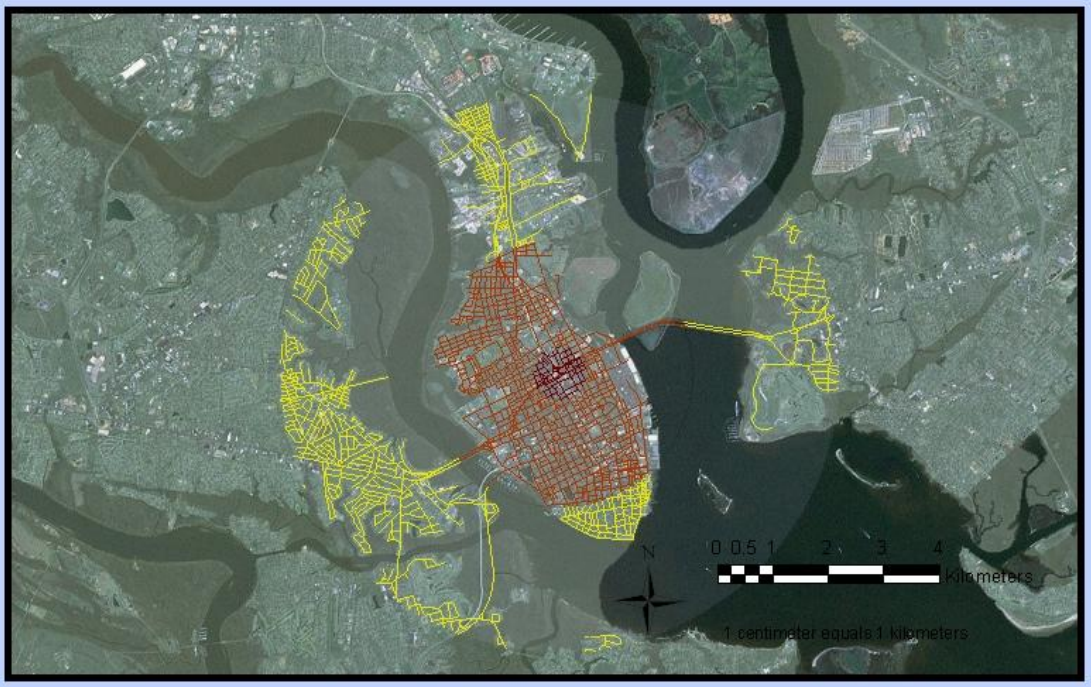
Strike Ring	MEAN HH SIZE	VACANT	SUM length	SUM area	ShapeLeng	ShapeArea
1 crater	2.32	862.00	21224.67	1688116.05	4605.81	1688116.05
1 fireball	2.21	2924.00	178056.66	34070718.18	34863.82	34070718.17
1 projectile	2.38	3631.00	473612.50	125270175.77	76337.44	125270175.76
2 crater	2.10	762.00	6957.16	1074132.62	5961.61	1074132.62
2 fireball	2.10	762.00	50282.90	21805526.89	35651.35	21805526.88
2 projectile	2.49	3382.00	151120.51	75316906.79	65110.01	75316906.80
3 crater	2.92	52.00	4605.81	1688118.19	4605.81	1688118.19
3 fireball	2.92	52.00	25609.86	17511177.27	25609.86	17511177.27
3 projectile	2.92	52.00	35260.56	46426037.34	35260.56	46426037.34

Roadways Destroyed (by Meteor Type and Impact Number)

Stony Meteor Results to Roadways:



Roads Destroyed By Stony Impact 1 by Damage Rings



Legend

Roads Destroyed by Stony Meteor Strike Ring

- 1 crater; 2 crater; 3 crater
- 1 fireball; 2 fireball; 3 fireball
- 1 projectile; 2 projectile; 3 projectile
- stony impact zones
- chuck_county

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The Map was created by Nathan Bailey. 4/26/2011.
Data layers and StreetMap USA Data are from ESRI.com. Meteor data is from the Geology Department of College of Charleston.

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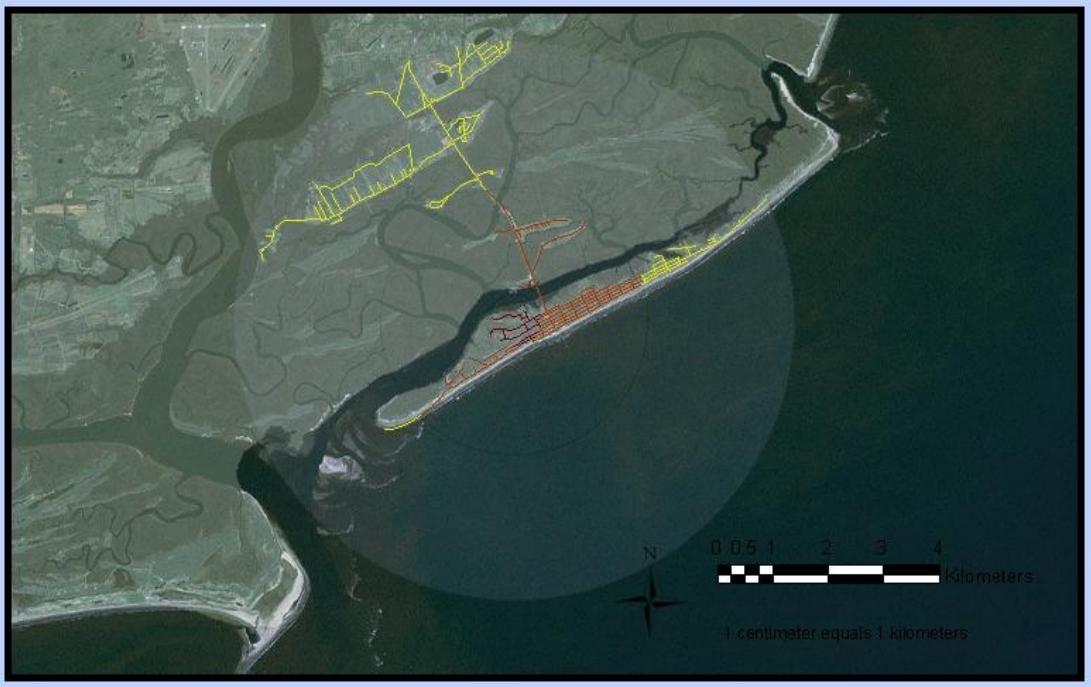
Roads Destroyed By Stony Impact 2 by Damage Rings



Legend

Roads Destroyed by Stony Meteor Strike Ring

- 1 crater; 2 crater; 3 crater
- 1 fireball; 2 fireball; 3 fireball
- 1 projectile; 2 projectile; 3 projectile
- stony impact zones
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Roads Destroyed By Stony Impact 3 by Damage Rings

Legend

Roads Destroyed by Stony Meteor Strike Ring

- 1 crater; 2 crater; 3 crater
- 1 fireball; 2 fireball; 3 fireball
- 1 projectile; 2 projectile; 3 projectile
- stony impact zones
- chuck_county

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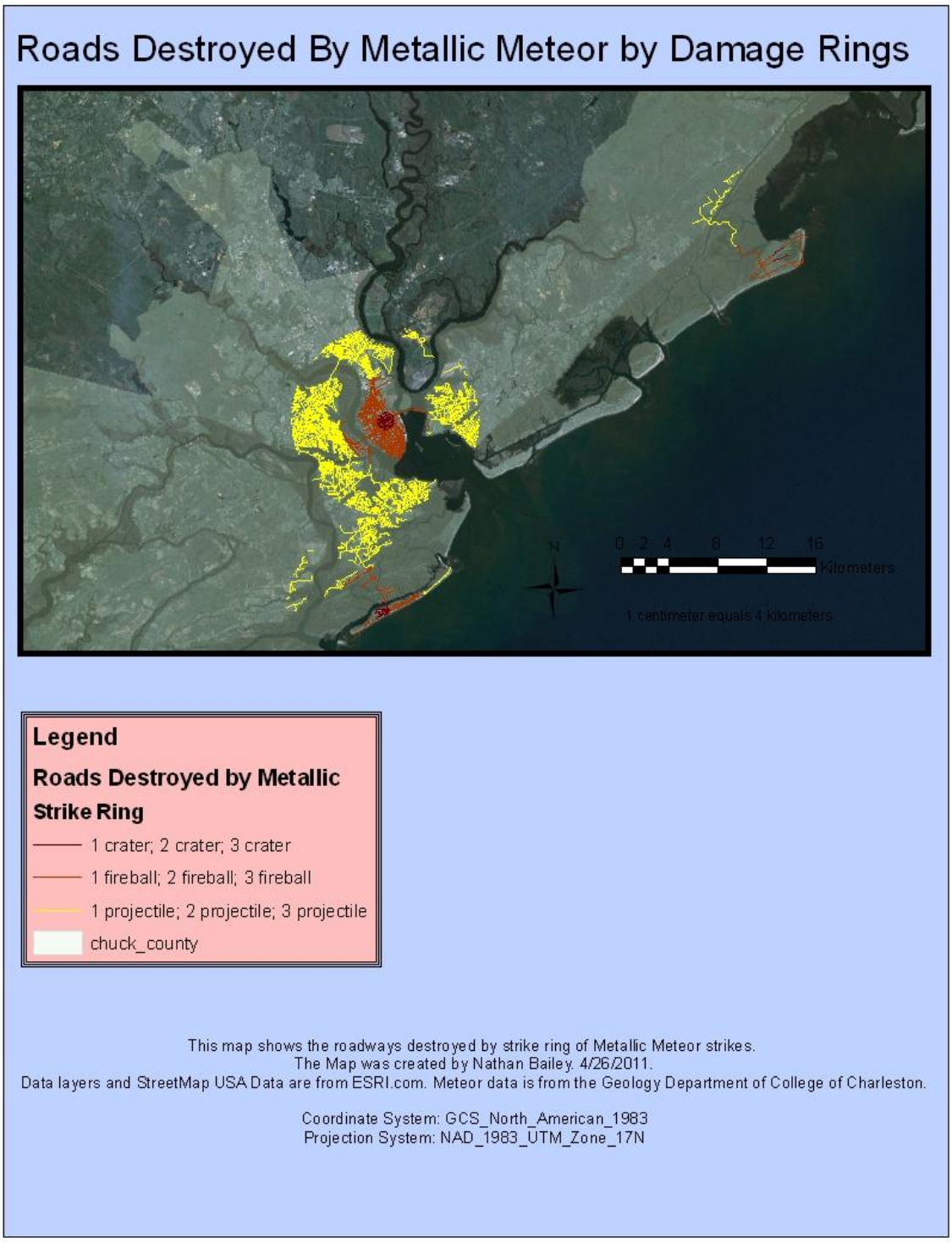
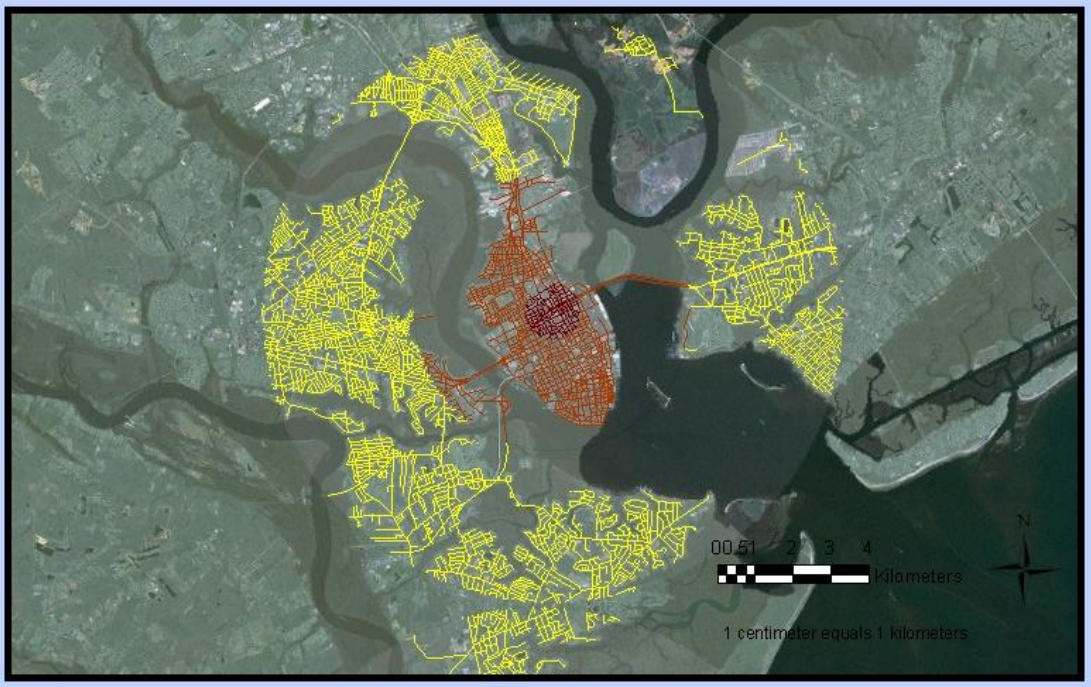
Metallic Results to Roadways:



Roads Destroyed By Metallic Impact 1 by Damage Rings



Legend

Roads Destroyed by Metallic Strike Ring

- 1 crater; 2 crater; 3 crater
- 1 fireball; 2 fireball; 3 fireball
- 1 projectile; 2 projectile; 3 projectile
- metallicunion
- chuck_county

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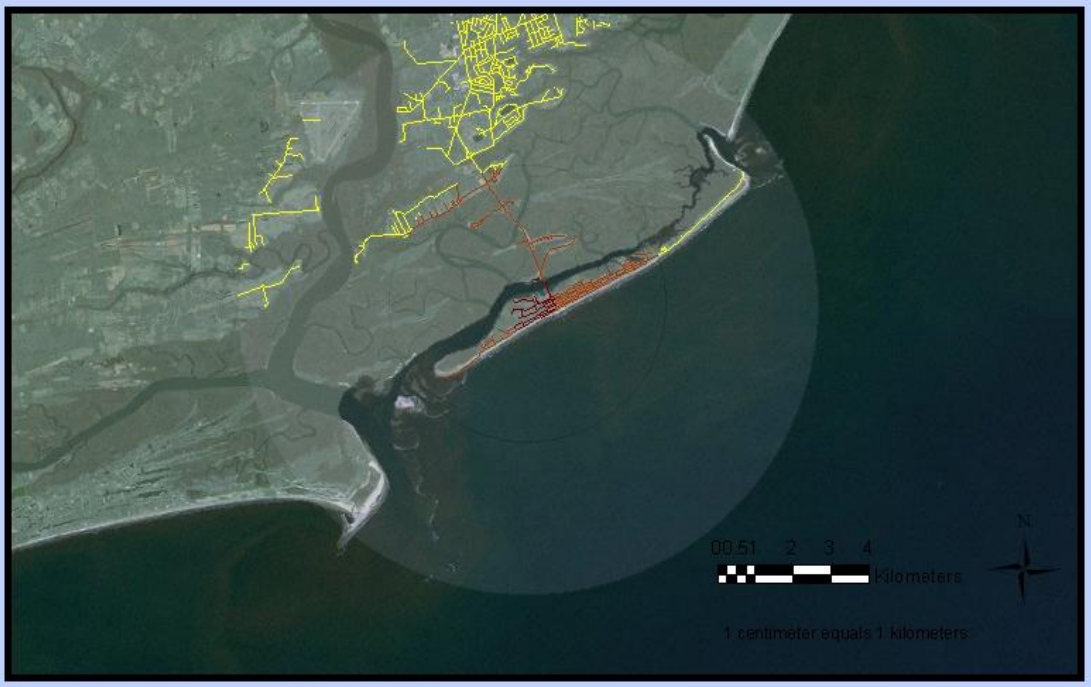
Roads Destroyed By Metallic Impact 2 by Damage Rings



Legend

Roads Destroyed by Metallic Strike Ring

- 1 crater; 2 crater; 3 crater
- 1 fireball; 2 fireball; 3 fireball
- 1 projectile; 2 projectile; 3 projectile
- metallicunion
- chuck_county

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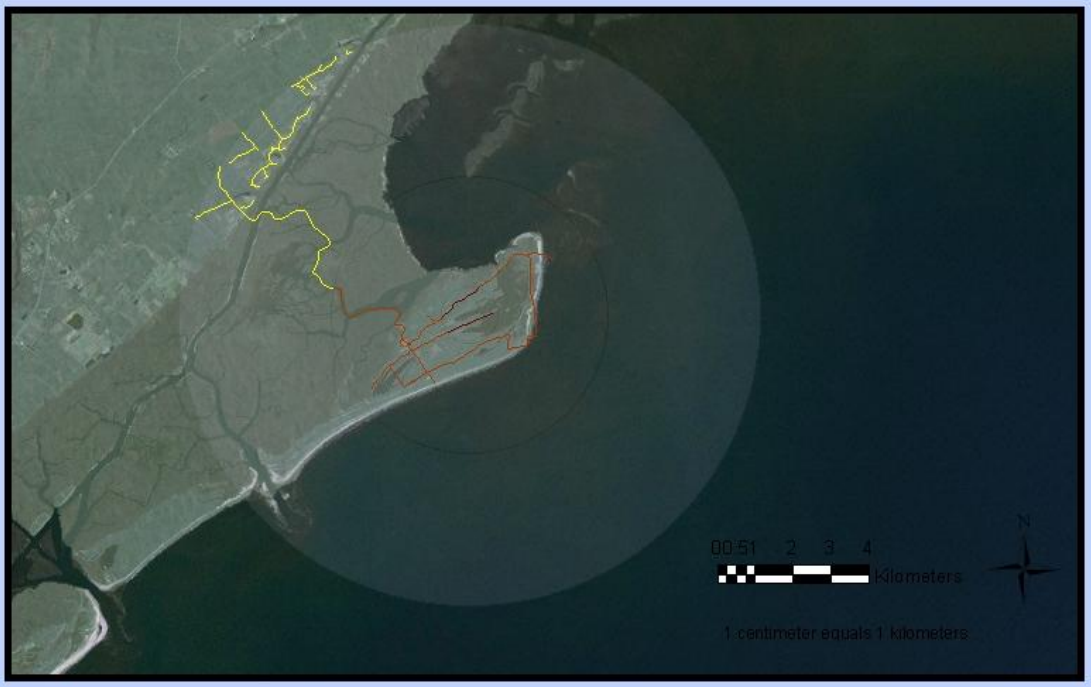
Roads Destroyed By Metallic Impact 3 by Damage Rings



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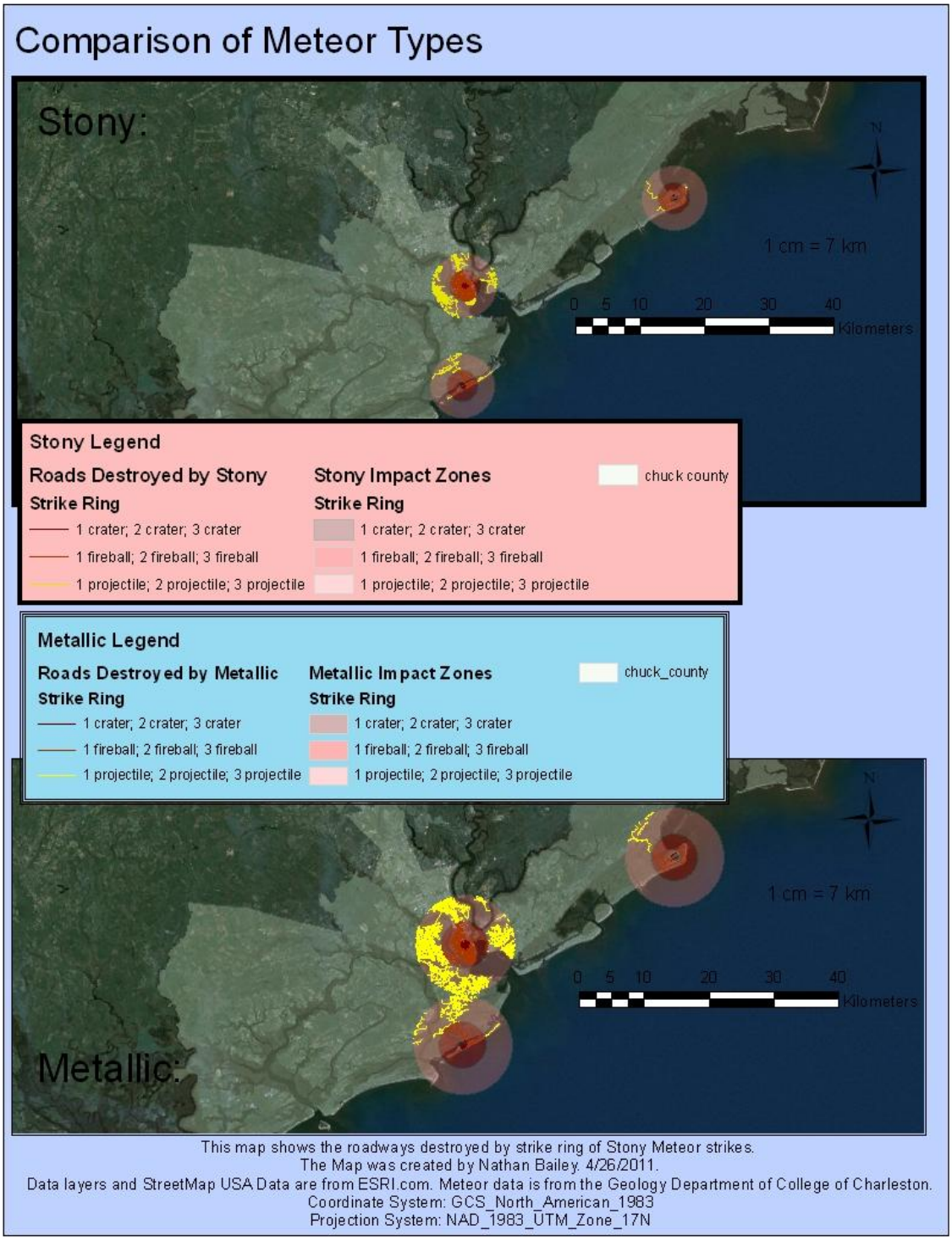
Coordinate System: GCS_North_American_1983
Projection System: NAD_1983_UTM_Zone_17N



Conclusion:

It is the conclusion of this paper that the stony meteor hit is preferable to that of the metallic. The worst case scenario is the metallic meteor impact since it destroys much

more and creates a continuous swath of destruction from North Charleston to Folly Beach where rescue and aid would be non-existent. This is not the case with the stony impact where much of James Island is still intact and rescue operations can be conducted through these still intact roadways since access to the inland is still viable. The rural area is by far the least affected by the impacts.