



Fall 2010

11.520 : A Workshop on Geographic Information Systems


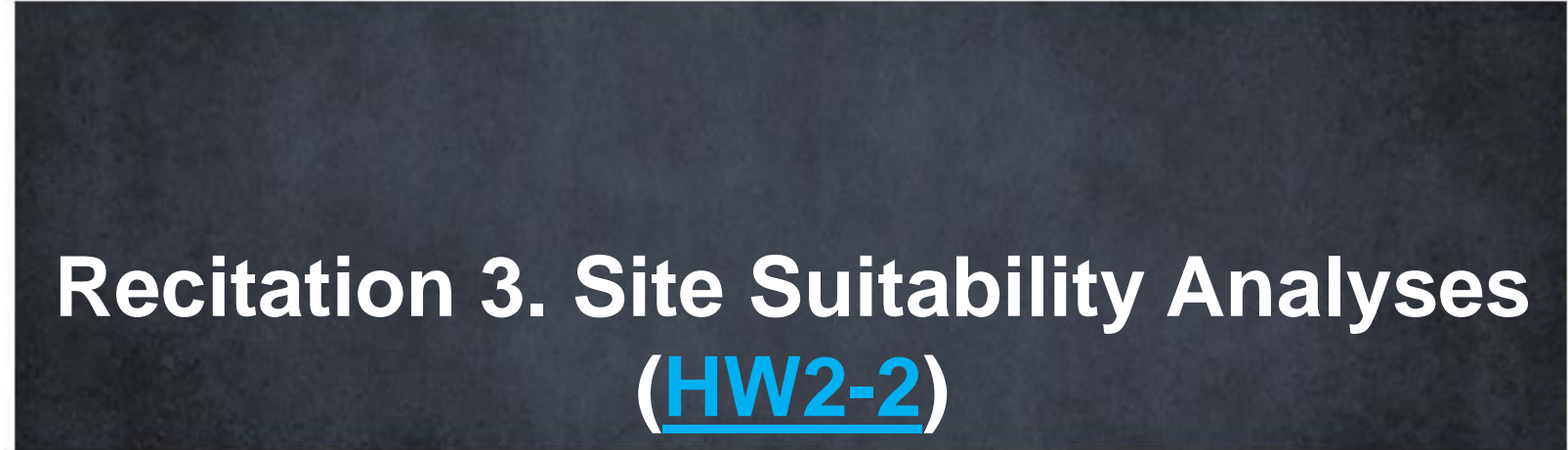
11.188 : Urban Planning and Social Science Laboratory

<http://mit.edu/11.520/www/>

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Teaching Assistant, Lulu Xue, luluxue@mit.edu

Teaching Assistant, Shan Jiang, shanjiang@mit.edu



Recitation 3. Site Suitability Analyses ([HW2-2](#))



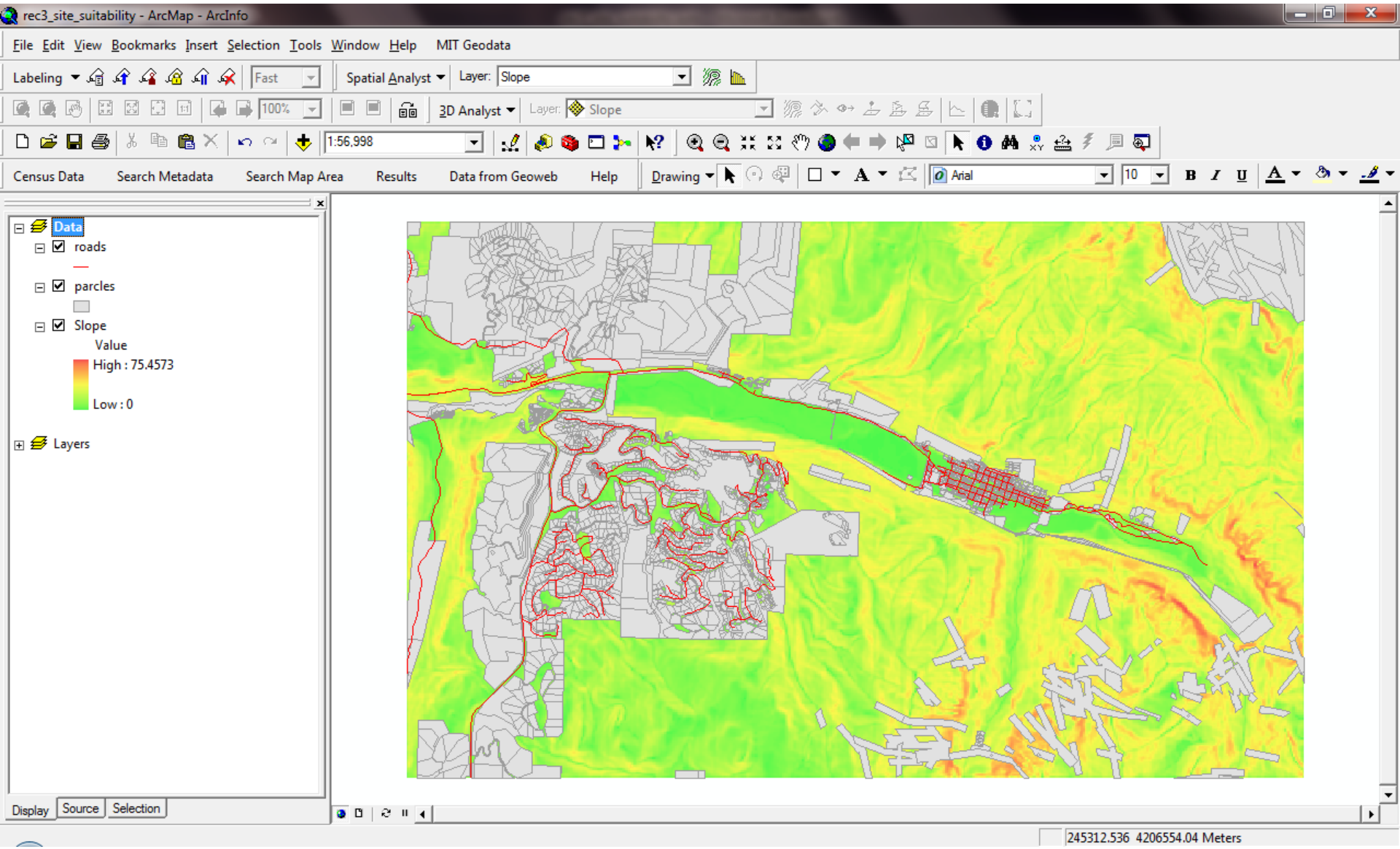
October 27/28, 2010

- **Question: Site a convention center in a small tourist town.**

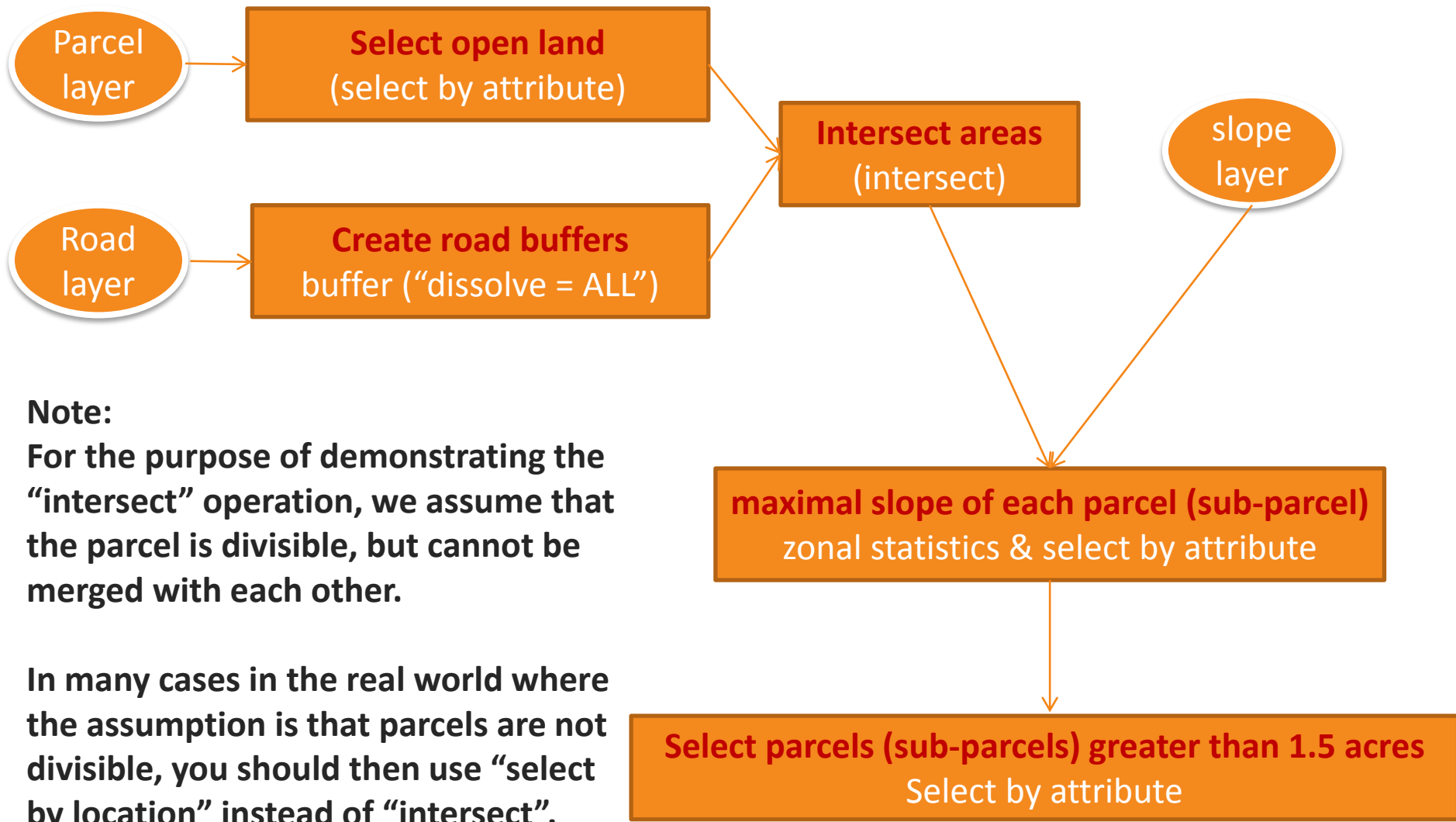
- Criterion 1: open land
- Criterion 2: adjacent to roads (within 100m)
- Criterion 3: slope less than 5 degrees
- Criterion 4: a level area greater than 1.5 acres

To perform the analysis, what kinds of datasets are needed?

Step 0--A Snapshot of the ArcMap Data Layer View



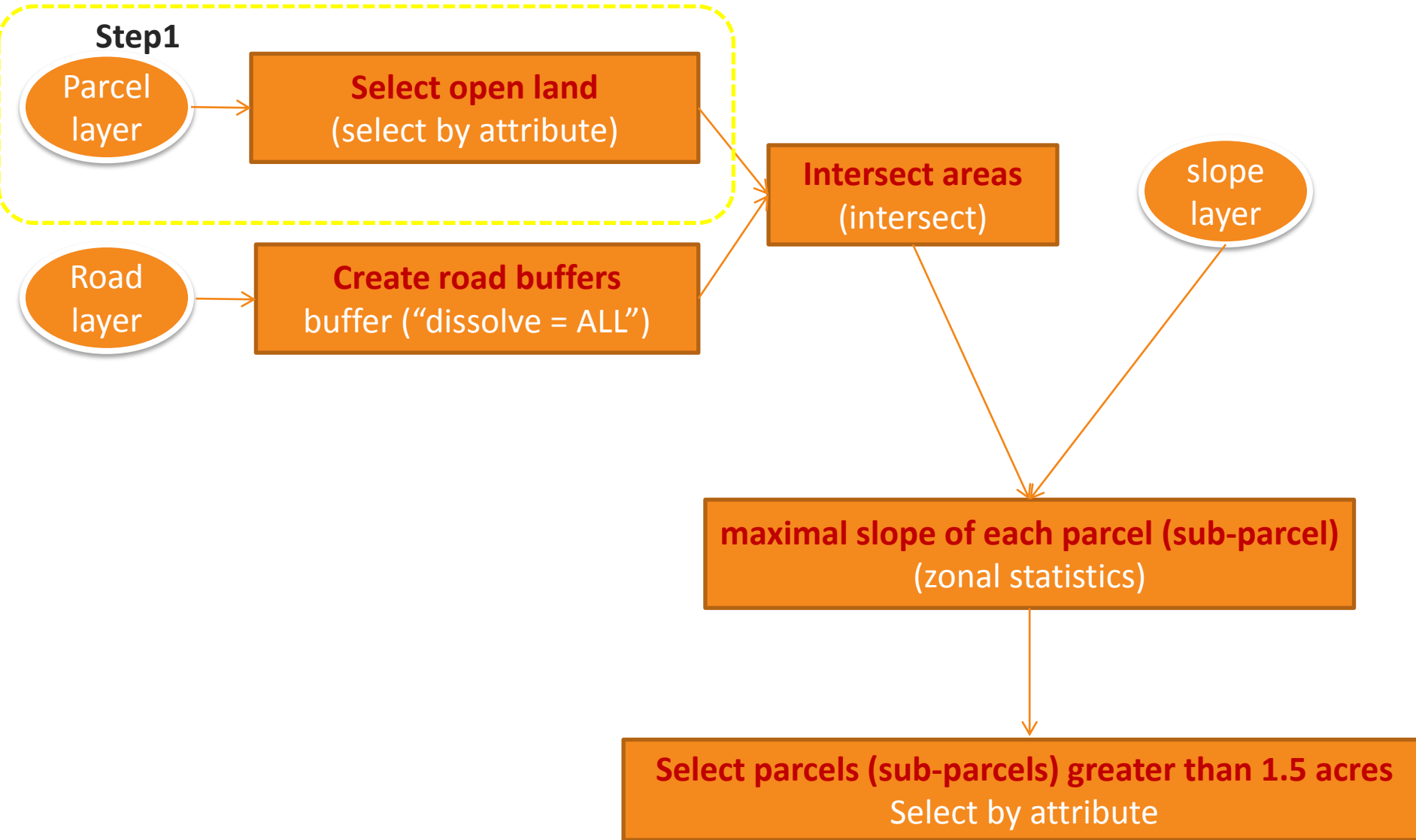
Conceptual Framework to Approach this Question



Note:
For the purpose of demonstrating the “intersect” operation, we assume that the parcel is divisible, but cannot be merged with each other.

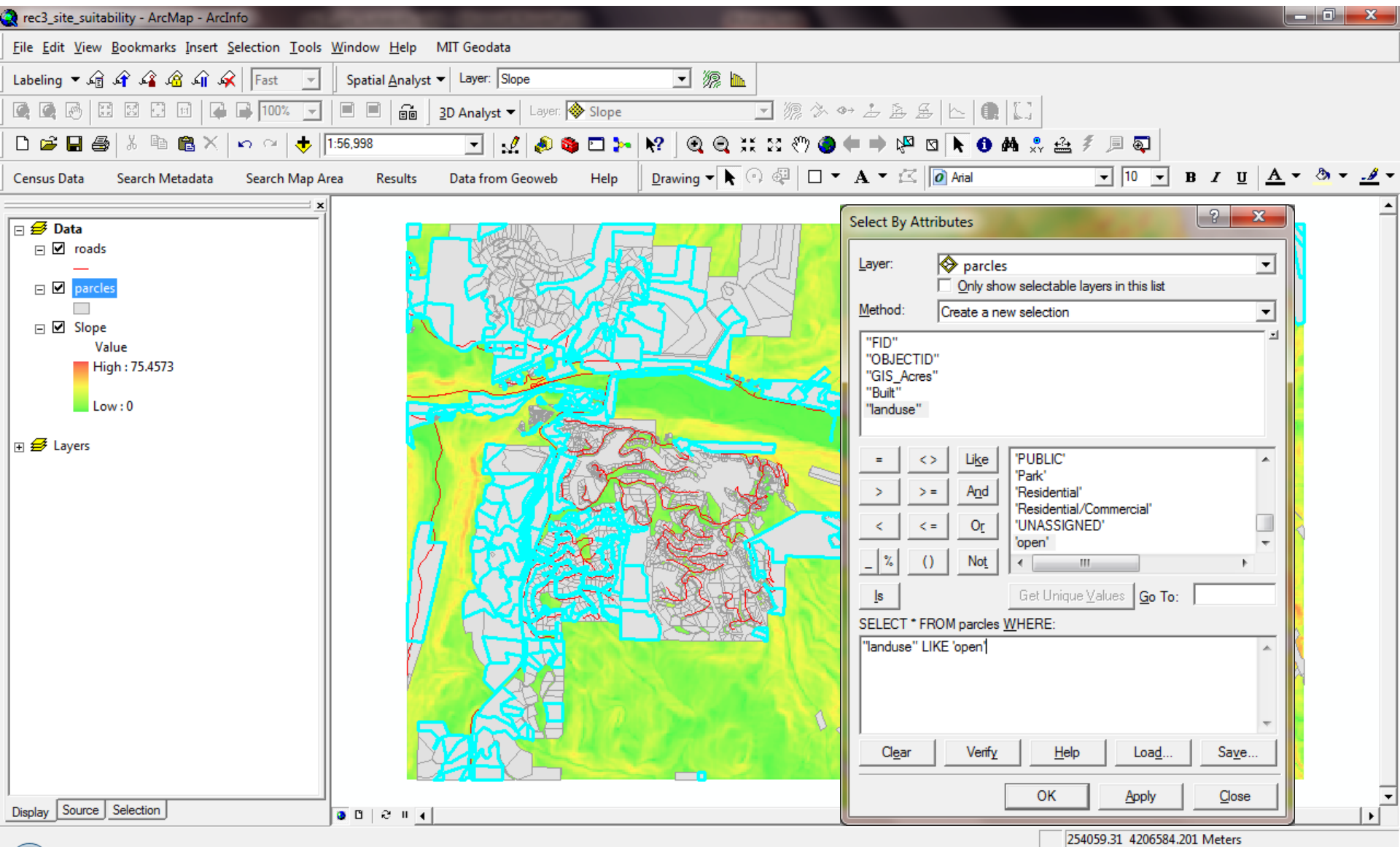
In many cases in the real world where the assumption is that parcels are not divisible, you should then use “select by location” instead of “intersect”.

Conceptual Framework to Approach this Question: Step 1



Step 1--A Snapshot of ArcMap view: selecting parcels that are open land (criterion 1)

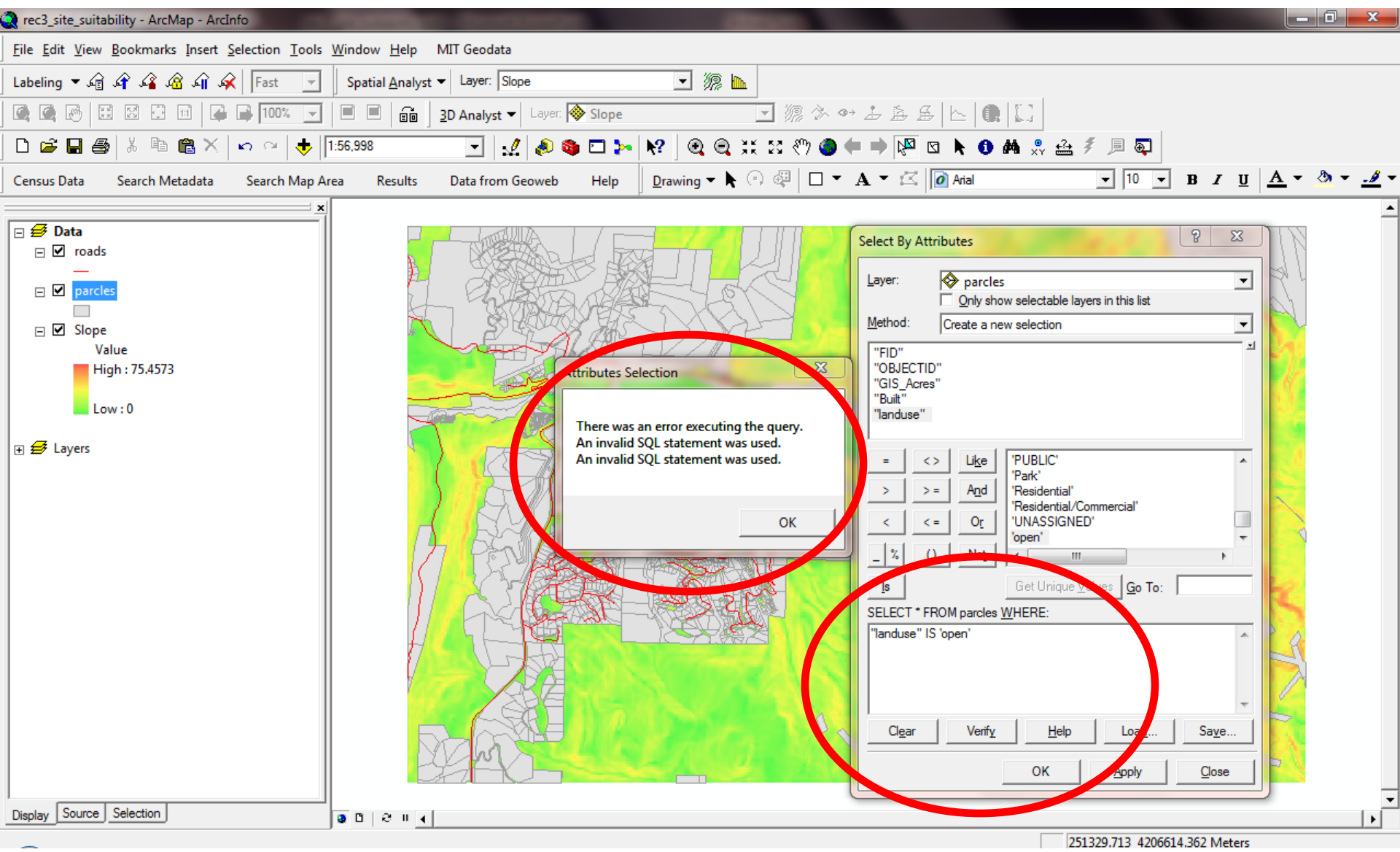
SQL: "landuse" = 'open' Or SQL: "landuse" LIKE 'open' are both correct.



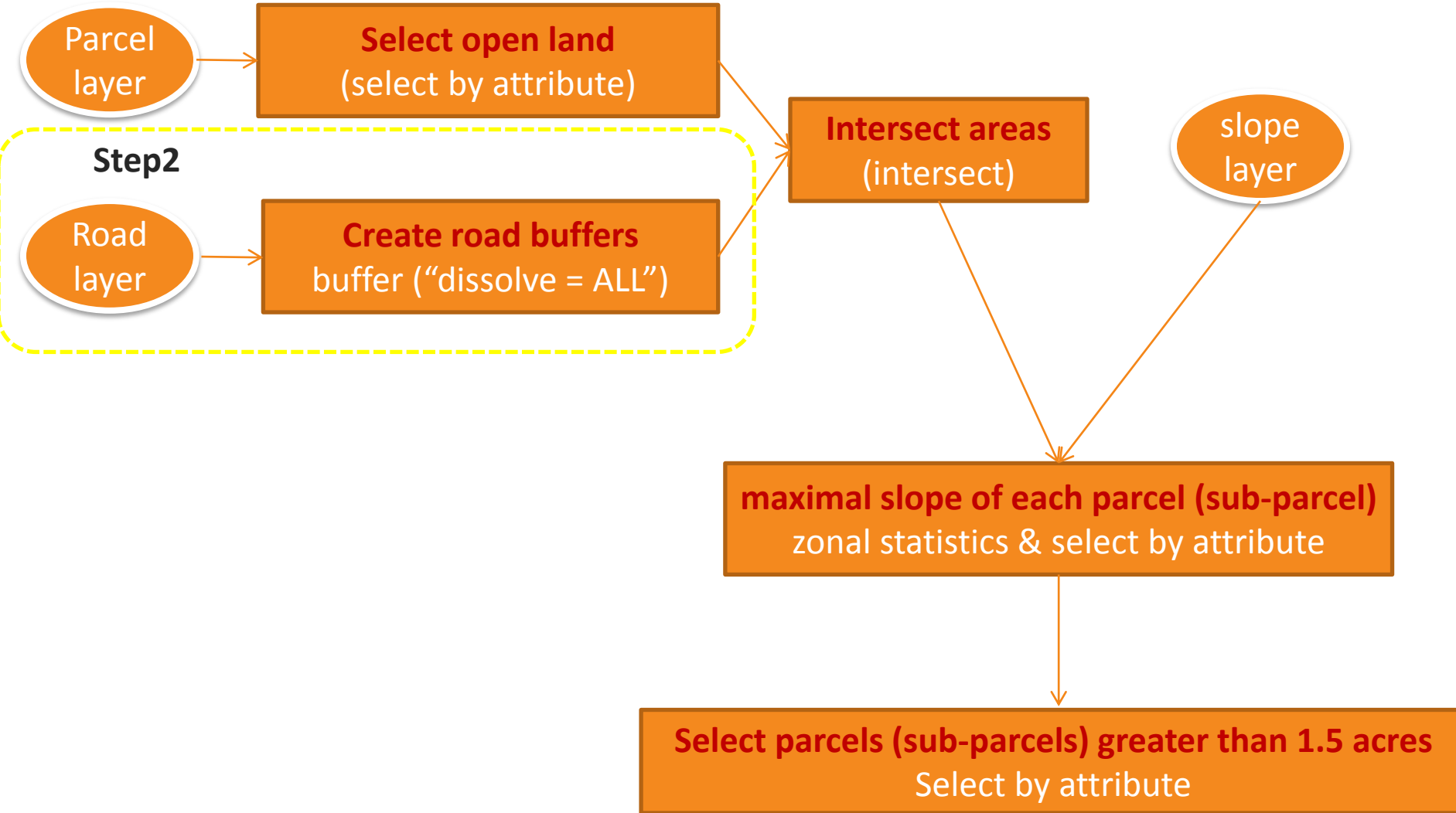
Step 1--A Snapshot of ArcMap view: selecting parcels that are open land (criterion 1)

SQL: "landuse" = 'open' Or SQL: "landuse" LIKE 'open' are both correct.

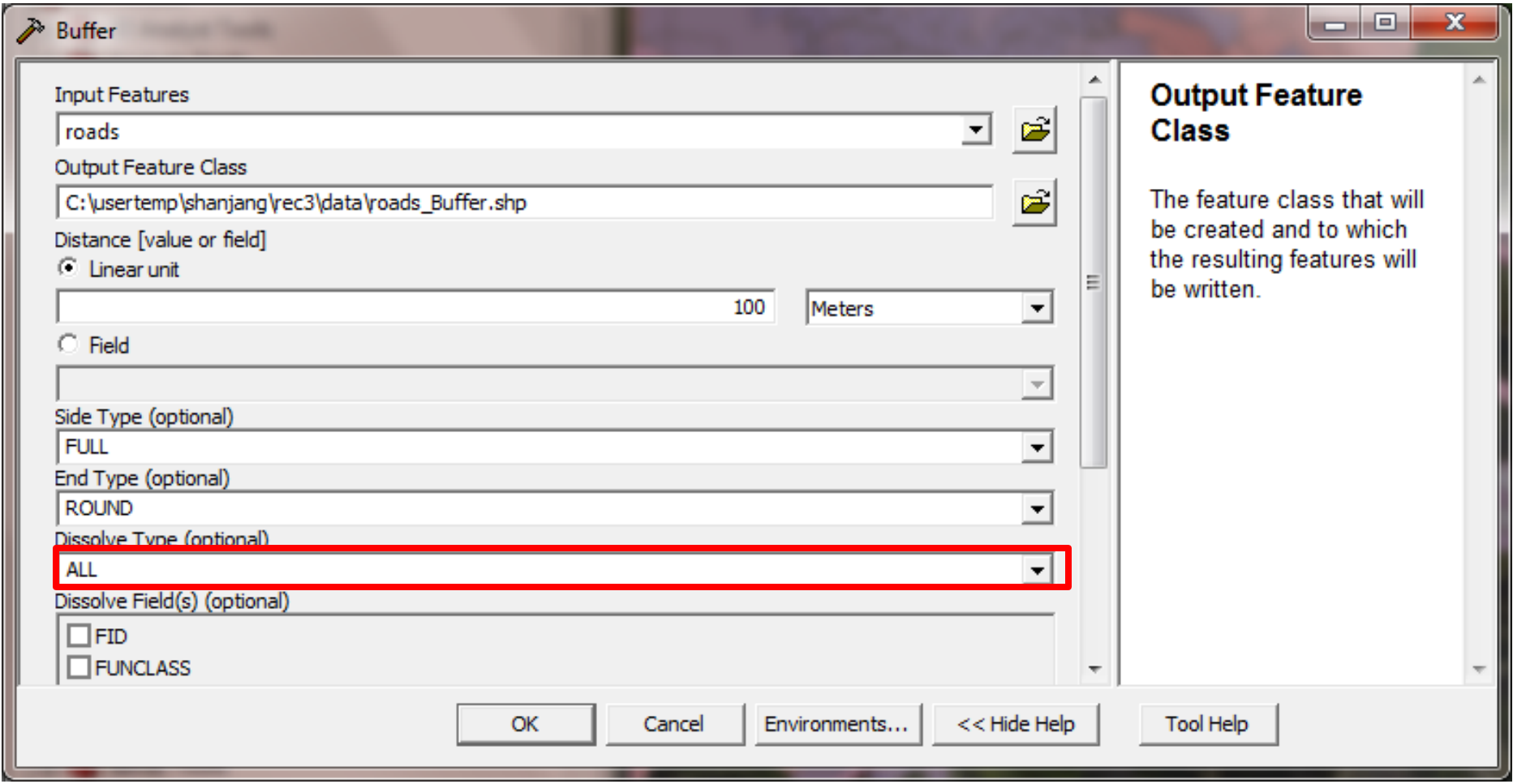
Notice that SQL : "landuse" IS 'open' does not work.



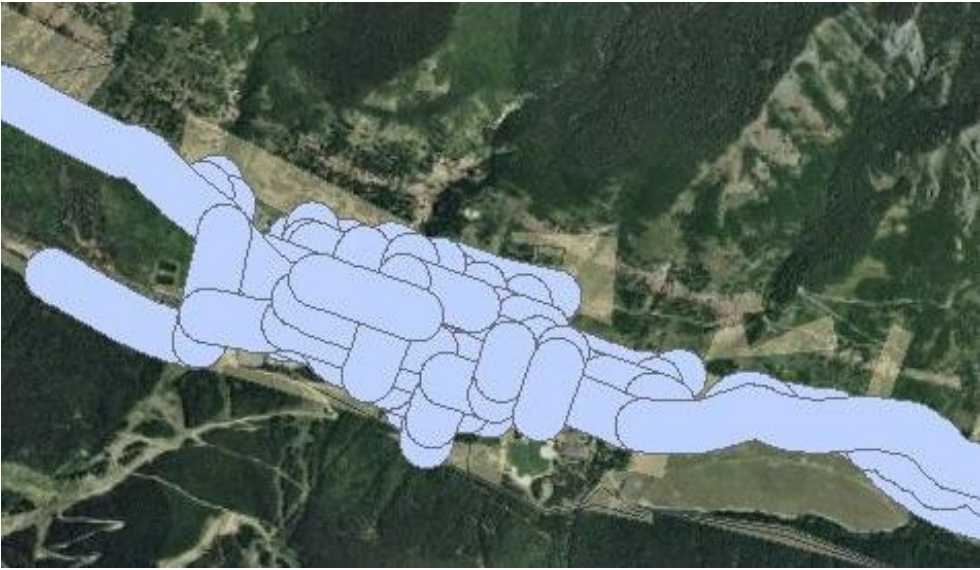
Conceptual Framework to Approach this Question: Step 2



Step 2--A Snapshot of ArcMap view: buffering road by 100 meters, and dissolve all (criterion 2)



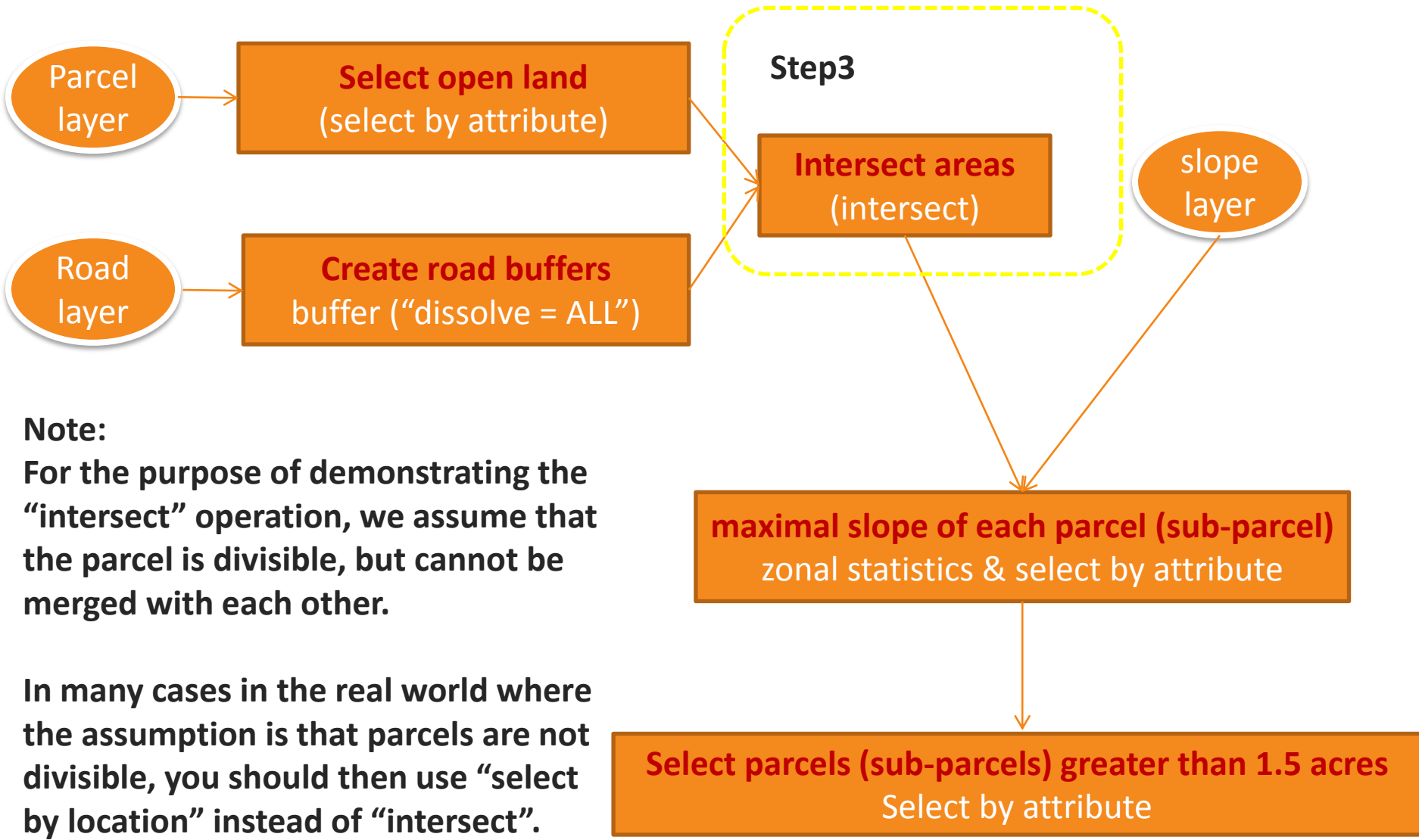
Step 2--Snapshots of ArcMap view: the buffering result. Which one did we get from this step?



Step 2--Snapshots of ArcMap view: the buffering result. Which one did we get from this step?



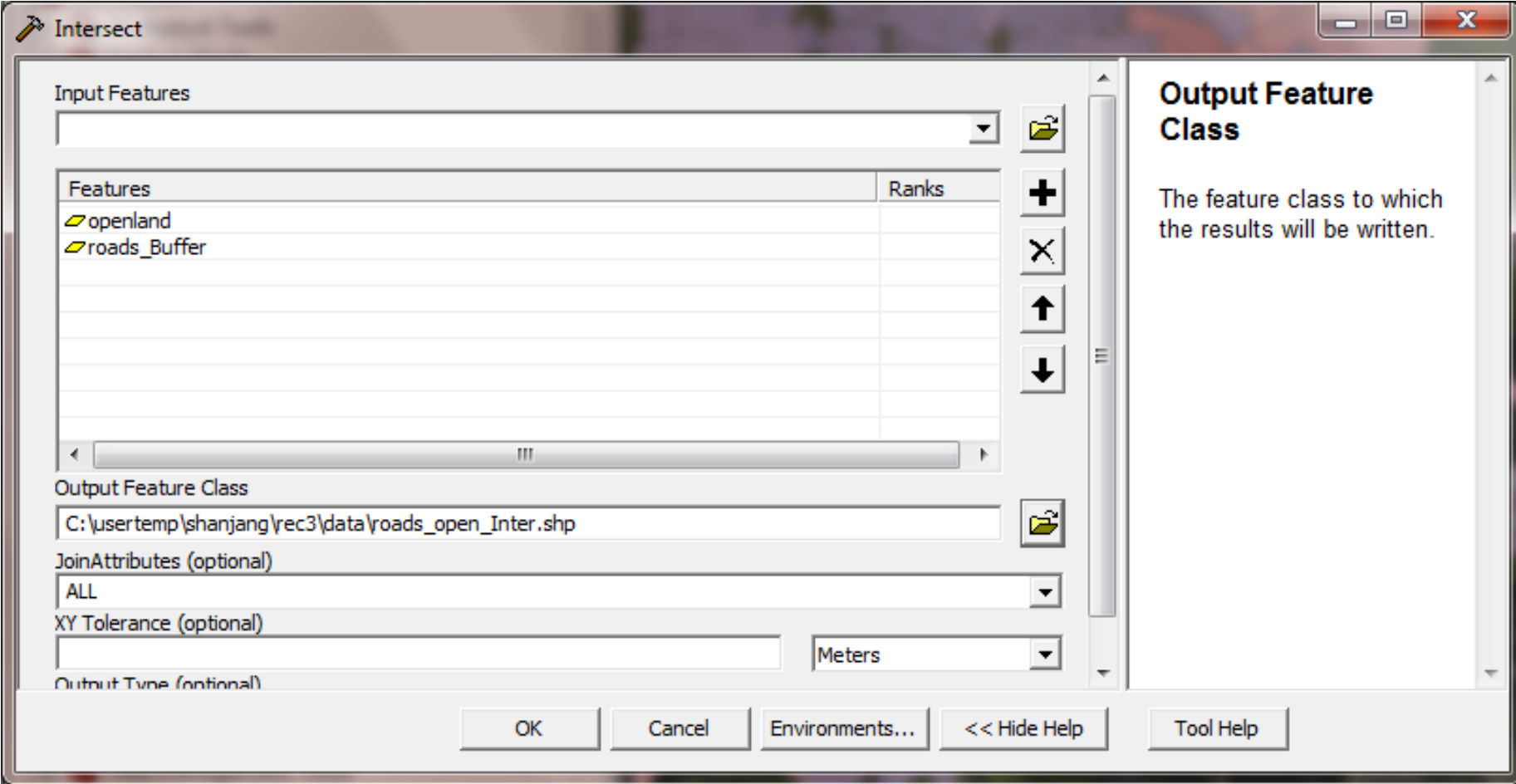
Conceptual Framework to Approach this Question: Step 3



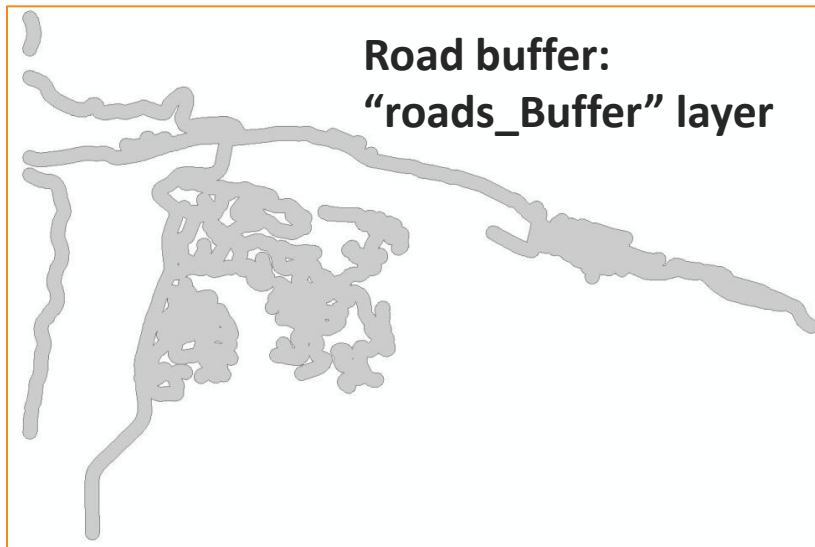
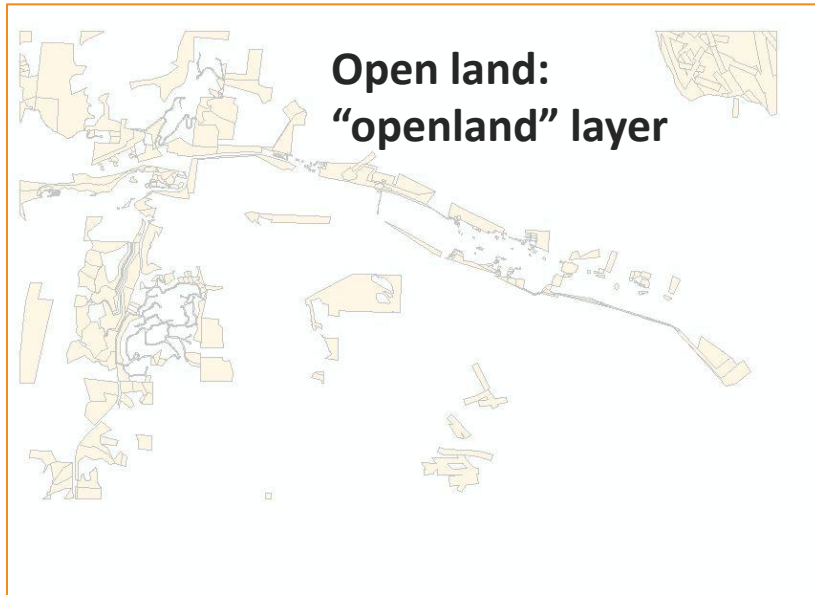
Note:
For the purpose of demonstrating the “intersect” operation, we assume that the parcel is divisible, but cannot be merged with each other.

In many cases in the real world where the assumption is that parcels are not divisible, you should then use “select by location” instead of “intersect”.

**Step 3—A Snapshot of ArcMap view:
intersecting the “openland” + “roads_Buffer” layers (criteria 1 & 2)**



**Step 3--Snapshots of ArcMap view:
intersecting the “openland” + “roads_Buffer” layers (criteria 1 & 2)**



Note:
For the purpose of demonstrating the “intersect” operation, we assume that the parcel is divisible, but cannot be merged with each other.

In many cases in the real world where the assumption is that parcels are not divisible, you should then use “select by location” instead of “intersect”.

**Step 3--Snapshots of ArcMap Attribute Table view:
intersecting the “openland” + “roads_Buffer” layers (criteria 1 & 2)**

“openland” layer attribute table: 390 rows

FID	Shape *	OBJECTID	GIS_Acres	Built	landuse
0	Polygon	804	91.238801	0	open
1	Polygon	806	92.843759	0	open
2	Polygon	818	8.537261	0	open
3	Polygon	819	50.542115	0	open
4	Polygon	820	27.556816	0	open
5	Polygon	822	4.692526	0	open
6	Polygon	828	27.707958	0	open
7	Polygon	829	19.601761	0	open
8	Polygon	831	4.905366	0	open
9	Polygon	1379	1.453824	0	open
10	Polygon	1381	8.23344	0	open
11	Polygon	2856	2.427645	0	open
12	Polygon	3826	168.938022	0	open
13	Polygon	3827	79.438772	0	open
14	Polygon	4522	10.480712	0	open
15	Polygon	4529	1.837813	0	open
16	Polygon	4734	11.791791	0	open
17	Polygon	5009	6.244812	0	open
18	Polygon	5017	2.161912	0	open
19	Polygon	5018	1.383732	0	open
20	Polygon	5033	29.318295	0	open
21	Polygon	5042	0.656174	0	open
22	Polygon	5047	4.14057	0	open

Resulting “roads_open_Inter” layer attribute table: 250 rows

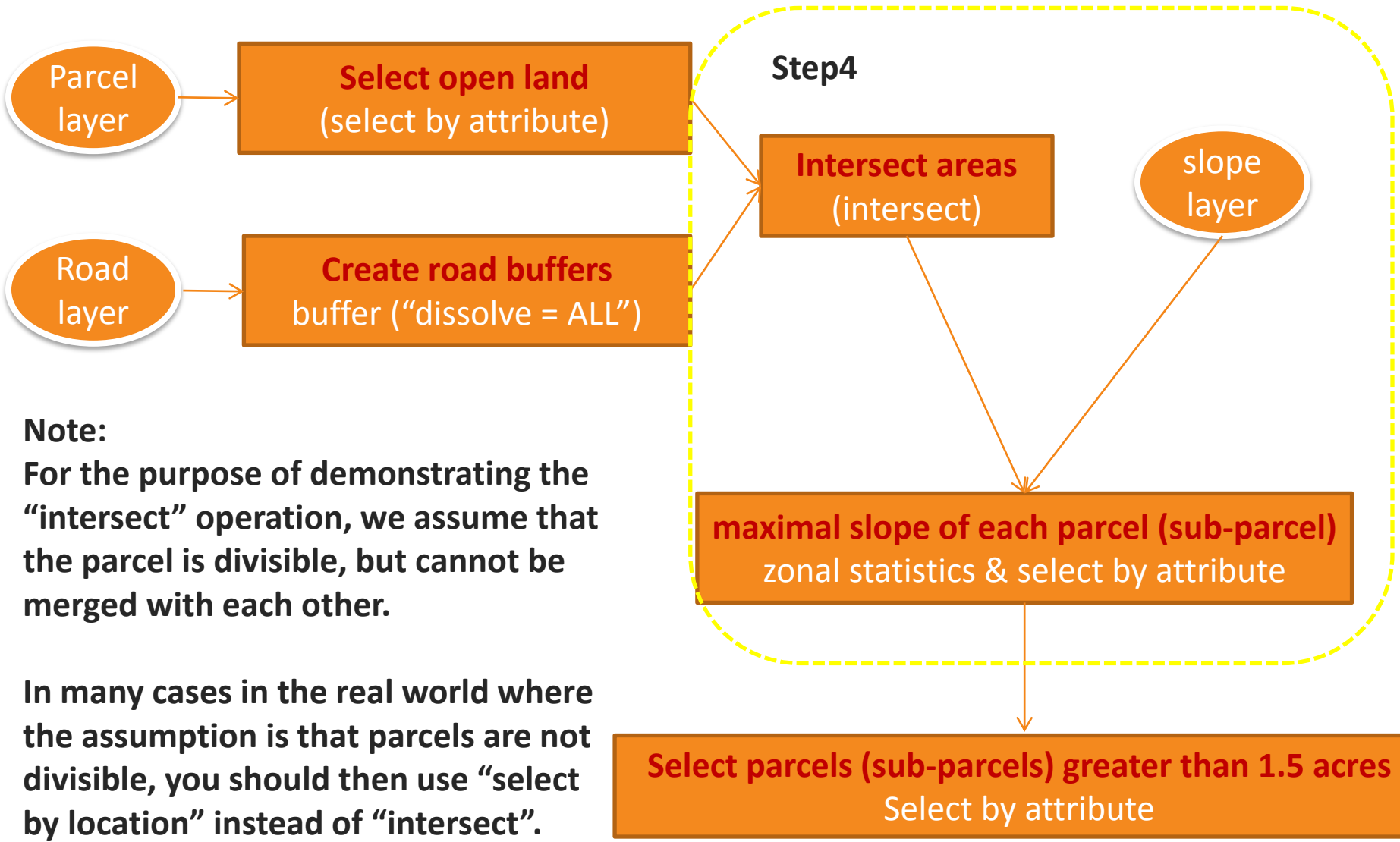
FID	Shape *	FID_openla	OBJECTID	GIS_Acres	Built	landuse	FID_road	Id
0	Polygon	37	8	0.204649	1	open	0	0
1	Polygon	40	434	35.13874	1	open	0	0
2	Polygon	42	521	0.445522	1	open	0	0
3	Polygon	43	522	0.08171	1	open	0	0
4	Polygon	44	599	0.041415	1	open	0	0
5	Polygon	45	623	0.057536	1	open	0	0
6	Polygon	46	740	35.225518	1	open	0	0
7	Polygon	47	745	1.738137	1	open	0	0
8	Polygon	48	747	1.817145	1	open	0	0
9	Polygon	49	797	2.353507	1	open	0	0
10	Polygon	51	837	12.37453	1	open	0	0
11	Polygon	53	954	0.525357	1	open	0	0
12	Polygon	54	956	2.034853	1	open	0	0
13	Polygon	55	986	0.098409	1	open	0	0
14	Polygon	56	990	29.856542	1	open	0	0
15	Polygon	60	1037	1.59119	1	open	0	0
16	Polygon	62	1095	0.084035	1	open	0	0
17	Polygon	63	1100	0.105581	1	open	0	0
18	Polygon	64	1110	36.308227	1	open	0	0
19	Polygon	65	1114	0.10354	1	open	0	0
20	Polygon	66	1150	4.310349	1	open	0	0

Dissolved “roads_Buffer” layer attribute table: 1 row

FID	Shape *	Id
0	Polygon	0

The “FID” from the “openland” layer is attached to the “roads_open_Inter” layer, and is the “FID_openla” field in the “roads_open_Inter” layer now.

Conceptual Framework to Approach this Question: Step 4

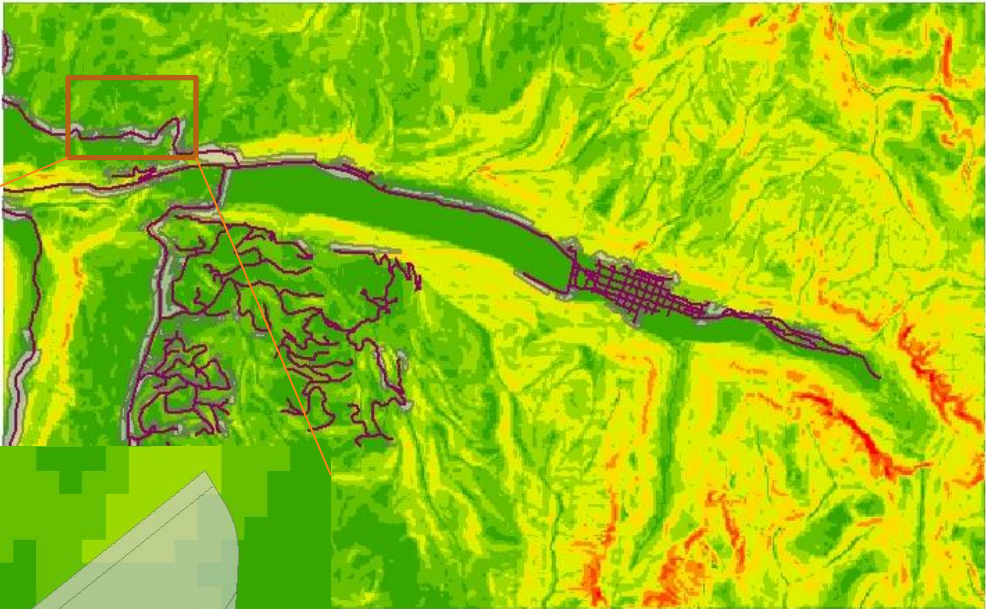


Note:
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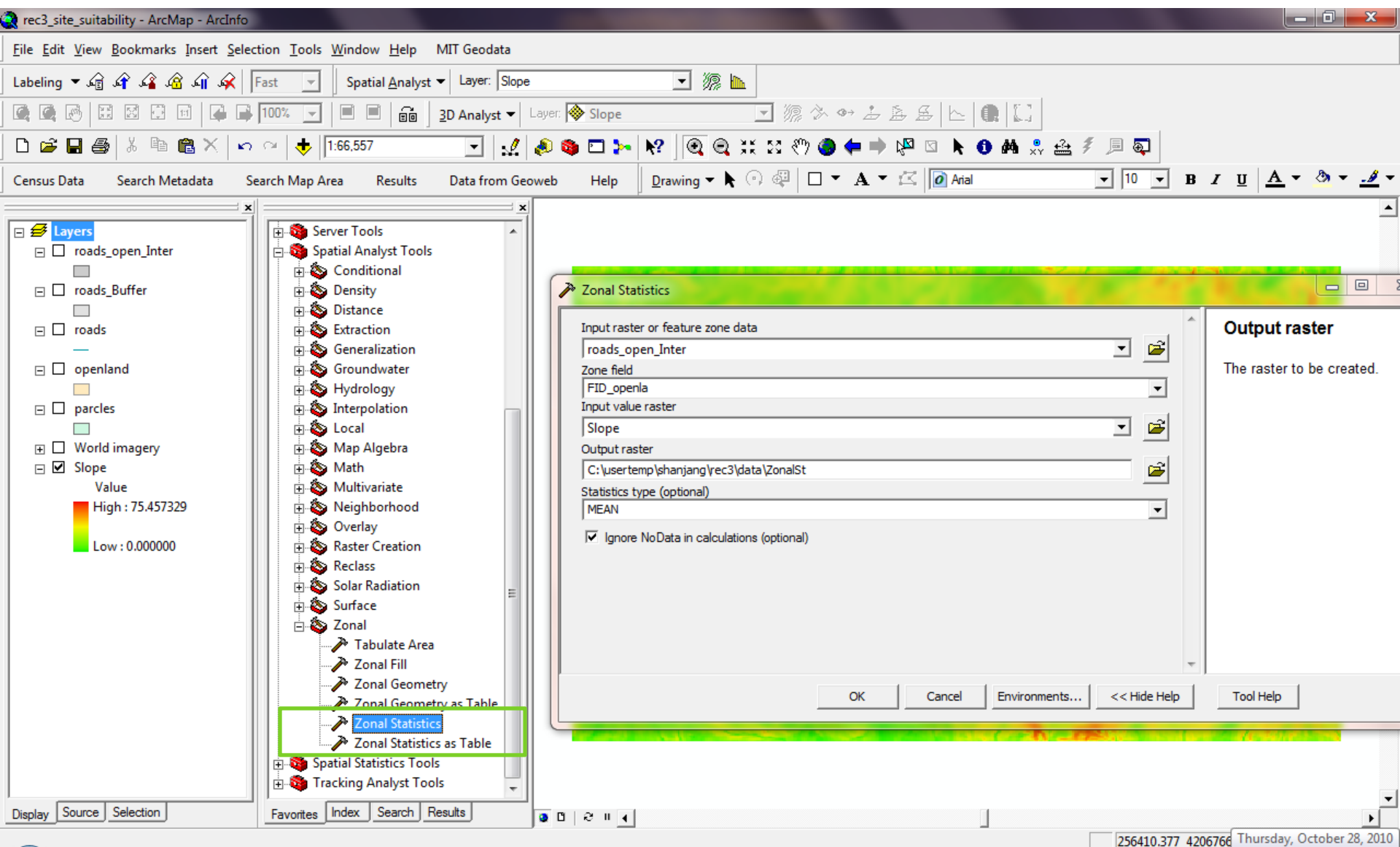
Select parcels (sub-parcels) greater than 1.5 acres
Select by attribute

Step 4-- Snapshots of ArcMap view: the slope layer (a raster layer)



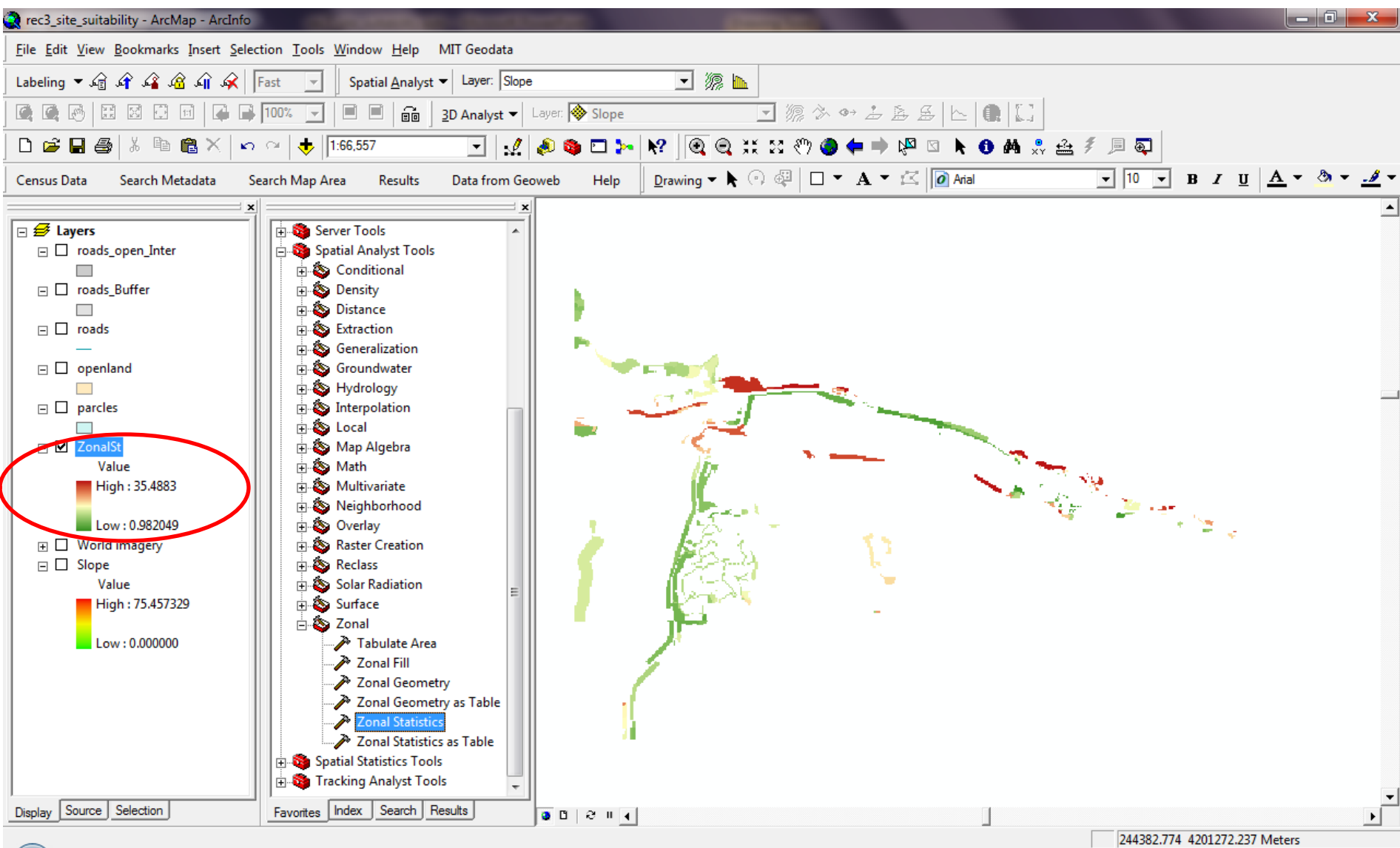
Step 4–Snapshots of ArcMap view: Zonal Statistics

(Note: the output is only a raster layer , “ZonalSt”, without a table)



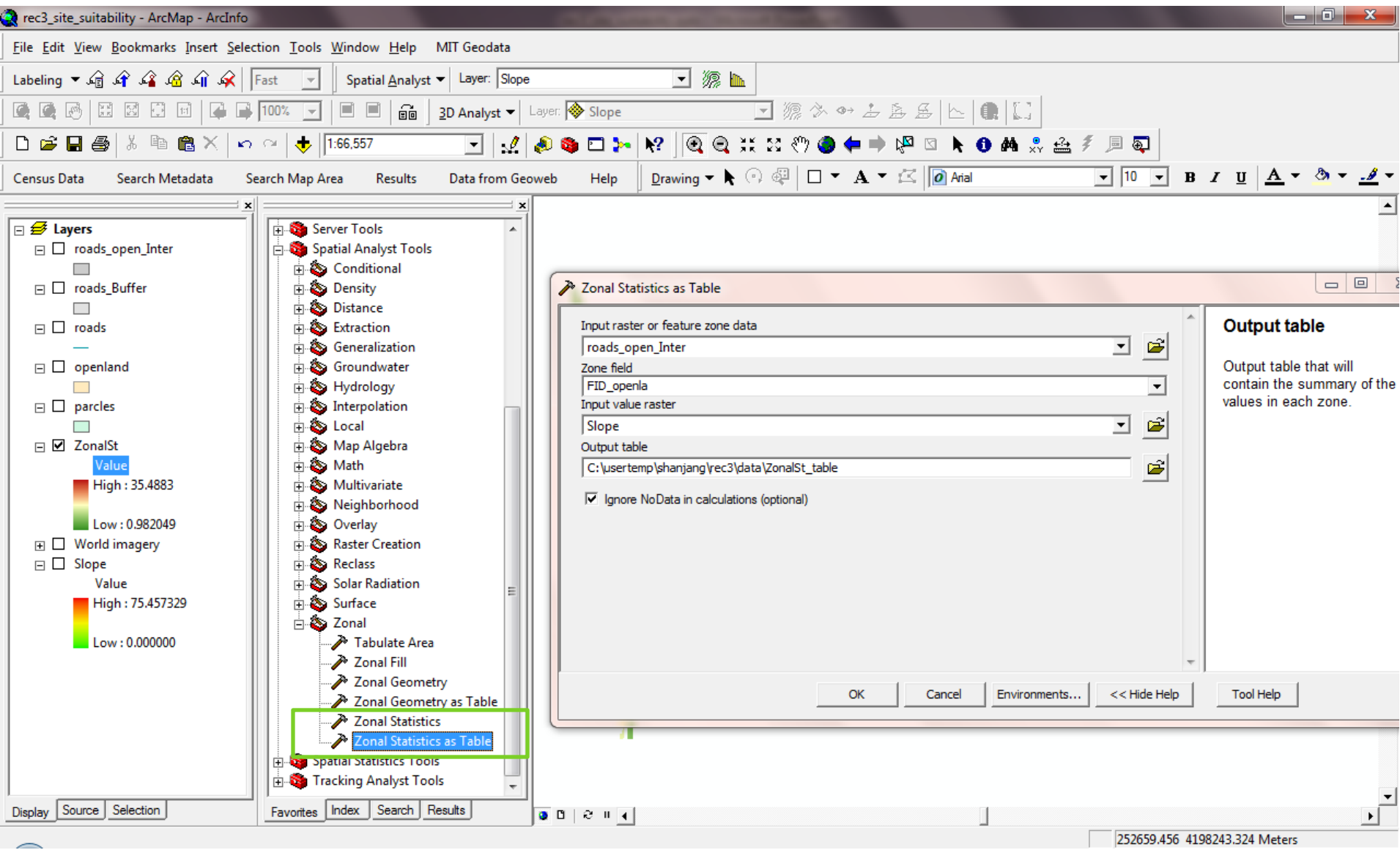
Step 4– A Snapshot of ArcMap view: Zonal Statistics

(Note: the output is only a raster layer , “ZonalSt”, without a table)



Step 4– Snapshots of ArcMap view: Zonal Statistics as Table (the input dialog view)

(Note: the output is only a table– see next slide)



Step 4—Snapshots of ArcMap view: Zonal Statistics as Table (the output view)

(Note: the output is only a table: "ZonalSt_Table")

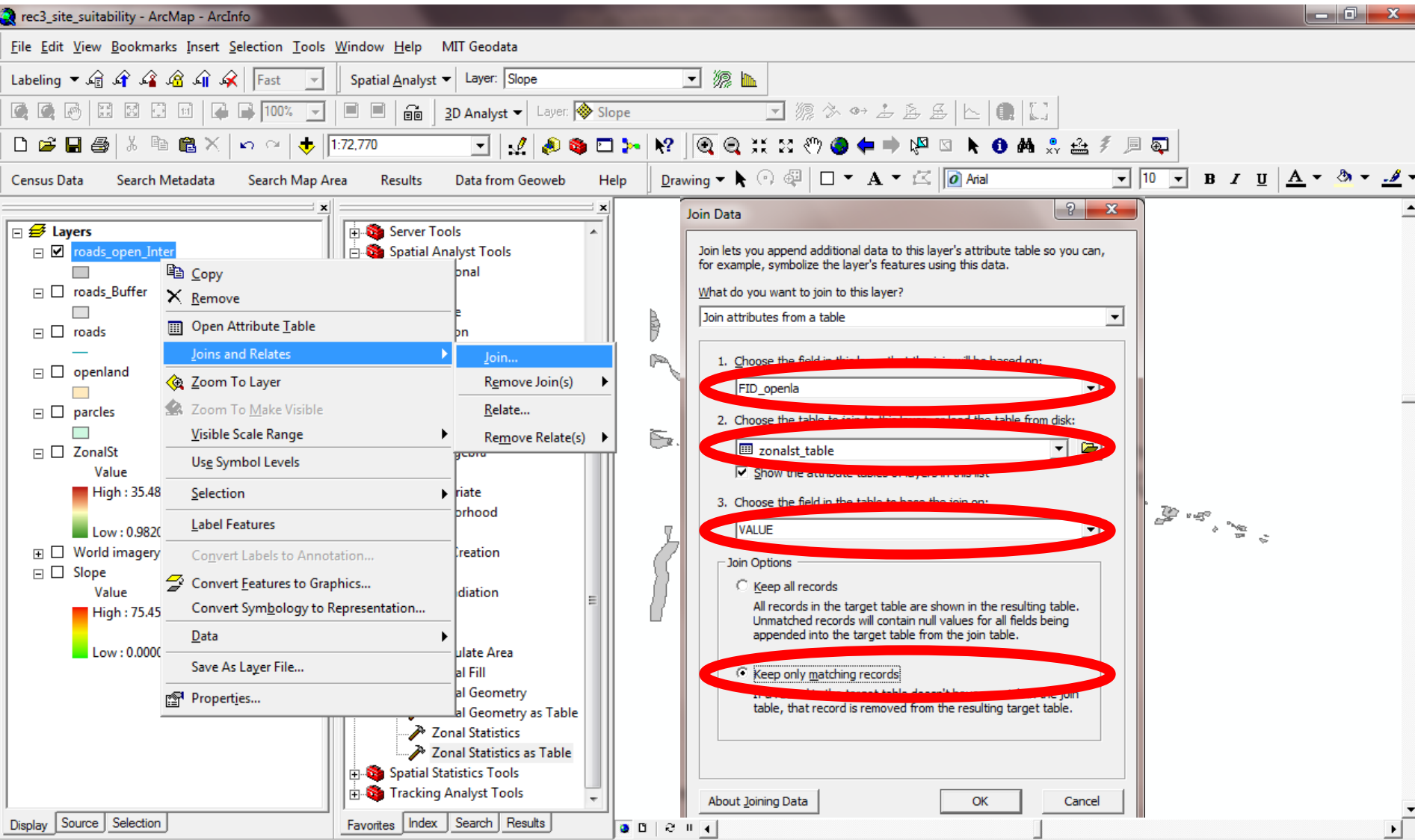
The screenshot shows the ArcMap interface with the 'Attributes of zonalst_table' window open. The table contains the following data:

Rowid	VALUE	COUNT	AREA	MIN	MAX	RANGE	MEAN	STD	SUM
1	37	1	625	14.421009	14.421009	0	14.421009	0	14.421009
2	40	14	8750	23.670721	31.126877	7.456156	27.036148	2.147496	378.50607
3	42	2	1250	1.846909	1.867208	0.020299	1.857058	0.010149	3.714117
4	43	1	625	7.574903	7.574903	0	7.574903	0	7.574903
5	46	69	43125	27.043493	39.431549	12.388056	33.32095	3.131496	2299.1455
6	47	4	2500	5.835512	7.293581	1.458069	6.502196	0.525822	26.008783
7	48	11	6875	5.253683	9.788436	4.534753	6.84416	1.553554	75.285759
8	49	13	8125	5.138742	10.329865	5.191123	7.312932	1.522191	95.068108
9	51	3	1875	20.302769	22.519434	2.216665	21.767076	1.035553	65.301231
10	53	2	1250	11.243147	11.749129	0.505982	11.496138	0.252991	22.992275
11	54	7	4375	8.085605	10.694275	2.60867	9.45159	0.955081	66.161125
12	55	1	625	35.047009	35.047009	0	35.047009	0	35.047009
13	56	54	33750	3.463563	18.09935	14.635787	10.272119	4.073085	554.6944
14	60	8	5000	3.885474	6.139256	2.253782	5.03616	0.712406	40.289276
15	63	1	625	5.812044	5.812044	0	5.812044	0	5.812044
16	64	66	41250	1.615806	24.584402	22.968596	9.630181	6.340775	635.59198
17	66	9	5625	6.447477	10.771886	4.324409	8.881298	1.437674	79.931686
18	67	7	4375	5.730571	8.515831	2.78526	7.503629	0.989883	52.525402
19	69	5	3125	5.749426	15.67098	9.921555	12.522532	3.751391	62.612663
20	72	2	1250	12.73981	25.023336	12.283526	18.881573	6.141763	37.763145
21	73	1	625	6.821811	6.821811	0	6.821811	0	6.821811
22	75	1	625	5.53642	5.53642	0	5.53642	0	5.53642
23	82	70	43750	2.784292	18.461884	15.677591	9.472275	5.123404	663.0592
24	86	3	1875	14.266218	19.726534	5.460316	17.335863	2.28028	52.007591
25	87	27	16875	7.69493	23.795206	16.100277	19.387949	4.055802	523.47461
26	88	1	625	23.446327	23.446327	0	23.446327	0	23.446327
27	89	24	15000	5.50454	15.684602	10.180061	8.919066	2.308887	214.05757

Opens the table

Step 4—Snapshots of ArcMap Attribute Table View:

- Join the attribute table of the “roads_open_Inter” layer(result from step 3) with the zonal statistics table “ZonalSt_Table”, based on “FID_openla” = “VALUE”



Step 4– A Snapshot of ArcMap Attribute Table View:

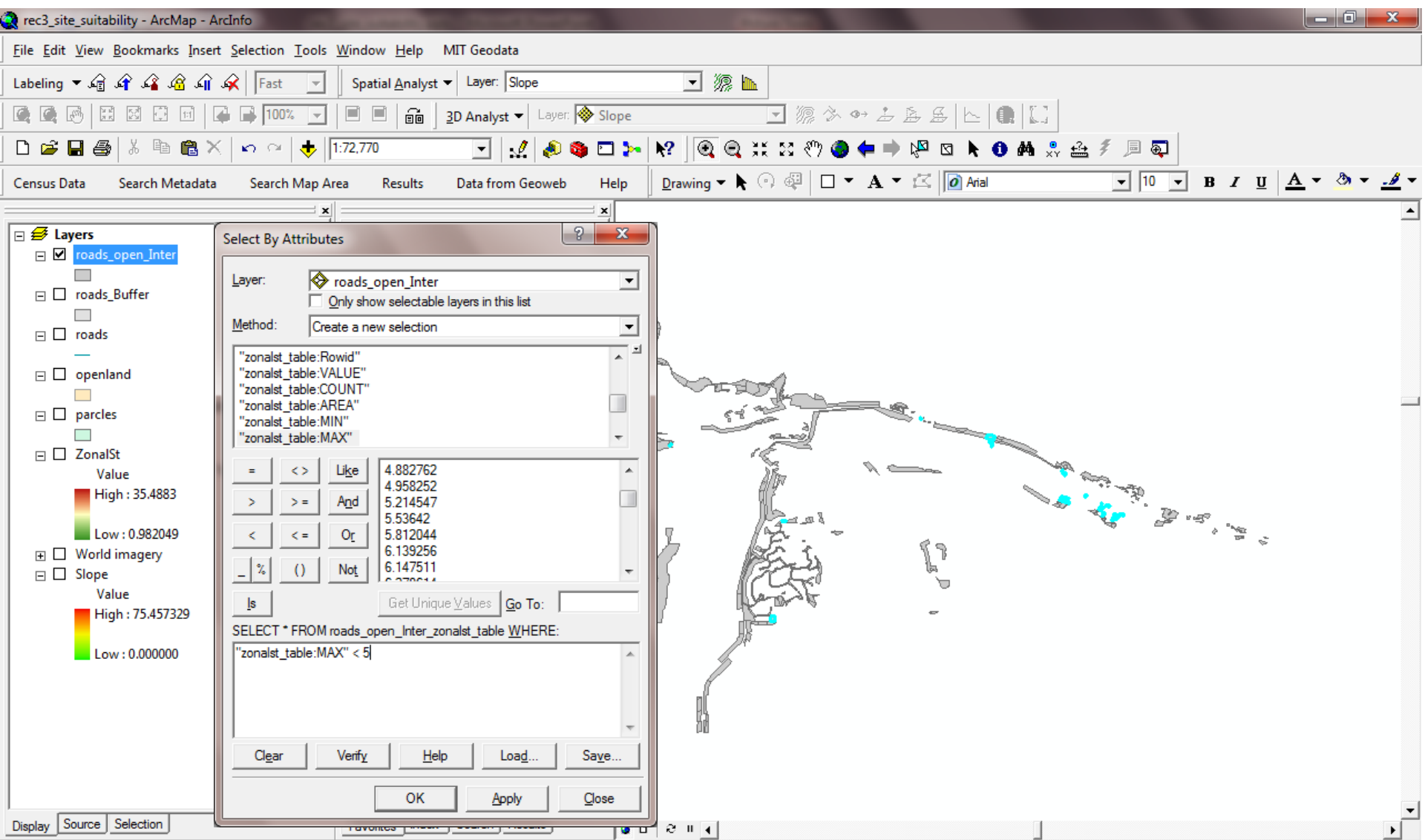
- Join the attribute table of the “roads_open_Inter” layer(result from step 3) with the zonal statistics table “ZonalSt_Table”, based on “FID_openla” = “VALUE”
- The layer attribute table after “join” contains Slope information from the zonal statistics table.

Attributes of roads_open_Inter

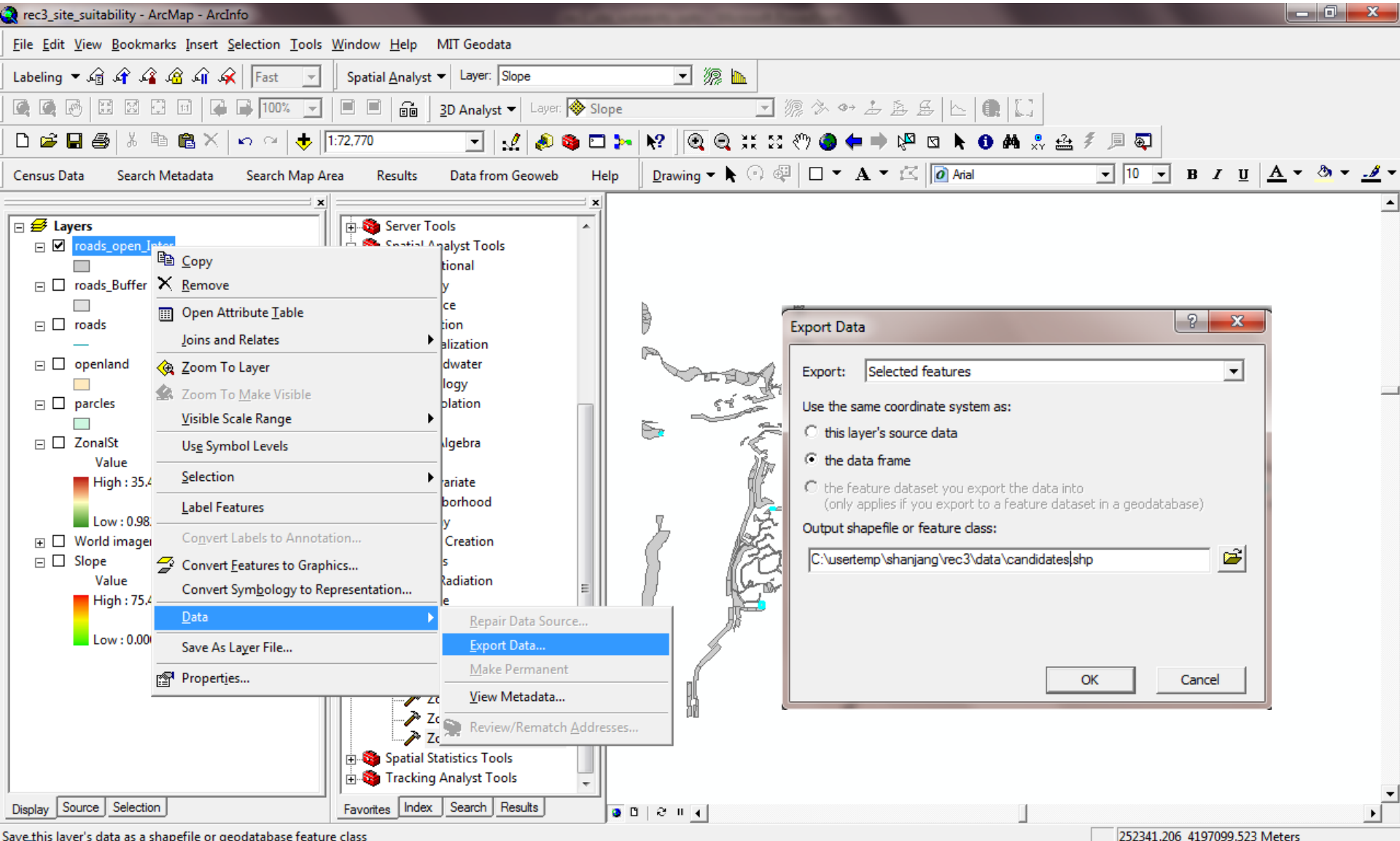
FID	Shape *	FID_openla	OBJECTID	GIS_Acres	Built	landuse	FID_road	Id	Rowid	VALUE *	COUNT	AREA	MIN	MAX	RANGE	MEAN	STD	SUM
0	Polygon	37	8	0.204649	1	open	0	0	1	37	1	625	14.421009	14.421009	0	14.421009	0	14.421009
1	Polygon	40	434	35.13874	1	open	0	0	2	40	14	8750	23.670721	31.126877	7.456156	27.036148	2.147496	378.50607
2	Polygon	42	521	0.445522	1	open	0	0	3	42	2	1250	1.846909	1.867208	0.020299	1.857058	0.010149	3.714117
3	Polygon	43	522	0.08171	1	open	0	0	4	43	1	625	7.574903	7.574903	0	7.574903	0	7.574903
6	Polygon	46	740	35.225518	1	open	0	0	5	46	69	43125	27.043493	39.431549	12.388056	33.32095	3.131496	2299.1455
7	Polygon	47	745	1.738137	1	open	0	0	6	47	4	2500	5.835512	7.293581	1.458069	6.502196	0.525822	26.008783
8	Polygon	48	747	1.817145	1	open	0	0	7	48	11	6875	5.253683	9.788436	4.534753	6.84416	1.553554	75.285759
9	Polygon	49	797	2.353507	1	open	0	0	8	49	13	8125	5.138742	10.329865	5.191123	7.312932	1.522191	95.068108
10	Polygon	51	837	12.37453	1	open	0	0	9	51	3	1875	20.302769	22.519434	2.216665	21.767076	1.035553	65.301231
11	Polygon	53	954	0.525357	1	open	0	0	10	53	2	1250	11.243147	11.749129	0.505982	11.496138	0.252991	22.992275
12	Polygon	54	956	2.034853	1	open	0	0	11	54	7	4375	8.085605	10.694275	2.60867	9.45159	0.955081	66.161125
13	Polygon	55	986	0.098409	1	open	0	0	12	55	1	625	35.047009	35.047009	0	35.047009	0	35.047009
14	Polygon	56	990	29.856542	1	open	0	0	13	56	54	33750	3.463563	18.09935	14.635787	10.272119	4.073085	554.6944
15	Polygon	60	1037	1.59119	1	open	0	0	14	60	8	5000	3.885474	6.139256	2.253782	5.03616	0.712406	40.289276
17	Polygon	63	1100	0.105581	1	open	0	0	15	63	1	625	5.812044	5.812044	0	5.812044	0	5.812044
18	Polygon	64	1110	36.308227	1	open	0	0	16	64	66	41250	1.615806	24.584402	22.968596	9.630181	6.340775	635.59198
20	Polygon	66	1150	4.310349	1	open	0	0	17	66	9	4375	6.447177	10.71886	4.271683	8.881288	2.337674	79.931686
21	Polygon	67	1172	1.627751	1	open	0	0	18	67	7	4375	5.835512	8.555831	2.720319	7.191619	0.939833	52.525402
22	Polygon	69	1204	0.743302	1	open	0	0	19	69	5	3125	5.749426	15.67098	9.921555	12.522532	3.751391	62.612663
23	Polygon	72	1255	0.171068	1	open	0	0	20	72	2	1250	12.73981	25.023336	12.283526	18.881573	6.141763	37.763145
24	Polygon	73	1267	0.070033	1	open	0	0	21	73	1	625	6.821811	6.821811	0	6.821811	0	6.821811
25	Polygon	75	1296	0.12901	0	open	0	0	22	75	1	625	5.53642	5.53642	0	5.53642	0	5.53642
26	Polygon	82	1406	29.346489	1	open	0	0	23	82	70	43750	2.784292	18.461884	15.677591	9.472275	5.123404	663.0592
29	Polygon	86	1458	0.539472	1	open	0	0	24	86	3	1875	14.266218	19.726534	5.460316	17.335863	2.28028	52.007591
30	Polygon	87	1473	21.690236	0	open	0	0	25	87	27	16875	7.69493	23.795206	16.100277	19.387949	4.055802	523.47461
31	Polygon	88	1512	0.21467	1	open	0	0	26	88	1	625	23.446327	23.446327	0	23.446327	0	23.446327
32	Polygon	89	1521	3.591982	1	open	0	0	27	89	24	15000	5.50454	15.684602	10.180061	8.919066	2.308687	214.05757
35	Polygon	92	1610	0.134861	1	open	0	0	28	92	1	625	2.664827	2.664827	0	2.664827	0	2.664827
36	Polygon	93	1623	0.191201	1	open	0	0	29	93	2	1250	3.929388	4.46234	0.532952	4.195864	0.266476	8.391727
37	Polygon	94	1676	6.609679	1	open	0	0	30	94	15	9375	4.034158	9.251947	5.217789	7.055075	1.761498	105.82613
38	Polygon	96	1729	0.416923	1	open	0	0	31	96	1	625	32.875137	32.875137	0	32.875137	0	32.875137
39	Polygon	97	1761	0.13429	1	open	0	0	32	97	1	625	28.85659	28.85659	0	28.85659	0	28.85659
40	Polygon	98	1769	2.944751	1	open	0	0	33	98	11	6875	4.686829	11.115245	6.428416	8.195166	2.175456	90.14682
42	Polygon	102	1861	0.134863	1	open	0	0	34	102	2	1250	3.317509	3.638541	0.321032	3.478025	0.160516	6.95605
44	Polygon	104	1886	1.297325	0	open	0	0	35	104	9	5625	14.379807	18.804804	4.424996	16.88253	1.695687	151.94276
45	Polygon	105	1887	0.858174	0	open	0	0	36	105	6	3750	5.988189	11.207441	5.219252	8.361597	1.819857	50.169582
46	Polygon	106	1888	0.80013	0	open	0	0	37	106	4	2500	5.720516	7.134776	1.41426	6.41818	0.6344	25.67272

Record: 1 | Show: All Selected | Records (0 out of 207 Selected) | Options

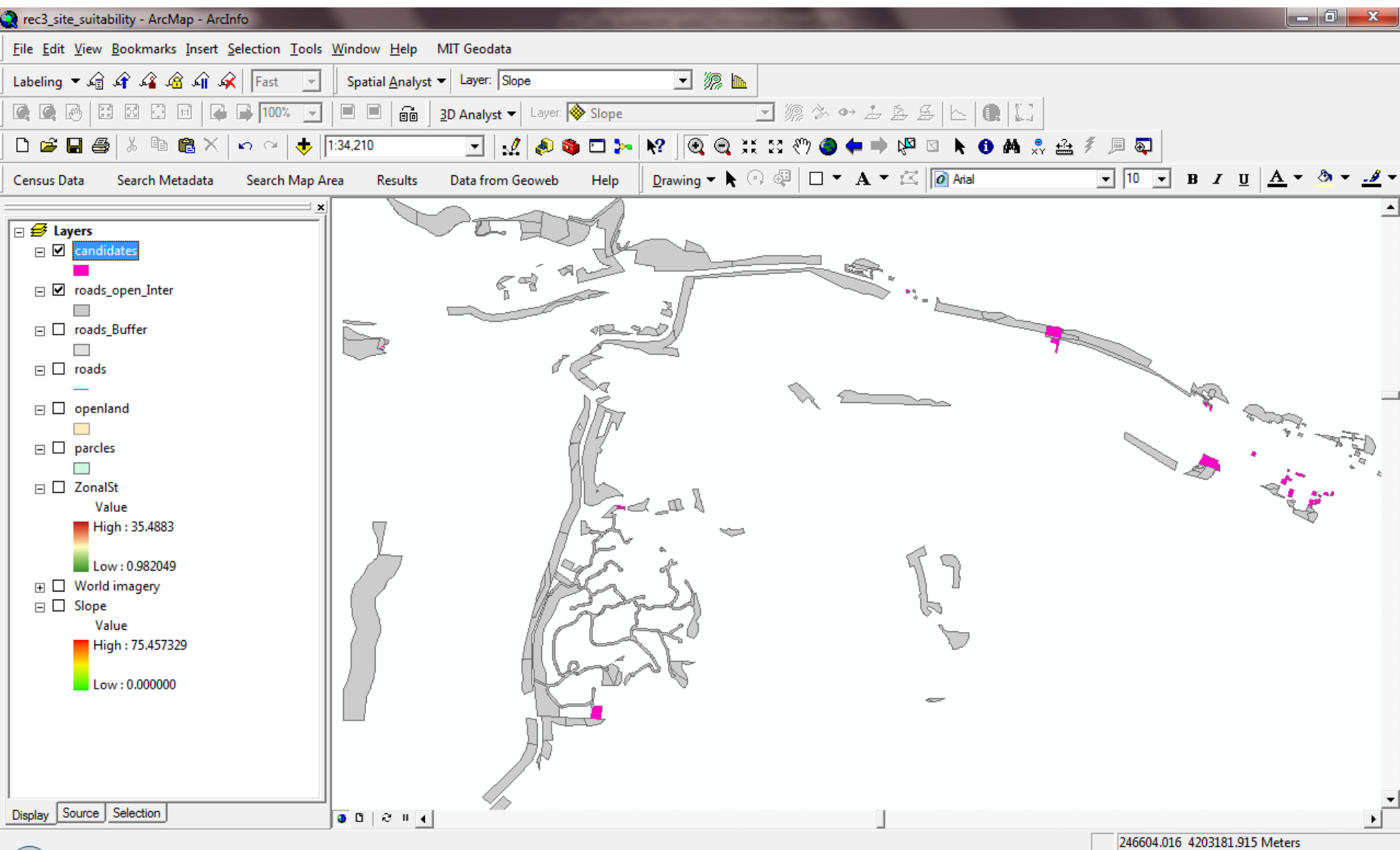
Step 4-- Snapshots of ArcMap view: select by attributes (criterion 3: the maximum slope variable is less than 5 degree)



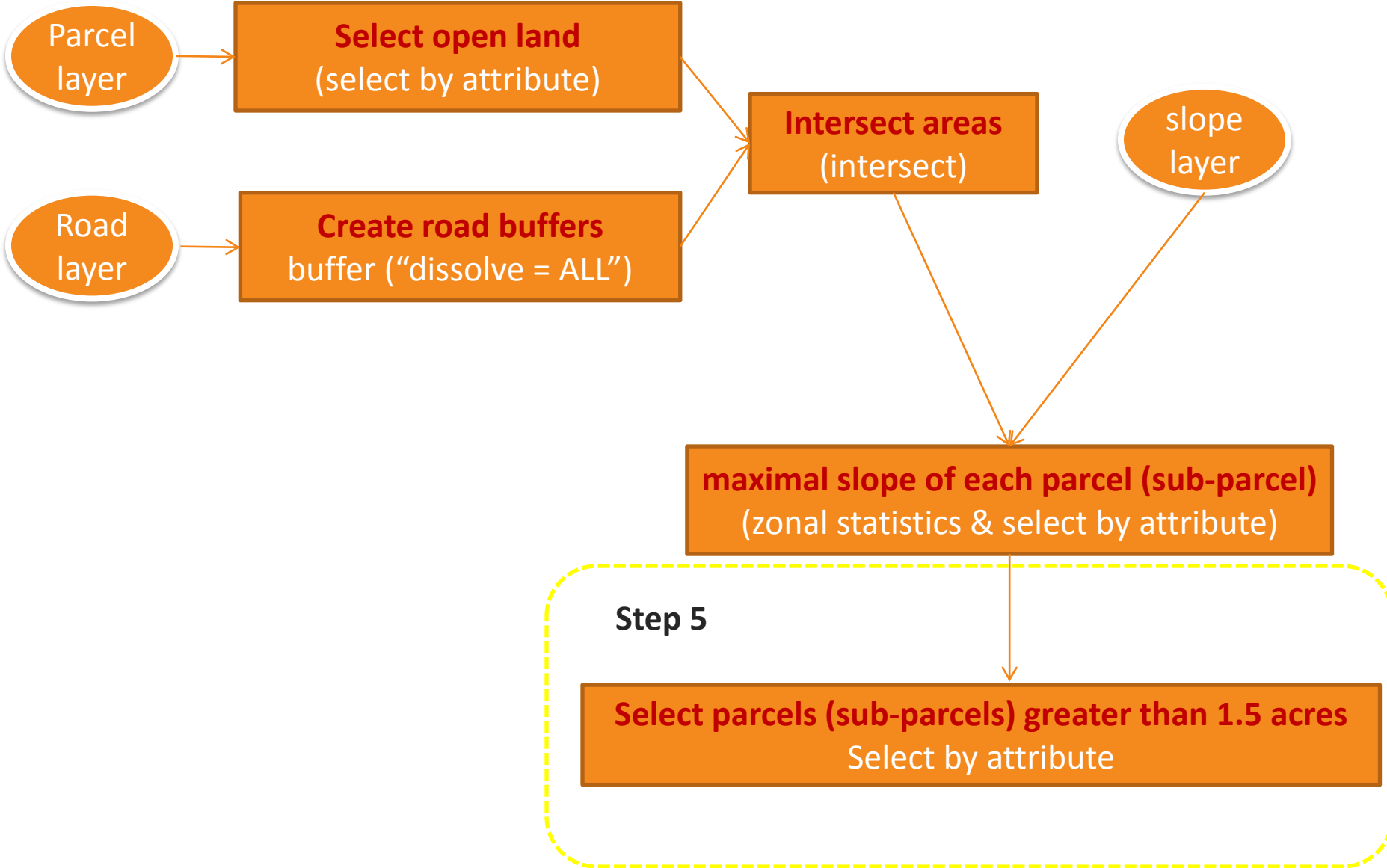
Step 4-- Snapshots of ArcMap view: export selected features as a new layer, "candidates.shp"



Step 4-- Snapshots of ArcMap view: export selected features as a new layer, "candidates.shp"



Conceptual Framework to Approach this Question: Step 5



Step 5– Snapshots of ArcMap view: select by attributes (criterion 4: the land acre, field “GIS_Acres”, is greater than 1.5 acres)

The screenshot shows the ArcMap interface with the 'Select by Attributes' dialog box open. The dialog is configured to create a new selection based on the 'GIS_Acres' field being greater than 1.5. The 'Attributes of candidates' table lists 23 records, with the 'GIS_Acres' column highlighted. The 'Candidates' table on the right provides statistical data for various fields, including REA, MIN, MAX, RANGE, MEAN, and STD.

FID	Shape *	FID_openla	OBJECTID	GIS_Acres
0	Polygon	42	521	0.445522
1	Polygon	92	1610	0.134861
2	Polygon	93	1623	0.191201
3	Polygon	102	1861	0.134863
4	Polygon	136	3045	0.143444
5	Polygon	138	3048	0.095966
6	Polygon	163	3353	0.0677771
7	Polygon	171	3456	0.110905
8	Polygon	178	3478	0.135848
9	Polygon	179	3479	0.084345
10	Polygon	209	4235	0.134864
11	Polygon	210	4261	1.921589
12	Polygon	213	4357	0.254314
13	Polygon	227	4576	1.256674
14	Polygon	285	5171	0.578386
15	Polygon	348	5860	0.756959
16	Polygon	360	6033	0.091535
17	Polygon	364	6040	0.057491
18	Polygon	370	10399	0.134762
19	Polygon	371	10409	0.099863
20	Polygon	372	10411	0.201845
21	Polygon	374	10432	0.070008
22	Polygon	375	10458	0.203451
23	Polygon	376	10466	0.134757

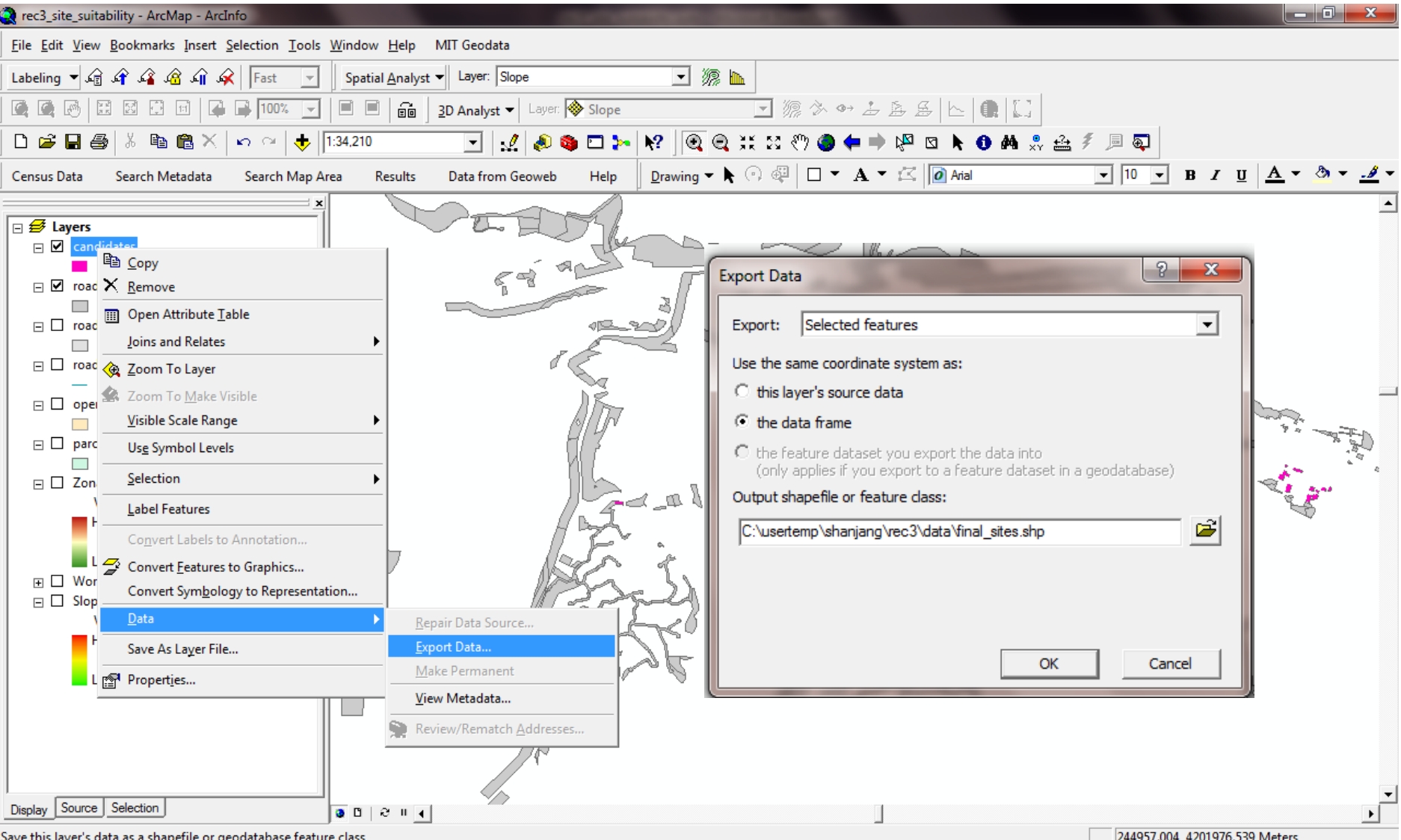
REA	MIN	MAX	RANGE	MEAN	STD
250	1.84691	1.86721	0.020299	1.85706	0.010149
625	2.66483	2.66483	0	2.66483	0
250	3.92939	4.46234	0.532952	4.19586	0.266476
250	3.31751	3.63854	0.321032	3.47802	0.160516
250	3.93933	4.54835	0.609018	4.24384	0.304509
625	2.62174	2.62174	0	2.62174	0
625	3.70391	3.70391	0	3.70391	0
625	4.1741	4.1741	0	4.1741	0
625	4.33486	4.33486	0	4.33486	0
625	4.70975	4.70975	0	4.70975	0
625	3.76949	3.76949	0	3.76949	0
875	3.03456	4.95825	1.92369	4.10172	0.601391
875	2.1216	2.50106	0.379454	2.24913	0.178141
875	4.05019	4.88276	0.83257	4.53975	0.355342
500	0.435052	1.21446	0.779406	0.982049	0.321106
250	1.24165	1.66633	0.424687	1.45399	0.212343
625	3.11644	3.11644	0	3.11644	0
625	4.30689	4.30689	0	4.30689	0
625	2.30211	2.30211	0	2.30211	0
625	4.19533	4.19533	0	4.19533	0
625	4.03369	4.03369	0	4.03369	0
625	2.14823	2.14823	0	2.14823	0
625	2.1273	2.1273	0	2.1273	0
625	3.58107	3.58107	0	3.58107	0

Step 5– A snapshot of ArcMap view: select by attributes
(criterion 4: the land acre, field “GIS_Acres”, is greater than 1.5 acres)
(3 out of 31 candidates were selected, as highlighted in the table)

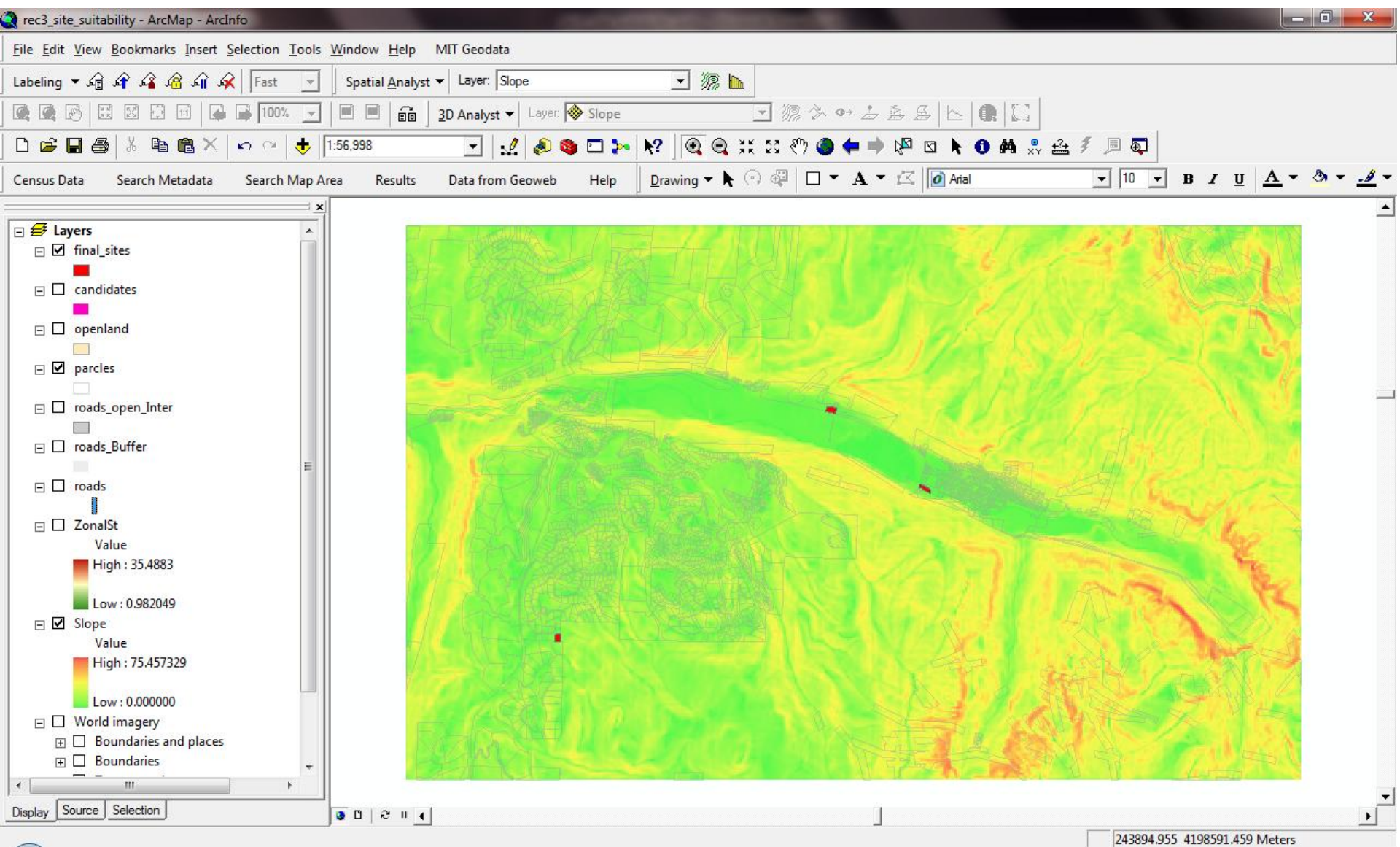
FID	Shape *	FID_openla	OBJECTID	GIS_Acres	Built	landuse	FID_tellur	Id	Rowid_	VALUE	COUNT	AREA	MIN	MAX	RANGE	MEAN	STD
8	Polygon	178	3478	0.135848	1	open	0	0	79	178	1	625	4.33486	4.33486	0	4.33486	0
9	Polygon	179	3479	0.084345	1	open	0	0	80	179	1	625	4.70975	4.70975	0	4.70975	0
10	Polygon	209	4235	0.134864	1	open	0	0	97	209	1	625	3.76949	3.76949	0	3.76949	0
11	Polygon	210	4261	1.921589	1	open	0	0	98	210	11	6875	3.03456	4.95825	1.92369	4.10172	0.601391
12	Polygon	213	4357	0.254314	1	open	0	0	100	213	3	1875	2.1216	2.50106	0.379454	2.24913	0.178141
13	Polygon	227	4576	1.256674	0	open	0	0	109	227	3	1875	4.05019	4.88276	0.83257	4.53975	0.355342
14	Polygon	285	5171	0.578386	0	open	0	0	136	285	4	2500	0.435052	1.21446	0.779406	0.982049	0.321106
15	Polygon	348	5860	0.756959	0	open	0	0	176	348	2	1250	1.24165	1.66633	0.424687	1.45399	0.212343
16	Polygon	360	6033	0.091535	0	open	0	0	185	360	1	625	3.11644	3.11644	0	3.11644	0
17	Polygon	364	6040	0.057491	0	open	0	0	186	364	1	625	4.30689	4.30689	0	4.30689	0
18	Polygon	370	10399	0.134762	1	open	0	0	190	370	1	625	2.30211	2.30211	0	2.30211	0
19	Polygon	371	10409	0.099863	1	open	0	0	191	371	1	625	4.19533	4.19533	0	4.19533	0
20	Polygon	372	10411	0.201845	1	open	0	0	192	372	1	625	4.03369	4.03369	0	4.03369	0
21	Polygon	374	10432	0.070008	1	open	0	0	194	374	1	625	2.14823	2.14823	0	2.14823	0
22	Polygon	375	10458	0.203451	1	open	0	0	195	375	1	625	2.1273	2.1273	0	2.1273	0
23	Polygon	376	10466	0.134757	1	open	0	0	196	376	1	625	3.58107	3.58107	0	3.58107	0
24	Polygon	378	10486	0.392317	1	open	0	0	198	378	2	1250	1.47401	1.55916	0.085151	1.51659	0.042576
25	Polygon	379	10489	0.173665	1	open	0	0	199	379	1	625	4.10117	4.10117	0	4.10117	0
26	Polygon	381	10504	0.490181	1	open	0	0	200	381	3	1875	1.8038	3.02431	1.2205	2.52734	0.52339
27	Polygon	382	10510	0.467777	1	open	0	0	201	382	3	1875	1.06147	1.8698	0.808325	1.54431	0.348251
28	Polygon	386	10535	2.493116	0	open	0	0	205	386	14	8750	2.27678	2.73073	0.45395	2.49845	0.144416
29	Polygon	388	10539	0.477989	1	open	0	0	206	388	2	1250	3.94469	3.99614	0.051448	3.97042	0.025724
30	Polygon	389	10554	1.961295	1	open	0	0	207	389	13	8125	0.479271	2.97907	2.4998	1.32004	0.832024

Record: 1 Show: All Selected Records (3 out of 31 Selected) Options

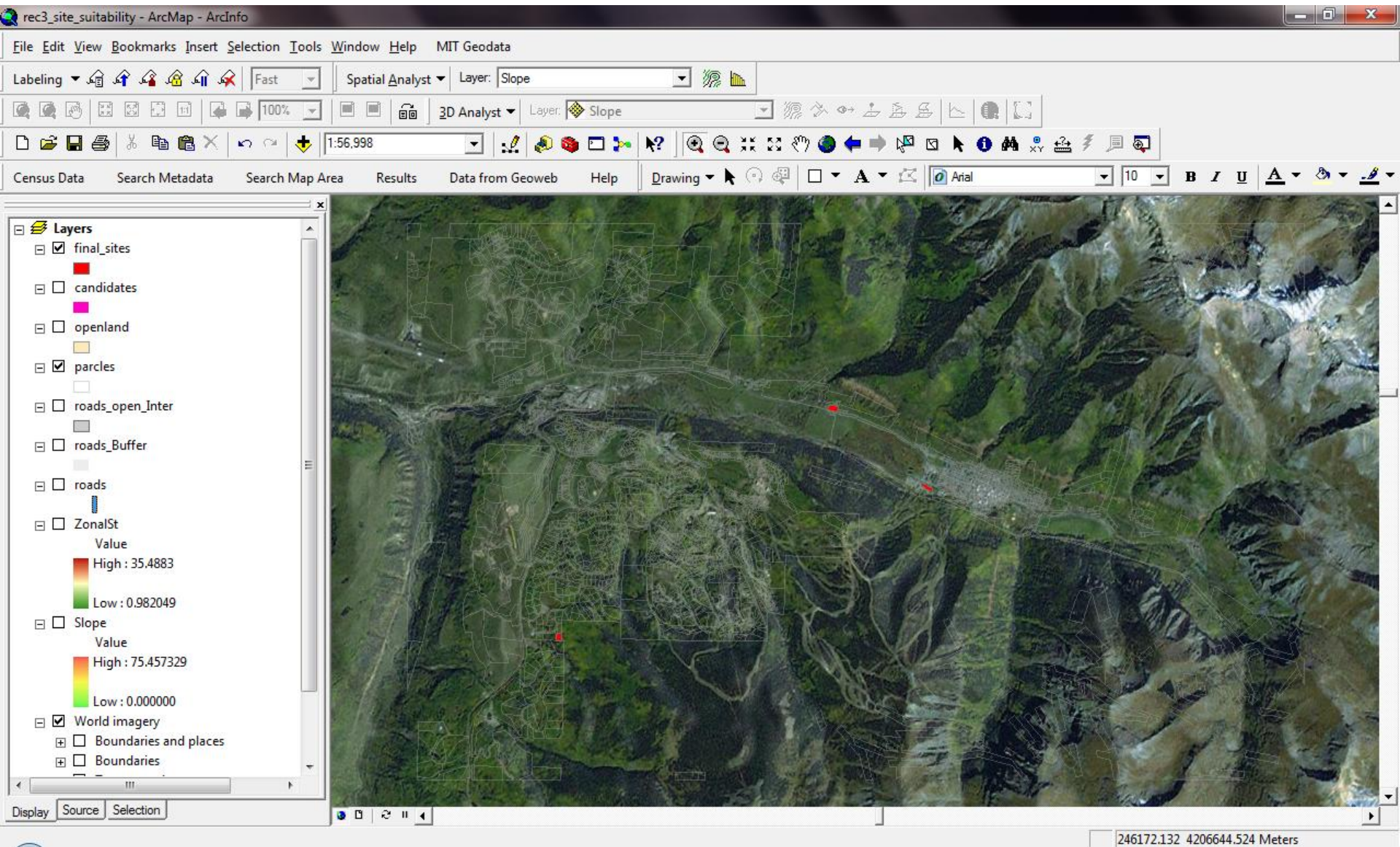
Step 5– Snapshots of ArcMap view: export the selected features



Step 5– A snapshot of ArcMap view: final results for the site suitability question (using the slope raster layer as a background) (the highlighted red parcels meet the criteria 1+2+3+4)





Step 5– A snapshot of ArcMap view: final results for the site suitability question (using the world image as a background) (the highlighted red parcels meet the criteria 1+2+3+4)





- Start to think about potential topics for the final term project
- Examples
 - **Race and ethnicity for the top 40 cities in the [United States](#), and for [Chicago](#)**

 **Race and ethnicity**
Thumbnails | Detail | Map | 108 comments



I was astounded by [Bill Rankin's map of Chicago's racial and ethnic divides](#) and wanted to see what other cities looked like mapped the same way. To match his map, Red is White, Blue is Black, Green is Asian, Orange is Hispanic, Gray is Other, and each dot is 25 people. Data from Census 2000.

Click [Detail](#) to see the city names.

103 photos | 570,818 views

items are from between 11 Sep 2010 & 20 Sep 2010.

This Power Point was prepared by Lulu Xue and Shan Jiang, Oct 2010
Dataset for the site suitability study was modified from the 2010 GIS test-out exam provided by Prof. Michael Flaxman

Questions? | Ask Us
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