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Shoreline Extraction and Change Analysis Using Remote Sensing and Geographic Information System: Case of Lake Tana, Ethiopia

Zelalem Getachew AYALKE[1], Faik Ahmet SESLI[2]

[1]Ondokuz Mayıs Universit, Engineering Faculty, Geomatic Engineering, , Samsun, Turkey
• **19211596@stu.omu.edu.tr** • ORCİD > 0000-0003-4223-0683

[2]Ondokuz Mayıs Universit, Engineering Faculty, Geomatic Engineering, , Samsun, Turkey
• **fasesli@omu.edu.tr** • ORCİD > 0000-0001-8352-734X

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Sorumlu Yazar: Zelalem Getachew AYALKE

SHORELINE EXTRACTION AND CHANGE ANALYSIS USING REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM: CASE OF LAKE TANA, ETHIOPIA

ABSTRACT

Delineation, extraction, and analyzing the change of shorelines of water bodies, such as rivers, sea, and lakes, from remote sensing images, are critical tasks for a variety of applications, including coastal erosion monitoring, coastal zone management, watershed definition, flood prediction, and water resource evaluation because the change of coastal area is a dynamic change due to natural and manmade effects. This study has been done to extract and change the analysis of the shoreline for the years 2000, 2010, and 2021. GIS and remote sensing were used for the data processing like satellite images (atmospheric correction, radiometric correction, and image enhancement), analyzing, and presenting. The processed image was further analyzed using the Landsat toolbox and DSAS v5 toolbox to extract the shoreline based on Normalized Difference Vegetation Index (NDVI), Greenness, Wetness and Brightness parameters within the study area, and the analysis of the change of the shoreline based on the baseline to use as a reference to generate Transects and shoreline parameters respectively. Linear Regression Rate, End Point Rate, and Net Shoreline Movement were used to analyze the change of the shoreline for lake Tana. Based on the result produced using GIS and remote sensing techniques can be helpful for the coastal zone planning, management, and monitoring of the coastal area for Lake Tana.

Keywords: Shoreline extraction, Shoreline Change, Geographic information System and Remote Sensing

HIGHLIGHTS

The shoreline of Lake Tana was extracted at different times series (2000, 2010, 2021) in this study, and the change through time was examined using remote sensing and geographic information systems. To extract and evaluate the change in coastline, remote sensing was employed to process the data for further analysis, and geographic information system analytical extension tools such as Landsat toolbox and DSAS v5 toolbox were used to extract and analyze the change of shoreline.

1. INTRODUCTION

Coastal areas are one of the most critical and vulnerable areas on the earth. Waves, wind, longshore currents, and tides are all constantly affecting them. Furthermore, shorelines are affected by geological-physical factors, which include but are not limited to events such as constructing sea walls and breakwaters, artificial

advancements, and retreatments. These activities can change geological-physical factors, resulting in major shoreline erosion and/or accretion. Since coastal areas have always played a significant role in human residence and operation, city development is constantly moving toward coastal areas, ensuring easy ocean transportation and access to edible products [2].

The shoreline is the line where the sea meets the ground at a certain tidal elevation point, and it is one of the most important landforms and an important feature of the earth's surface that can change in a very short period of time [3], [4]. The shoreline, as a transition between land and sea, is reflected as one of the most complex, dynamic, and unsteady geomorphic components in the shore system, which is influenced by both marine and terrestrial forces and alters coastal landforms. Wave action, sedimentation by longshore currents, geomorphology, geology along the shore, changes in sea level, and man-made events are all factors that influence shoreline fluctuations. Despite the increased risk of natural disasters such as tsunamis, dangerous waves, and coastal erosion, it is extremely important for economic growth and the natural environment [4].

Delineation and extraction of shorelines and water bodies, such as rivers and lakes, from remote sensing images, are critical tasks for a variety of applications, including coastal erosion monitoring, coastal zone management, watershed definition, flood prediction, and water resource evaluation. Although manual shoreline tracing is simple along relatively short segments of the coast, it is impractical where the shoreline gets more intricate. In addition, to update shoreline maps, evaluate the spatial and temporal evolution of alterations according to natural and human-caused events, and extract the waterline for broad areas, automatic and reliable approaches are necessary[5].

Knowledge about changes on the earth's surface is becoming increasingly important in tracking local, regional, and global resources and the environment. The vast array of historical and current remote sensing imagery allows researchers to examine the spatiotemporal pattern of environmental elements as well as the influence of human activities over time [6], [7]

Many researchers are applying remote sensing and tools to investigate changes in shorelines. Image enhancement, multi-temporal data classification density slice using single or multiple bands, and multi-spectral classification, both supervised and unsupervised, are among the change detection techniques currently in use. Additionally, various thresholding-based techniques have been used for automatic shoreline extraction from remotely sensed images [8].

GIS is also one of the essential tools for any modification detection monitoring studies on the temporal scale by delivering the information in digital structure [4], [9].

Shoreline detection has become much easier thanks to advances in remote sensing and image processing with the help of geospatial software like ERDAS Imagine. And it has also been proven that Coastal Zone Management (CZM) is impossible without geospatial technologies like GIS. Satellite images are important in spatio-temporal research because they allow for the detection of changes at one location compared to other sites along the coast using freely available satellite Images [10].

Recent improvements in remote sensing (RS) and geographic information system (GIS) technologies have created a viable platform for creating comprehensive coverage and analyzing shoreline change using a variety of methods. Because remote sensing data may offer information across a huge region in a short amount of time, it is widely utilized to analyze changes in shorelines. Several studies have been undertaken to demonstrate the effectiveness of using GIS and RS integration for environmental change detection, specifically shoreline change[7], [11]–[15]

They used a computer-based shoreline analysis method to calculate rates of shoreline change (DSAS). DSAS has been widely applied to the study of the dynamics of shoreline movements on both short and long-time scales. Studies on the determination of shorelines have recently been undertaken on various satellite images using DSAS software, which is an extension of ArcGIS software [16], [17].

The main objective of this study is to extract the shoreline and then determine the changes that occurred at the Lake Tana Shoreline in 20 years from 2000 to 2021.

2. MATERIALS AND METHODS

2.1 Location of the study area

The location of the study area is at Lake Tana which is in the north-western Ethiopian Highlands; its exact geographic coordinate extends between 10°45'54.1"N, 36°10'24.9" E and 12°50'15.9" N, 38°50'54.48" E. The lake is approximately 84 kilometers long and 66 kilometers wide, with a maximum depth of 15 meters, and an elevation of 1,830 metres above sea level. Lake Tana is fed by the Gilgel Abay, Reb and Gumara rivers which is the main source of the Blue Nile. Its surface. area ranges from 3,000 to 3,500 square kilometres, depending on season and rainfall. In 2015, the Lake Tana region was nominated as a UNESCO Biosphere Reserve recognizing its national and international natural and cultural importance[18].

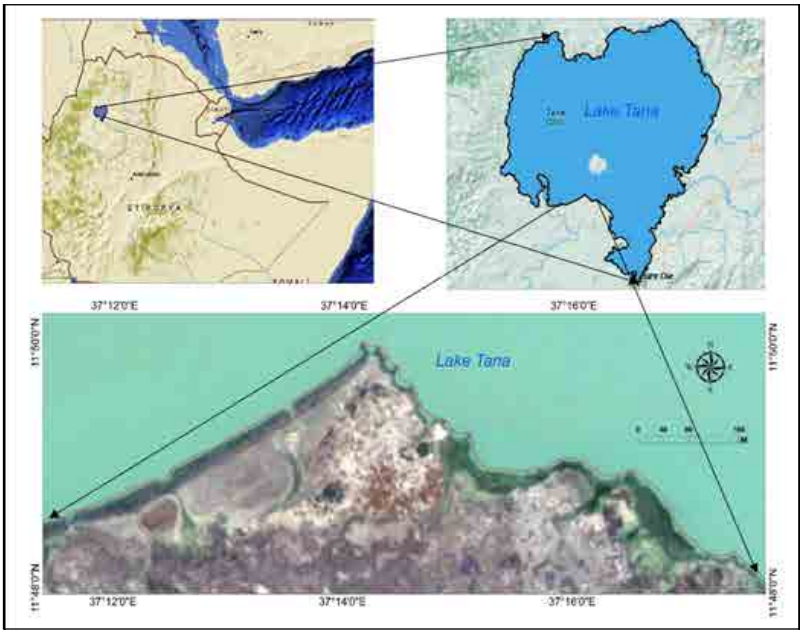

Figure 1 Location map of the study area.

2.2 Materials and Data

The materials and data used in this study are shown in table 1 below.

Table 1. Shows the material and data used in the study

S. No.	Data/Material/Softwares	Version/year	Purpose
1	ArcGIS	10.5	Spatial data managment, analysis and presentation
2	LandSat Toolbox Extension	For ArcGIS 10.5	Shoreline extraction
3	DSAS	V5.0	Digital analysis of shoreline
4	ERDAS Imagine	2015	Image processing(radio and atmosphere correction)
5	Landsat 7 ETM+	200,2010 & 2021	Use as input to extract shorelines

2.3 Method

2.3.1 Shoreline Extraction

The method of the study was composed of two main stages which were shoreline extraction and change detection after preprocessing Landsat satellite image as shown in (Fig. 2.1.).

In image process tasks preprocessing works performed on the data which was downloaded from earth explorer (USGS). The Remotely sensed images were already geometrically corrected. For geometrically corrected Landsat 7 ETM+ image which was for the years 2000, 2010 and 2021, radiometric and atmospheric correction has been applied using ERDAS Imagine version 2015 software. The errors corrected in this process were cloud and scanline errors [19].

After completing radiometric and atmospheric error correction, required data were ready for further processing like NDVI, Landsat & Tasseled cap, category creation of for land and sea, classifying land and sea, and finally creating shore boundary step by step. All the mentioned process has been done in ArcGIS 10.5 environment with the ArcGIS extension tool called land toolbox.

During automatically extracting shoreline for the study area using the ArcGIS extension tool called Landsat toolbox was determining Normalized Difference Vegetation Index for the selected time series Landsat 7 ETM+ images by the relation in (1). The combination of band 1,2,3,4,5 & 7 using the method Landsat & Tasseled cap was generating brightness, greenness and wetness of the study area. Furthermore, a combination of brightness, greenness, wetness and NDVI produced land and sea category which is an important element so as to classify land and sea. As already illustrated in figure. 2.2. lastly using classified land and sea as input shore boundary has been extracted for each year.

$$NDVI = \frac{(\text{Near Infrared Band})}{(\text{Red Band})} = \frac{(\text{Band 4})}{(\text{Band 3})}$$

2.3.2. Shoreline Change Analysis

Changes along the shoreline were examined using DSAS ArcGIS extension software in the study's second stage. The USGS developed DSAS, which calculates rate-of-change statistics for a time series of shoreline vector data. DSAS does this by casting perpendicular to the baseline transects at a user-specified spacing alongshore [16]. The distance between the oldest and most recent shorelines for

each transect is the net shoreline movement (NSM) (unit: meter). The endpoint rate (EPR) is calculated by dividing the distance between the oldest and most recent shoreline movement by the duration between the two shorelines. (Measurement unit: meter/year)

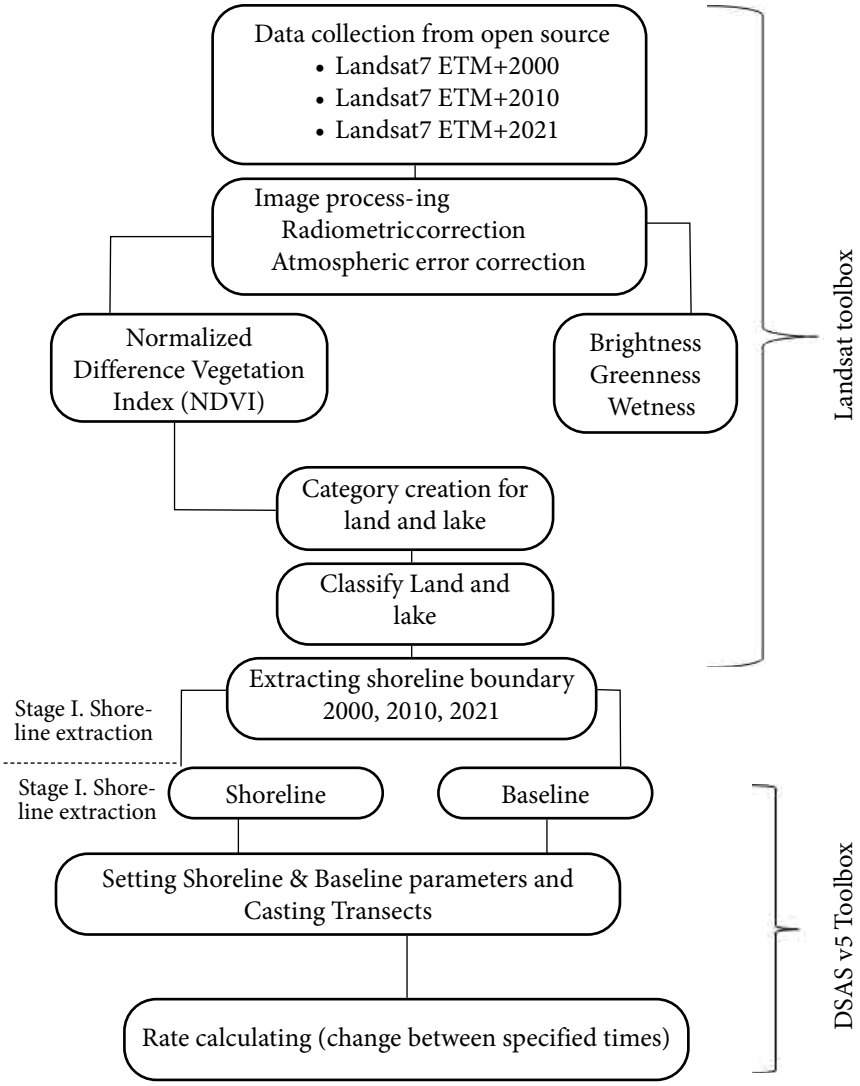

Figure 2 shoreline extraction and change analysis work flow

3. RESULTS AND DISCUSSIONS

3.1. Shoreline Extraction

Shoreline extracted from Landsat images for the years 2000, 2010 and 2021 is presented in Figure 3. As already stated in the methods part, the shoreline extracted for the years 2000, 2010 and 2021 using remote sensing data in the ArcGIS environment. In this study, the shoreline of Lake Tana was extracted at different time series as presented in figure 3, and 4 in different scales so as to increase or sea the shorelines at different time series in detail.

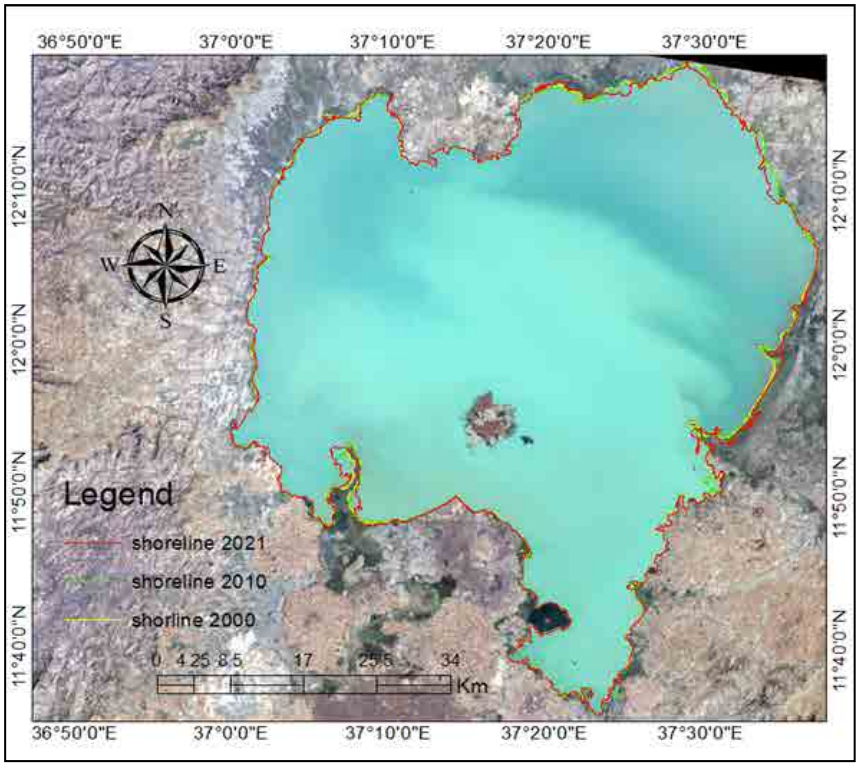

Figure 3 Lake Tana's shorelines map

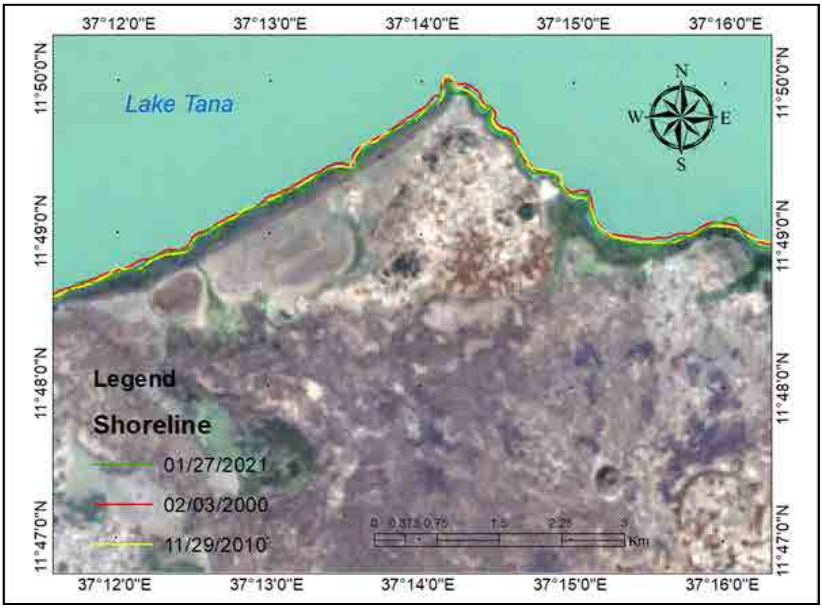

Figure 4 Shorelines map of the part of Lake Tana at different time series map

3.2. Shoreline change analysis

In the shoreline change analysis, due to the largeness of the Lake in terms of area of coverage, it becomes difficult to see the change at the same time with a large scale in the form of a map. Therefore, as it indicated in the study area map for detailed investigation, the part of the Lake Tana used for change analysis illustrated in figure 4. In this study, changes that occurred along Lake Tana shoreline for 20 years were determined for extracted shorelines using DSAS. The result from calculated statistics is presented as NSM and EPR in table 3 and also presented in Annex (table 6).

Table 3 Statistical NSM and EPR results of the DSAS analysis

Net Shoreline Movement NSM(m)		**End Point Rate EPR(m/years)**	
Maximum negative distance	-63.38	Maximum value erosion	-3.02
Average of all negative distances	-23.28	Average of all erosional rates	-1.11
Maximum positive distance	149.40	Maximum value Accretion	7.12
Average of all positive distances	59.63	Average of all accretional rates	2.84

The map in figure 5 shows the change in distance between 2000 and 2021 on a large scale, so that it is possible to see the effect of changes at different time series by different natural or manmade factors that have a significant effect on the change of shorelines.

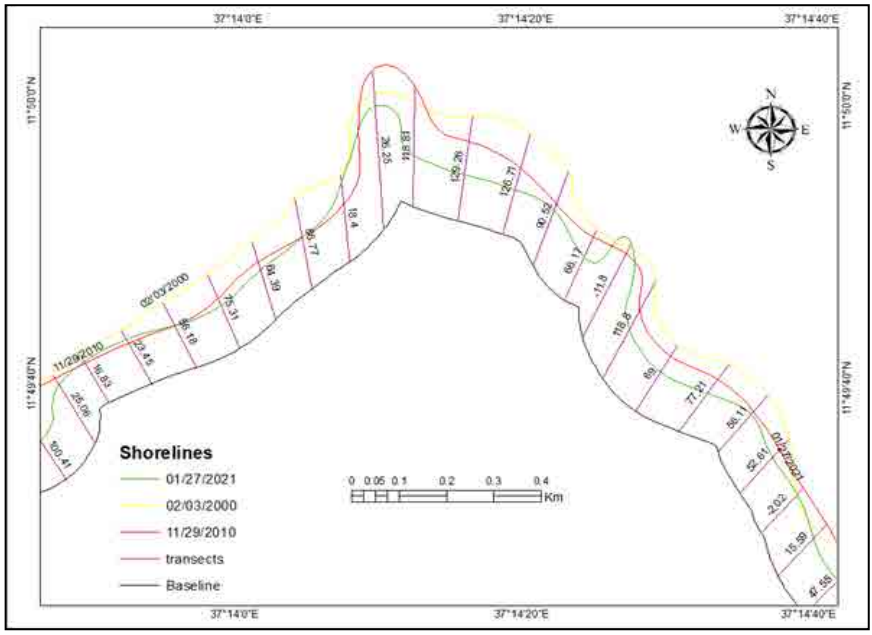

Figure 5 Map of shorelines change between different time series

4. CONCLUSION

This work used GIS and remote sensing to extract shoreline and change the analysis of the shoreline variance for Lake Tana. Using the Landsat toolbox, DSAS program, and multitemporal satellite data, the Lake Tana shoreline was examined during a 20-year period (2000-2021). The Landsat toolbox was utilized in this study to generate shorelines at various time intervals for the automatic extraction of the study area's shorelines. Whereas, in the case of change analysis from a DSAS application, the LRR method is a more favorable technique for comprehending coastal change; nonetheless, the EPR method is useful if the shoreline is moving either seaward or landward constantly. The shoreline change rates were calculated using statistical approaches such as EPR, NSM, and LRR to assess long and short-term trends.

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Annex

Table 6. Shows over all statistical change date for 14.3km shorelines (2000,2010 &2021

Calculated Change Statistics

TransectID	BaselineID	TransOrder	Azimuth	ShrCount	TCD	SHAPE_Leng	SCE	NSM	EPR	EPRunc	LRR	LR2	LSE	LC090	WLR	WR2	WSE	WC090
1	1	1	343.290	3.000	100.000	149.165	48.530	48.530	2.310	0.670	2.330	0.920	10.350	4.320	2.330	0.920	1.010	4.320
2	1	2	342.050	3.000	200.000	144.594	44.430	44.430	2.120	0.670	2.130	0.920	9.110	3.870	2.130	0.920	0.910	3.870
3	1	3	341.350	3.000	300.000	123.970	23.140	23.140	1.100	0.670	1.110	0.380	5.760	2.450	1.110	0.880	0.560	2.450
4	1	4	341.910	3.000	400.000	149.430	34.210	34.210	1.630	0.670	1.630	1.000	1.400	0.600	1.630	1.000	0.130	0.600
5	1	5	342.160	3.000	500.000	186.305	85.220	85.220	4.060	0.670	4.060	1.000	2.900	1.230	4.060	1.000	0.290	1.230
6	1	6	344.660	3.000	600.000	163.359	54.460	54.460	2.600	0.670	2.600	1.000	1.400	0.590	2.600	1.000	0.140	0.590
7	1	7	343.350	3.000	700.000	130.379	30.370	-10.810	-0.520	0.670	-0.480	0.110	20.520	8.730	-0.490	0.110	2.050	8.730
8	1	8	340.760	3.000	800.000	152.868	52.380	-27.560	-1.310	0.670	-1.270	0.260	31.660	13.560	-1.270	0.260	3.190	13.560
9	1	9	340.350	3.000	900.000	142.352	62.320	20.240	0.970	0.670	1.000	0.240	26.020	11.070	1.000	0.240	2.600	11.070
10	1	10	340.750	3.000	1000.000	164.001	61.100	61.100	2.910	0.670	2.920	0.980	5.680	2.420	2.920	0.980	0.570	2.420
11	1	11	341.460	3.000	1100.000	177.536	76.080	76.080	3.630	0.670	3.620	0.990	4.960	2.110	3.620	0.990	0.500	2.110
12	1	12	341.730	3.000	1200.000	155.573	53.760	53.760	2.560	0.670	2.540	0.740	22.040	9.380	2.540	0.740	2.200	9.380
13	1	13	340.580	3.000	1300.000	156.740	56.440	36.150	1.720	0.670	1.680	0.380	31.800	13.530	1.680	0.380	3.180	13.530
14	1	14	337.860	3.000	1400.000	135.423	33.830	33.830	1.610	0.670	1.610	0.990	2.060	0.880	1.610	0.990	0.210	0.880
15	1	15	336.040	3.000	1500.000	191.676	68.190	67.340	3.210	0.670	3.240	0.760	27.320	11.630	3.240	0.760	2.730	11.630
16	1	16	335.410	3.000	1600.000	249.365	143.740	143.710	6.850	0.670	6.870	0.980	14.430	6.140	6.870	0.980	1.440	6.140
17	1	17	340.310	3.000	1700.000	207.562	43.610	20.140	0.960	0.670	0.990	0.230	27.120	11.540	0.990	0.230	2.710	11.540
18	1	18	338.500	3.000	1800.000	232.689	31.150	10.730	0.510	0.670	0.540	0.130	20.910	8.900	0.540	0.130	2.090	8.900
19	1	19	338.870	3.000	1900.000	134.316	34.080	15.760	0.750	0.670	0.780	0.230	21.180	9.010	0.780	0.230	2.120	9.010
20	1	20	334.810	3.000	2000.000	160.773	54.830	29.690	1.410	0.670	1.450	0.310	32.350	13.760	1.450	0.310	3.230	13.760
21	1	21	334.020	3.000	2100.000	159.546	53.090	23.200	1.110	0.670	1.150	0.200	33.580	14.290	1.150	0.200	3.360	14.290
22	1	22	334.160	3.000	2200.000	141.645	41.570	20.130	0.960	0.670	0.990	0.260	25.470	10.840	0.990	0.260	2.550	10.840
23	1	23	334.040	3.000	2300.000	138.896	35.070	35.070	1.670	0.670	1.680	0.970	4.200	1.790	1.680	0.970	0.420	1.790
24	1	24	333.920	3.000	2400.000	165.109	54.070	54.070	2.580	0.670	2.580	0.930	10.210	4.340	2.590	0.930	1.020	4.340
25	1	25	332.290	3.000	2500.000	147.187	47.180	42.240	2.010	0.670	2.040	0.680	20.730	8.820	2.040	0.680	2.070	8.820
26	1	26	331.760	3.000	2600.000	201.196	84.020	23.180	1.100	0.670	1.130	0.660	18.020	7.670	1.130	0.660	1.800	7.670
27	1	27	332.120	3.000	2700.000	234.926	133.580	133.580	6.370	0.670	6.310	0.810	45.080	19.170	6.310	0.810	4.510	19.170
28	1	28	332.920	3.000	2800.000	208.989	74.330	74.330	3.540	0.670	3.510	0.940	13.300	5.660	3.530	0.940	1.330	5.660
29	1	29	333.810	3.000	2900.000	194.974	40.320	40.320	1.920	0.670	1.910	0.930	8.000	3.400	1.930	0.930	0.800	3.400
30	1	30	334.830	3.000	3000.000	152.766	52.750	52.750	2.510	0.670	2.530	0.950	8.950	3.810	2.530	0.950	0.900	3.810
31	1	31	333.270	3.000	3100.000	125.682	24.450	24.450	1.170	0.670	1.160	1.000	0.280	0.120	1.160	1.000	0.030	0.120
32	1	32	330.550	3.000	3200.000	133.247	33.000	-5.410	-0.260	0.670	-0.290	0.030	24.670	10.500	-0.290	0.030	2.470	10.500
33	1	33	330.430	3.000	3300.000	117.798	17.680	2.490	0.120	0.670	0.100	0.010	13.450	5.720	0.100	0.010	1.350	5.720
34	1	34	331.560	3.000	3400.000	128.086	26.590	13.600	0.650	0.670	0.670	0.280	15.980	6.800	0.670	0.280	1.600	6.800
35	1	35	334.780	3.000	3500.000	153.978	52.110	52.110	2.480	0.670	2.500	0.850	15.590	6.630	2.500	0.850	1.560	6.630
36	1	36	334.180	3.000	3600.000	185.139	72.400	72.400	3.450	0.670	3.440	0.960	8.010	3.420	3.440	0.960	0.800	3.420
37	1	37	333.520	3.000	3700.000	172.609	37.250	37.250	1.780	0.670	1.780	0.960	5.590	2.380	1.780	0.960	0.560	2.380
38	1	38	334.150	3.000	3800.000	180.447	30.350	23.130	1.100	0.670	1.120	0.550	15.040	6.400	1.120	0.550	1.500	6.400
39	1	39	334.620	3.000	3900.000	169.018	51.100	51.100	2.440	0.670	2.450	0.860	14.660	6.240	2.450	0.860	1.470	6.240
40	1	40	332.520	3.000	4000.000	229.260	110.650	110.650	5.270	0.670	5.260	0.970	14.020	5.970	5.260	0.970	1.400	5.970
41	1	41	332.040	3.000	4100.000	218.661	92.420	92.420	4.400	0.670	4.390	0.960	12.420	5.280	4.390	0.960	1.240	5.280
42	1	42	333.160	3.000	4200.000	160.577	49.190	49.190	2.340	0.670	2.360	0.950	8.050	3.420	2.360	0.950	0.800	3.420
43	1	43	333.600	3.000	4300.000	138.618	38.620	38.620	1.840	0.670	1.850	0.940	7.160	3.050	1.850	0.940	0.720	3.050
44	1	44	331.840	3.000	4400.000	140.420	40.250	40.250	1.920	0.670	1.930	0.830	13.200	5.620	1.930	0.830	1.320	5.620
45	1	45	329.540	3.000	4500.000	213.267	53.000	53.000	2.530	0.670	2.540	0.920	10.830	4.600	2.540	0.920	1.080	4.600
46	1	46	328.440	3.000	4600.000	246.126	134.200	134.200	6.400	0.670	6.370	0.950	21.250	9.040	6.370	0.950	2.130	9.040
47	1	47	329.030	3.000	4700.000	189.938	89.580	89.580	4.270	0.670	4.260	0.960	12.280	5.220	4.260	0.960	1.230	5.220
48	1	48	330.540	3.000	4800.000	234.886	113.850	113.850	5.430	0.670	5.400	0.910	25.230	10.730	5.400	0.910	2.520	10.730
49	1	49	328.920	3.000	4900.000	234.678	111.960	111.960	5.340	0.670	5.310	0.940	19.620	8.350	5.310	0.940	1.960	8.350
50	1	50	326.420	3.000	5000.000	181.531	64.900	64.900	3.090	0.670	3.060	0.770	24.930	10.610	3.060	0.770	2.490	10.610
51	1	51	326.260	3.000	5100.000	153.438	44.450	39.910	1.900	0.670	1.880	0.650	20.510	8.730	1.880	0.650	2.050	8.730
52	1	52	327.370	3.000	5200.000	200.202	89.410	89.410	4.260	0.670	4.240	0.950	14.430	6.140	4.240	0.950	1.440	6.140
53	1	53	327.340	3.000	5300.000	201.108	100.410	100.410	4.790	0.670	4.780	0.780	37.030	15.760	4.740	0.780	3.700	15.760
54	1	54	329.590	3.000	5400.000	171.858	25.060	25.060	1.190	0.670	1.190	0.960	3.690	1.570	1.190	0.960	0.370	1.570
55	1	55	329.350	3.000	5500.000	118.953	18.200	16.830	0.800	0.670	0.810	0.680	8.260	3.520	0.810	0.680	0.830	3.520
56	1	56	330.920	3.000	5600.000	133.689	33.140	23.650	1.120	0.670	1.140	0.490	17.190	7.310	1.140	0.490	1.720	7.310
57	1	57	333.510	3.000	5700.000	158.013	56.780	56.180	2.680	0.670	2.710	0.760	22.700	9.660	2.710	0.760	2.270	9.660
58	1	58	337.520	3.000	5800.000	176.987	75.310	75.310	3.590	0.670	3.610	0.920	15.960	6.790	3.610	0.920	1.600	6.790
59	1	59	343.580	3.000	5900.000	177.379	64.390	64.390	3.070	0.670	3.080	0.940	11.470	4.880	3.080	0.940	1.150	4.880
60	1	60	350.010	3.000	6000.000	201.408	86.770	86.770	4.140	0.670	4.180	0.780	33.020	14.050	4.180	0.780	3.300	14.050
61	1	61	354.100	3.000	6100.000	191.362	66.145	18.490	0.880	0.670	0.930	0.080	46.250	19.680	0.930	0.080	4.620	19.680
62	1	62	356.070	3.000	6200.000	147.690	78.180	26.250	1.250	0.670	1.190	0.100	53.440	22.740	1.190	0.100	5.340	22.740
63	1	63	1.190	3.000	6300.000	261.234	151.490	115.810	5.520	0.670	5.430	0.520	77.850	33.120	5.430	0.520	7.780	33.120
64	1	64	7.890	3.000	6400.000	229.941	129.260	39.260	1.870	0.670	1.850	0.990	8.830	3.760	1.850	0.990	0.880	3.760
65	1	65	14.970	3.000	6500.000	226.938	126.710	126.710	6.040	0.670	6.050	0.990	10.620	4.520	6.050	0.990	1.060	4.520
66	1	66	20.020	3.000	6600.000	215.423	90.520	90.520	4.310	0.670	4.340	0.880	24.140	10.270	4.340	0.880	2.410	10.270
67	1	67	24.020	3.000	6700.000	169.526	66.170	66.170	3.150	0.670	3.140	0.930	12.470	5.310	3.140	0.930	1.250	5.310
68	1	68	26.570	3.000	6800.000	229.544	26.260	-11.800	-0.560	0.670	-0.540	0.150	16.770	7.140	-0.540	0.150	1.680	7.140
69	1	69	27.930	3.000	6900.000	240.484	118.800	118.800	5.660	0.670	5.670	0.990	10.110	4.300	5.670	0.990	1.010	4.300
70	1	70	31.330	3.000	7000.000	165.521	69.000	69.000	3.290	0.670	3.280	0.990	5.790	2.460	3.280	0.990	0.580	2.460
71	1	71	36.510	3.000	7100.000	180.885	77.210	77.210	3.680	0.670	3.680	1.000	0.230	0.100	3.680	1.000	0.020	0.100
72	1	72	40.070	3.000	7200.000	162.867	56.110	56.110	2.670	0.670	2.690	0.860	16.120	6.860	2.690	0.860	1.610	6.860
73	1	73	42.110	3.000	7300.000	156.480	52.610	52.610	2.510	0.670	2.510	1.000	2.090	0.890	2.510	1.000	0.210	0.890
74	1	74	42.450	3.000	7400.000	190.795	20.260	-2.020	-0.100	0.670	-0.120	0.010	15.690	6.680	-0.120	0.010	1.570	6.680
75	1	75	42.160	3.000	7500.000	153.023	41.070	15.890	0.740	0.670	0.710	0.190	27.370	11.650	0.710	0.190	2.740	11.650
76	1	76	43.990	3.000	7600.000	148.164	47.550	47.550	2.270	0.670	2.250	0.850	13.950	5.940	2.250	0.850	1.400	5.940
77	1	77	45.300	3.000	7700.000	174.730	71.620	47.730	2.270	0.670	2.230	0.410	39.600	16.850	2.230	0.410	3.960	16.850
78	1	78	45.500	3.000	7800.000	203.358	45.890	8.730	0.420	0.670	0.370	0.030	33.940	14.440	0.370	0.030	3.390	14.440
79	1	79	45.200	3.000	7900.000	163.081	36.360	-5.470	-0.260	0.670	-0.290	0.020	27.380	11.650	-0.290	0.020	2.740	11.650

80	1	80	44.890	1.000	8000.000	172.391	80.230	9.450	0.450	0.870	0.400	0.020	45.430	19.330	0.400	0.020	4.540	19.320
81	1	81	44.890	1.000	8100.000	158.790	55.390	53.010	2.530	0.870	2.500	0.700	24.260	10.320	2.500	0.700	2.480	10.320
82	1	82	43.880	1.000	8200.000	141.134	36.090	36.090	1.720	0.870	1.720	1.000	0.460	0.190	1.720	1.000	0.050	0.190
83	1	83	41.170	1.000	8300.000	164.321	82.460	80.690	1.460	0.870	1.550	0.250	38.890	16.550	1.510	0.250	3.890	16.550
84	1	84	38.460	1.000	8400.000	227.298	108.600	54.600	3.080	0.870	3.150	0.370	61.470	26.150	3.150	0.370	6.150	26.150
85	1	85	35.150	1.000	8500.000	176.005	83.980	47.340	2.280	0.870	2.300	0.530	32.300	13.750	2.300	0.530	5.280	13.750
86	1	86	32.450	1.000	8600.000	207.041	45.130	45.130	2.150	0.870	2.170	0.790	16.570	7.050	2.170	0.790	1.660	7.050
87	1	87	30.320	1.000	8700.000	182.595	51.480	51.480	2.450	0.870	2.450	0.980	5.080	2.160	2.450	0.980	0.510	2.160
88	1	88	28.820	1.000	8800.000	167.088	37.740	37.740	1.800	0.870	1.780	0.890	13.330	5.660	1.780	0.890	1.330	5.660
89	1	89	28.620	1.000	8900.000	175.151	62.870	62.870	3.000	0.870	2.980	0.890	15.570	6.620	2.980	0.890	1.560	6.620
90	1	90	26.200	1.000	9000.000	163.588	53.310	51.960	2.950	0.870	2.920	0.720	27.180	11.570	2.920	0.720	2.720	11.570
91	1	91	21.700	1.000	9100.000	143.575	43.010	39.990	1.910	0.870	1.880	0.680	19.300	8.210	1.880	0.680	1.980	8.210
92	1	92	18.550	1.000	9200.000	160.595	59.770	59.770	2.850	0.870	2.850	1.000	1.390	0.590	2.850	1.000	0.140	0.590
93	1	93	15.310	1.000	9300.000	162.120	61.860	61.860	2.950	0.870	2.950	1.000	2.050	0.870	2.950	1.000	0.200	0.870
94	1	94	12.310	1.000	9400.000	175.246	75.210	75.210	3.580	0.870	3.590	0.980	6.760	2.880	3.590	0.980	0.680	2.880
95	1	95	11.580	1.000	9500.000	165.779	65.070	65.070	3.100	0.870	3.110	1.000	3.050	1.300	3.110	1.000	0.310	1.300
96	1	96	7.920	1.000	9600.000	172.277	72.280	72.280	3.440	0.870	3.450	1.000	2.390	1.020	3.450	1.000	0.340	1.020
97	1	97	5.530	1.000	9700.000	193.032	91.010	91.010	4.340	0.870	4.380	0.940	16.210	6.900	4.360	0.940	1.620	6.900
98	1	98	4.830	1.000	9800.000	171.905	68.000	68.000	3.240	0.870	3.260	0.880	17.690	7.530	3.260	0.880	1.770	7.530
99	1	99	4.090	1.000	9900.000	188.805	81.890	84.970	3.100	0.870	3.140	0.580	39.340	16.740	3.140	0.580	3.980	16.740
100	1	100	3.880	1.000	10000.000	179.170	68.550	52.420	2.490	0.870	2.530	0.580	32.300	13.740	2.530	0.580	3.250	13.740
101	1	101	3.790	1.000	10100.000	154.798	31.050	31.050	1.480	0.870	1.480	0.990	2.220	0.940	1.480	0.990	0.220	0.940
102	1	102	3.400	1.000	10200.000	182.482	47.300	47.300	2.250	0.870	2.260	0.970	5.680	2.400	2.260	0.970	0.560	2.400
103	1	103	2.410	1.000	10300.000	173.214	48.390	48.390	2.310	0.870	2.320	0.870	13.310	5.670	2.320	0.870	1.330	5.670
104	1	104	1.080	1.000	10400.000	150.927	40.790	17.800	0.850	0.870	0.890	0.140	33.110	14.090	0.890	0.140	8.310	14.090
105	1	105	359.680	1.000	10500.000	149.532	43.540	1.080	0.100	0.870	0.140	0.000	54.670	14.750	0.140	0.000	3.470	14.750
106	1	106	359.700	1.000	10600.000	198.179	97.830	-83.380	-3.020	0.870	-2.950	0.990	54.800	23.320	-2.950	0.990	5.480	23.320
107	1	107	2.020	1.000	10700.000	202.765	95.440	-99.770	-2.850	0.870	-2.780	0.570	54.280	23.100	-2.780	0.570	5.430	23.100
108	1	108	5.000	1.000	10800.000	160.742	26.390	21.840	1.000	0.870	1.020	0.590	12.680	5.400	1.020	0.590	1.270	5.400
109	1	109	8.020	1.000	10900.000	172.140	49.160	49.160	2.340	0.870	2.350	0.940	9.110	3.880	2.330	0.940	0.910	3.880
110	1	110	11.990	1.000	11000.000	174.034	58.140	58.140	3.250	0.870	3.210	0.740	28.180	11.970	3.210	0.740	2.810	11.970
111	1	111	14.990	1.000	11100.000	184.384	84.370	58.210	2.680	0.870	2.620	0.410	46.650	19.850	2.620	0.410	4.660	19.850
112	1	112	18.630	1.000	11200.000	182.765	75.730	55.170	2.630	0.870	2.580	0.480	39.990	17.020	2.580	0.480	4.000	17.020
113	1	113	22.880	1.000	11300.000	172.927	49.230	44.840	2.120	0.870	2.100	0.650	22.580	9.610	2.100	0.650	2.260	9.610
114	1	114	27.340	1.000	11400.000	217.836	85.780	85.780	3.140	0.870	3.130	1.000	1.970	0.840	3.130	1.000	0.200	0.840
115	1	115	32.040	1.000	11500.000	195.167	53.590	53.590	2.550	0.870	2.570	0.920	10.940	4.650	2.570	0.920	1.090	4.650
116	1	116	35.280	1.000	11600.000	173.028	71.300	71.300	3.400	0.870	3.430	0.940	13.040	5.550	3.410	0.940	1.300	5.550
117	1	117	38.270	1.000	11700.000	200.958	96.730	96.730	4.610	0.870	4.640	0.930	19.060	8.110	4.630	0.930	1.910	8.110
118	1	118	34.380	1.000	11800.000	215.688	114.530	114.560	5.480	0.870	5.470	0.980	10.620	4.520	5.470	0.980	1.060	4.520
119	1	119	34.080	1.000	11900.000	246.270	144.580	144.580	6.880	0.870	6.900	0.990	12.300	5.230	6.900	0.990	1.230	5.230
120	1	120	35.800	1.000	12000.000	250.728	149.400	149.400	7.120	0.870	7.130	1.000	2.340	3.080	7.130	1.000	0.720	3.080
121	1	121	37.040	1.000	12100.000	242.168	140.120	140.120	6.680	0.870	6.680	1.000	1.880	0.720	6.680	1.000	0.170	0.720
122	1	122	38.100	1.000	12200.000	240.241	137.490	137.490	6.550	0.870	6.550	1.000	1.780	0.760	6.550	1.000	0.180	0.760
123	1	123	39.290	1.000	12300.000	231.098	125.780	125.780	6.000	0.870	5.990	1.000	4.420	1.880	5.990	1.000	0.440	1.880
124	1	124	40.340	1.000	12400.000	242.588	128.050	128.050	5.880	0.870	5.880	0.990	9.560	4.070	5.850	0.990	0.960	4.070
125	1	125	41.090	1.000	12500.000	253.891	129.110	129.110	6.150	0.870	6.150	0.990	6.960	2.950	6.150	0.990	0.690	2.950
126	1	126	40.950	1.000	12600.000	239.906	137.950	137.960	6.580	0.870	6.530	0.780	50.740	21.590	6.510	0.780	5.070	21.590
127	1	127	38.230	1.000	12700.000	223.325	120.150	115.390	5.500	0.870	5.440	0.700	52.460	22.320	5.440	0.700	5.250	22.320
128	1	128	35.170	1.000	12800.000	177.844	89.130	81.200	2.920	0.870	2.880	0.640	32.230	13.720	2.880	0.640	3.220	13.720
129	1	129	34.970	1.000	12900.000	138.280	26.380	22.880	1.090	0.870	1.070	0.620	12.490	5.320	1.070	0.620	1.250	5.320
130	1	130	34.590	1.000	13000.000	198.662	84.180	84.180	4.010	0.870	3.980	0.870	23.280	9.910	3.980	0.870	2.330	9.910
131	1	131	33.880	1.000	13100.000	206.308	106.270	106.270	5.070	0.870	5.040	0.880	30.320	12.900	5.030	0.880	3.030	12.900
132	1	132	33.010	1.000	13200.000	181.736	79.710	57.870	2.760	0.870	2.730	0.480	42.190	17.950	2.710	0.480	4.220	17.950
133	1	133	32.410	1.000	13300.000	167.635	61.710	47.470	2.260	0.870	2.220	0.520	31.610	13.450	2.220	0.520	3.160	13.450
134	1	134	30.440	1.000	13400.000	133.780	17.270	12.780	0.610	0.870	0.600	0.490	9.050	5.850	0.600	0.490	0.900	5.850
135	1	135	27.920	1.000	13500.000	105.968	4.030	3.830	0.180	0.870	0.180	0.690	1.770	0.750	0.180	0.690	0.180	0.750
136	1	136	25.930	1.000	13600.000	148.039	88.840	27.850	1.330	0.870	1.300	0.470	20.690	8.800	1.300	0.470	2.070	8.800
137	1	137	25.410	1.000	13700.000	172.106	44.530	44.530	2.120	0.870	2.100	0.780	16.470	7.010	2.100	0.780	1.650	7.010
138	1	138	25.940	1.000	13800.000	140.509	31.520	31.520	1.500	0.870	1.520	0.790	11.510	4.900	1.520	0.790	1.150	4.900
139	1	139	25.750	1.000	13900.000	144.398	35.790	35.790	1.710	0.870	1.710	0.970	4.500	1.920	1.710	0.970	0.450	1.920
140	1	140	22.850	1.000	14000.000	132.551	30.200	30.200	1.440	0.870	1.430	0.910	6.790	2.890	1.430	0.910	0.680	2.890
141	1	141	21.000	1.000	14100.000	140.515	37.440	37.440	1.780	0.870	1.780	1.000	0.620	0.260	1.780	1.000	0.060	0.260
142	1	142	20.580	1.000	14200.000	141.458	35.810	35.810	1.710	0.870	1.710	1.000	1.060	0.440	1.710	1.000	0.100	0.440
143	1	143	20.700	1.000	14300.000	144.899	37.010	37.010	1.760	0.870	1.760	0.980	3.290	1.400	1.760	0.980	0.330	1.400

TransectID	BaselineID	ShorelineI	Distance	IntersectX	IntersectY	Uncertaint
1	1	02/03/2000	-149.165	302808.818	1306099.853	10.000
1	1	11/29/2010	-111.710	302819.588	1306063.979	10.000
1	1	01/27/2021	-100.633	302822.773	1306053.370	10.000
2	1	02/03/2000	-144.594	302901.460	1306127.138	10.000
2	1	11/29/2010	-110.530	302911.958	1306094.732	10.000
2	1	01/27/2021	-100.164	302915.153	1306084.871	10.000
3	1	02/03/2000	-123.970	303003.172	1306131.855	10.000
3	1	11/29/2010	-104.985	303009.244	1306113.868	10.000
3	1	01/27/2021	-100.834	303010.572	1306109.935	10.000
4	1	02/03/2000	-149.430	303093.754	1306148.418	10.000
4	1	11/29/2010	-133.508	303098.804	1306133.318	10.000
4	1	01/27/2021	-115.216	303104.606	1306115.970	10.000
5	1	02/03/2000	-186.305	303184.799	1306200.447	10.000
5	1	11/29/2010	-145.913	303196.500	1306161.788	10.000
5	1	01/27/2021	-101.082	303209.486	1306118.879	10.000
6	1	02/03/2000	-163.359	303279.734	1306233.049	10.000
6	1	11/29/2010	-133.569	303287.617	1306204.320	10.000
6	1	01/27/2021	-108.901	303294.144	1306180.531	10.000
7	1	02/03/2000	-119.565	303365.496	1306252.654	10.000
7	1	11/29/2010	-100.007	303371.100	1306233.916	10.000
7	1	01/27/2021	-130.379	303362.397	1306263.014	10.000
8	1	02/03/2000	-125.309	303454.738	1306283.327	10.000
8	1	11/29/2010	-100.491	303462.915	1306259.896	10.000
8	1	01/27/2021	-152.868	303445.656	1306309.347	10.000
9	1	02/03/2000	-142.352	303544.017	1306327.413	10.000
9	1	11/29/2010	-100.030	303558.246	1306287.554	10.000
9	1	01/27/2021	-122.095	303550.827	1306308.335	10.000
10	1	02/03/2000	-164.001	303636.401	1306359.240	10.000
10	1	11/29/2010	-125.535	303649.085	1306322.926	10.000
10	1	01/27/2021	-102.900	303656.549	1306301.557	10.000
11	1	02/03/2000	-177.536	303729.081	1306402.045	10.000
11	1	11/29/2010	-144.382	303739.623	1306370.612	10.000
11	1	01/27/2021	-101.455	303753.273	1306329.912	10.000
12	1	02/03/2000	-155.573	303822.082	1306433.515	10.000
12	1	11/29/2010	-154.843	303822.311	1306432.821	10.000
12	1	01/27/2021	-101.810	303838.935	1306382.461	10.000

13	1	02/03/2000	-136.432	303914.612	1306459.675	10.000
13	1	11/29/2010	-156.740	303907.861	1306478.828	10.000
13	1	01/27/2021	-100.283	303926.629	1306425.581	10.000
14	1	02/03/2000	-135.423	304004.647	1306484.713	10.000
14	1	11/29/2010	-120.501	304010.271	1306470.892	10.000
14	1	01/27/2021	-101.593	304017.397	1306453.378	10.000
15	1	02/03/2000	-191.676	304075.462	1306522.693	10.000
15	1	11/29/2010	-123.481	304103.155	1306460.375	10.000
15	1	01/27/2021	-124.336	304102.808	1306461.156	10.000
16	1	02/03/2000	-249.365	304159.019	1306566.699	10.000
16	1	11/29/2010	-157.566	304192.795	1306481.339	10.000
16	1	01/27/2021	-105.627	304211.905	1306433.044	10.000
17	1	02/03/2000	-207.562	304256.860	1306589.833	10.000
17	1	11/29/2010	-163.950	304271.552	1306548.770	10.000
17	1	01/27/2021	-187.418	304263.646	1306570.866	10.000
18	1	02/03/2000	-132.689	304303.711	1306605.174	10.000
18	1	11/29/2010	-101.538	304315.127	1306576.191	10.000
18	1	01/27/2021	-121.955	304307.645	1306595.187	10.000
19	1	02/03/2000	-134.316	304386.739	1306648.912	10.000
19	1	11/29/2010	-100.240	304400.671	1306617.814	10.000
19	1	01/27/2021	-118.558	304393.182	1306634.532	10.000
20	1	02/03/2000	-160.773	304470.501	1306692.819	10.000
20	1	11/29/2010	-105.941	304493.835	1306643.200	10.000
20	1	01/27/2021	-131.281	304483.051	1306666.131	10.000
21	1	02/03/2000	-159.546	304568.631	1306699.681	10.000
21	1	11/29/2010	-106.452	304591.886	1306651.951	10.000
21	1	01/27/2021	-136.348	304578.791	1306678.826	10.000
22	1	02/03/2000	-141.645	304673.448	1306707.691	10.000
22	1	11/29/2010	-100.071	304691.567	1306670.273	10.000
22	1	01/27/2021	-121.516	304682.221	1306689.574	10.000
23	1	02/03/2000	-138.896	304754.212	1306763.918	10.000
23	1	11/29/2010	-115.670	304764.378	1306743.034	10.000
23	1	01/27/2021	-103.827	304769.561	1306732.386	10.000
24	1	02/03/2000	-165.309	304807.424	1306862.748	10.000
24	1	11/29/2010	-124.926	304825.174	1306826.476	10.000
24	1	01/27/2021	-111.239	304831.190	1306814.181	10.000
25	1	02/03/2000	-147.187	304882.379	1306913.226	10.000

25	1	11/29/2010	-100.009	304904.315	1306871.458	10.000
25	1	01/27/2021	-104.943	304902.021	1306875.825	10.000
26	1	02/03/2000	-201.196	304931.035	1306926.729	10.000
26	1	11/29/2010	-167.174	304947.135	1306896.758	10.000
26	1	01/27/2021	-178.021	304942.002	1306906.313	10.000
27	1	02/03/2000	-234.926	305012.421	1306962.052	10.000
27	1	11/29/2010	-221.242	305018.818	1306949.956	10.000
27	1	01/27/2021	-101.345	305074.876	1306843.972	10.000
28	1	02/03/2000	-208.949	305090.234	1307016.490	10.000
28	1	11/29/2010	-186.908	305100.267	1306996.865	10.000
28	1	01/27/2021	-134.621	305124.067	1306950.309	10.000
29	1	02/03/2000	-144.974	305157.610	1307053.568	10.000
29	1	11/29/2010	-114.385	305171.111	1307026.120	10.000
29	1	01/27/2021	-104.652	305175.407	1307017.386	10.000
30	1	02/03/2000	-152.766	305245.285	1307104.415	10.000
30	1	11/29/2010	-114.598	305261.519	1307069.872	10.000
30	1	01/27/2021	-100.012	305267.724	1307056.671	10.000
31	1	02/03/2000	-125.682	305338.952	1307130.372	10.000
31	1	11/29/2010	-113.414	305344.470	1307119.414	10.000
31	1	01/27/2021	-101.234	305349.948	1307108.535	10.000
32	1	02/03/2000	-100.242	305433.025	1307153.395	10.000
32	1	11/29/2010	-133.247	305416.795	1307182.134	10.000
32	1	01/27/2021	-105.653	305430.364	1307158.107	10.000
33	1	02/03/2000	-102.603	305519.043	1307203.809	10.000
33	1	11/29/2010	-117.798	305511.545	1307217.025	10.000
33	1	01/27/2021	-100.116	305520.270	1307201.646	10.000
34	1	02/03/2000	-128.036	305602.733	1307258.756	10.000
34	1	11/29/2010	-101.443	305615.396	1307235.373	10.000
34	1	01/27/2021	-114.437	305609.209	1307246.798	10.000
35	1	02/03/2000	-153.978	305688.231	1307327.384	10.000
35	1	11/29/2010	-108.007	305707.817	1307285.795	10.000
35	1	01/27/2021	-101.866	305710.433	1307280.239	10.000
36	1	02/03/2000	-185.139	305772.116	1307362.018	10.000
36	1	11/29/2010	-157.646	305784.091	1307337.270	10.000
36	1	01/27/2021	-112.734	305803.653	1307296.842	10.000
37	1	02/03/2000	-172.609	305858.684	1307399.862	10.000
37	1	11/29/2010	-146.560	305870.298	1307376.546	10.000

37	1	01/27/2021	-135.361	305875.291	1307366.521	10.000
38	1	02/03/2000	-130.447	305933.324	1307436.407	10.000
38	1	11/29/2010	-100.097	305946.556	1307409.093	10.000
38	1	01/27/2021	-107.317	305943.408	1307415.591	10.000
39	1	02/03/2000	-169.018	306011.882	1307486.990	10.000
39	1	11/29/2010	-124.714	306030.873	1307446.963	10.000
39	1	01/27/2021	-117.916	306033.787	1307440.822	10.000
40	1	02/03/2000	-229.860	306075.618	1307523.316	10.000
40	1	11/29/2010	-189.980	306094.019	1307487.935	10.000
40	1	01/27/2021	-119.212	306126.671	1307425.150	10.000
41	1	02/03/2000	-218.661	306160.166	1307567.213	10.000
41	1	11/29/2010	-186.215	306175.381	1307538.555	10.000
41	1	01/27/2021	-126.240	306203.504	1307485.584	10.000
42	1	02/03/2000	-160.577	306230.587	1307608.872	10.000
42	1	11/29/2010	-125.355	306246.383	1307577.390	10.000
42	1	01/27/2021	-111.389	306252.646	1307564.908	10.000
43	1	02/03/2000	-138.618	306317.085	1307650.393	10.000
43	1	11/29/2010	-109.939	306329.838	1307624.705	10.000
43	1	01/27/2021	-100.003	306334.256	1307615.806	10.000
44	1	02/03/2000	-140.420	306400.502	1307697.325	10.000
44	1	11/29/2010	-103.496	306417.928	1307664.772	10.000
44	1	01/27/2021	-100.168	306419.499	1307661.838	10.000
45	1	02/03/2000	-213.267	306449.446	1307723.427	10.000
45	1	11/29/2010	-172.686	306470.015	1307688.446	10.000
45	1	01/27/2021	-160.271	306476.309	1307677.744	10.000
46	1	02/03/2000	-246.126	306527.832	1307748.129	10.000
46	1	11/29/2010	-202.959	306550.424	1307711.346	10.000
46	1	01/27/2021	-111.928	306598.067	1307633.778	10.000
47	1	02/03/2000	-189.998	306654.521	1307729.188	10.000
47	1	11/29/2010	-158.844	306670.552	1307702.475	10.000
47	1	01/27/2021	-100.417	306700.615	1307652.376	10.000
48	1	02/03/2000	-224.880	306719.835	1307823.183	10.000
48	1	11/29/2010	-197.073	306733.511	1307798.971	10.000
48	1	01/27/2021	-111.025	306775.831	1307724.049	10.000
49	1	02/03/2000	-234.678	306762.299	1307912.958	10.000
49	1	11/29/2010	-200.977	306779.694	1307884.093	10.000
49	1	01/27/2021	-122.720	306820.085	1307817.066	10.000

50	1	02/03/2000	-181.531	306821.352	1307955.477	10.000
50	1	11/29/2010	-178.607	306822.969	1307953.042	10.000
50	1	01/27/2021	-116.627	306857.255	1307901.408	10.000
51	1	02/03/2000	-148.896	306906.635	1307988.145	10.000
51	1	11/29/2010	-153.439	306904.112	1307991.923	10.000
51	1	01/27/2021	-108.984	306928.801	1307954.955	10.000
52	1	02/03/2000	-200.202	306980.766	1308040.697	10.000
52	1	11/29/2010	-171.782	306996.092	1308016.763	10.000
52	1	01/27/2021	-110.795	307028.981	1307965.404	10.000
53	1	02/03/2000	-201.108	307070.537	1308082.856	10.000
53	1	11/29/2010	-194.695	307073.998	1308077.457	10.000
53	1	01/27/2021	-100.703	307124.724	1307998.328	10.000
54	1	02/03/2000	-173.858	307152.988	1308140.444	10.000
54	1	11/29/2010	-165.461	307157.239	1308133.202	10.000
54	1	01/27/2021	-148.802	307165.672	1308118.835	10.000
55	1	02/03/2000	-118.953	307209.529	1308182.066	10.000
55	1	11/29/2010	-100.153	307219.056	1308165.860	10.000
55	1	01/27/2021	-102.122	307218.059	1308167.557	10.000
56	1	02/03/2000	-133.669	307295.606	1308238.295	10.000
56	1	11/29/2010	-100.528	307311.712	1308209.330	10.000
56	1	01/27/2021	-110.223	307307.001	1308217.803	10.000
57	1	02/03/2000	-158.033	307383.642	1308298.018	10.000
57	1	11/29/2010	-101.254	307408.968	1308247.200	10.000
57	1	01/27/2021	-101.854	307408.701	1308247.736	10.000
58	1	02/03/2000	-176.987	307477.548	1308360.901	10.000
58	1	11/29/2010	-118.598	307499.872	1308306.948	10.000
58	1	01/27/2021	-101.677	307506.342	1308291.313	10.000
59	1	02/03/2000	-177.379	307571.863	1308431.051	10.000
59	1	11/29/2010	-130.123	307585.210	1308385.720	10.000
59	1	01/27/2021	-112.991	307590.049	1308369.285	10.000
60	1	02/03/2000	-201.408	307662.661	1308524.337	10.000
60	1	11/29/2010	-116.219	307677.434	1308440.438	10.000
60	1	01/27/2021	-114.635	307677.709	1308438.878	10.000
61	1	02/03/2000	-191.361	307757.876	1308576.097	10.000
61	1	11/29/2010	-125.222	307764.677	1308510.308	10.000
61	1	01/27/2021	-172.963	307759.768	1308557.796	10.000
62	1	02/03/2000	-295.719	307828.481	1308750.503	10.000

62	1	11/29/2010	-347.649	307824.917	1308802.311	10.000
62	1	01/27/2021	-269.468	307830.282	1308724.314	10.000
63	1	02/03/2000	-225.592	307914.482	1308733.267	10.000
63	1	11/29/2010	-261.234	307915.225	1308768.902	10.000
63	1	01/27/2021	-109.781	307912.070	1308617.482	10.000
64	1	02/03/2000	-229.941	308036.093	1308703.867	10.000
64	1	11/29/2010	-174.105	308028.426	1308648.560	10.000
64	1	01/27/2021	-100.685	308018.345	1308575.836	10.000
65	1	02/03/2000	-226.938	308158.540	1308665.553	10.000
65	1	11/29/2010	-148.591	308138.305	1308589.864	10.000
65	1	01/27/2021	-100.226	308125.814	1308543.140	10.000
66	1	02/03/2000	-219.423	308239.332	1308582.833	10.000
66	1	11/29/2010	-143.179	308213.225	1308511.198	10.000
66	1	01/27/2021	-128.907	308208.338	1308497.789	10.000
67	1	02/03/2000	-169.526	308298.886	1308457.501	10.000
67	1	11/29/2010	-150.682	308291.214	1308440.289	10.000
67	1	01/27/2021	-103.352	308271.946	1308397.059	10.000
68	1	02/03/2000	-217.743	308365.658	1308417.049	10.000
68	1	11/29/2010	-203.286	308359.191	1308404.119	10.000
68	1	01/27/2021	-229.544	308370.936	1308427.604	10.000
69	1	02/03/2000	-240.484	308422.884	1308344.531	10.000
69	1	11/29/2010	-166.844	308388.393	1308279.468	10.000
69	1	01/27/2021	-121.681	308367.239	1308239.565	10.000
70	1	02/03/2000	-169.521	308467.787	1308205.750	10.000
70	1	11/29/2010	-141.033	308452.974	1308181.416	10.000
70	1	01/27/2021	-100.525	308431.911	1308146.815	10.000
71	1	02/03/2000	-180.689	308576.905	1308162.566	10.000
71	1	11/29/2010	-140.590	308553.049	1308130.336	10.000
71	1	01/27/2021	-103.483	308530.972	1308100.511	10.000
72	1	02/03/2000	-162.867	308658.763	1308097.520	10.000
72	1	11/29/2010	-114.188	308627.427	1308060.268	10.000
72	1	01/27/2021	-106.758	308622.644	1308054.582	10.000
73	1	02/03/2000	-156.480	308703.587	1308000.056	10.000
73	1	11/29/2010	-126.800	308683.683	1307978.038	10.000
73	1	01/27/2021	-103.875	308668.311	1307961.032	10.000
74	1	02/03/2000	-110.532	308719.099	1307877.494	10.000
74	1	11/29/2010	-130.795	308732.777	1307892.445	10.000

74	1	01/27/2021	-112.551	308720.462	1307878.984	10.000
75	1	02/03/2000	-127.535	308765.112	1307797.185	10.000
75	1	11/29/2010	-153.023	308782.222	1307816.077	10.000
75	1	01/27/2021	-111.949	308754.650	1307785.633	10.000
76	1	02/03/2000	-148.164	308838.653	1307726.896	10.000
76	1	11/29/2010	-140.737	308833.495	1307721.553	10.000
76	1	01/27/2021	-100.616	308805.632	1307692.685	10.000
77	1	02/03/2000	-150.833	308916.074	1307658.962	10.000
77	1	11/29/2010	-174.730	308933.030	1307675.801	10.000
77	1	01/27/2021	-103.108	308882.212	1307625.331	10.000
78	1	02/03/2000	-166.318	309020.257	1307635.555	10.000
78	1	11/29/2010	-203.388	309046.697	1307661.539	10.000
78	1	01/27/2021	-157.592	309014.034	1307629.440	10.000
79	1	02/03/2000	-126.721	309090.644	1307619.274	10.000
79	1	11/29/2010	-163.081	309116.446	1307644.893	10.000
79	1	01/27/2021	-132.196	309094.529	1307623.132	10.000
80	1	02/03/2000	-121.614	309160.589	1307573.801	10.000
80	1	11/29/2010	-172.392	309196.424	1307609.777	10.000
80	1	01/27/2021	-112.161	309153.918	1307567.103	10.000
81	1	02/03/2000	-156.408	309224.247	1307507.522	10.000
81	1	11/29/2010	-158.790	309225.922	1307509.215	10.000
81	1	01/27/2021	-103.397	309186.968	1307469.833	10.000
82	1	02/03/2000	-141.114	309285.231	1307431.121	10.000
82	1	11/29/2010	-121.949	309271.947	1307417.306	10.000
82	1	01/27/2021	-105.021	309260.215	1307405.104	10.000
83	1	02/03/2000	-164.321	309379.565	1307400.609	10.000
83	1	11/29/2010	-100.864	309337.788	1307352.844	10.000
83	1	01/27/2021	-133.634	309359.362	1307377.510	10.000
84	1	02/03/2000	-227.298	309502.725	1307412.765	10.000
84	1	11/29/2010	-118.696	309435.178	1307327.725	10.000
84	1	01/27/2021	-162.701	309462.547	1307362.182	10.000
85	1	02/03/2000	-176.005	309554.915	1307364.326	10.000
85	1	11/29/2010	-112.026	309518.080	1307312.015	10.000
85	1	01/27/2021	-128.668	309527.661	1307325.622	10.000
86	1	02/03/2000	-207.041	309575.728	1307296.208	10.000
86	1	11/29/2010	-163.467	309552.349	1307259.437	10.000
86	1	01/27/2021	-161.911	309551.513	1307258.123	10.000

87	1	02/03/2000	-182.695	309589.115	1307184.619	10.000
87	1	11/29/2010	-162.375	309578.856	1307167.080	10.000
87	1	01/27/2021	-131.217	309563.125	1307140.184	10.000
88	1	02/03/2000	-167.088	309614.716	1307080.529	10.000
88	1	11/29/2010	-163.920	309613.189	1307077.754	10.000
88	1	01/27/2021	-129.347	309596.520	1307047.464	10.000
89	1	02/03/2000	-176.162	309669.332	1307002.930	10.000
89	1	11/29/2010	-162.816	309662.940	1306991.214	10.000
89	1	01/27/2021	-113.295	309639.223	1306947.743	10.000
90	1	02/03/2000	-162.221	309732.767	1306930.029	10.000
90	1	11/29/2010	-163.568	309733.362	1306931.237	10.000
90	1	01/27/2021	-100.257	309705.408	1306874.432	10.000
91	1	02/03/2000	-140.562	309805.701	1306877.551	10.000
91	1	11/29/2010	-143.576	309806.815	1306880.351	10.000
91	1	01/27/2021	-100.571	309790.911	1306840.395	10.000
92	1	02/03/2000	-160.595	309902.385	1306877.645	10.000
92	1	11/29/2010	-128.073	309892.041	1306846.812	10.000
92	1	01/27/2021	-100.824	309883.374	1306820.978	10.000
93	1	02/03/2000	-162.120	309991.581	1306859.469	10.000
93	1	11/29/2010	-127.714	309982.493	1306826.285	10.000
93	1	01/27/2021	-100.264	309975.243	1306799.810	10.000
94	1	02/03/2000	-175.247	310083.914	1306853.504	10.000
94	1	11/29/2010	-128.185	310073.881	1306807.524	10.000
94	1	01/27/2021	-100.041	310067.882	1306780.027	10.000
95	1	02/03/2000	-165.779	310179.031	1306832.582	10.000
95	1	11/29/2010	-128.484	310171.547	1306796.046	10.000
95	1	01/27/2021	-100.705	310165.972	1306768.832	10.000
96	1	02/03/2000	-172.277	310269.025	1306831.165	10.000
96	1	11/29/2010	-132.077	310263.484	1306791.349	10.000
96	1	01/27/2021	-100.000	310259.062	1306759.578	10.000
97	1	02/03/2000	-193.032	310363.460	1306846.516	10.000
97	1	11/29/2010	-126.252	310357.030	1306780.046	10.000
97	1	01/27/2021	-102.022	310354.697	1306755.929	10.000
98	1	02/03/2000	-171.905	310457.371	1306841.824	10.000
98	1	11/29/2010	-115.178	310452.794	1306785.282	10.000
98	1	01/27/2021	-103.909	310451.885	1306774.050	10.000
99	1	02/03/2000	-186.605	310554.810	1306875.496	10.000

99	1	11/29/2010	-104.919	310548.987	1306794.018	10.000
99	1	01/27/2021	-121.634	310550.179	1306810.690	10.000
100	1	02/03/2000	-179.170	310648.973	1306897.672	10.000
100	1	11/29/2010	-112.625	310644.474	1306831.279	10.000
100	1	01/27/2021	-126.849	310645.436	1306845.470	10.000
101	1	02/03/2000	-134.798	310738.968	1306887.679	10.000
101	1	11/29/2010	-116.069	310737.732	1306868.990	10.000
101	1	01/27/2021	-103.744	310736.918	1306856.692	10.000
102	1	02/03/2000	-162.482	310835.966	1306941.761	10.000
102	1	11/29/2010	-131.184	310834.112	1306910.519	10.000
102	1	01/27/2021	-115.181	310833.164	1306894.544	10.000
103	1	02/03/2000	-173.214	310921.406	1307000.127	10.000
103	1	11/29/2010	-131.952	310919.670	1306958.901	10.000
103	1	01/27/2021	-124.821	310919.370	1306951.777	10.000
104	1	02/03/2000	-150.927	311001.846	1307028.348	10.000
104	1	11/29/2010	-101.192	311000.912	1306978.622	10.000
104	1	01/27/2021	-133.126	311001.511	1307010.550	10.000
105	1	02/03/2000	-143.537	311097.933	1307026.952	10.000
105	1	11/29/2010	-100.000	311098.179	1306983.416	10.000
105	1	01/27/2021	-141.473	311097.944	1307024.888	10.000
106	1	02/03/2000	-134.794	311197.951	1307014.966	10.000
106	1	11/29/2010	-100.353	311198.129	1306980.526	10.000
106	1	01/27/2021	-198.179	311197.624	1307078.350	10.000
107	1	02/03/2000	-142.991	311299.168	1306995.970	10.000
107	1	11/29/2010	-107.324	311297.912	1306960.326	10.000
107	1	01/27/2021	-202.765	311301.274	1307055.708	10.000
108	1	02/03/2000	-160.742	311380.680	1306945.931	10.000
108	1	11/29/2010	-134.353	311378.381	1306919.642	10.000
108	1	01/27/2021	-139.698	311378.846	1306924.967	10.000
109	1	02/03/2000	-172.140	311462.082	1306886.304	10.000
109	1	11/29/2010	-157.953	311460.103	1306872.256	10.000
109	1	01/27/2021	-122.976	311455.224	1306837.621	10.000
110	1	02/03/2000	-174.034	311554.026	1306829.141	10.000
110	1	11/29/2010	-173.360	311553.893	1306828.481	10.000
110	1	01/27/2021	-105.899	311540.571	1306762.348	10.000
111	1	02/03/2000	-156.231	311653.561	1306774.822	10.000
111	1	11/29/2010	-184.384	311660.841	1306802.017	10.000

111	1	01/27/2021	-100.019	311639.025	1306720.522	10.000
112	1	02/03/2000	-162.226	311764.376	1306768.647	10.000
112	1	11/29/2010	-182.763	311770.937	1306788.108	10.000
112	1	01/27/2021	-107.056	311746.752	1306716.368	10.000
113	1	02/03/2000	-168.233	311877.286	1306779.659	10.000
113	1	11/29/2010	-172.927	311879.110	1306783.984	10.000
113	1	01/27/2021	-123.693	311859.980	1306738.619	10.000
114	1	02/03/2000	-217.636	312010.958	1306839.755	10.000
114	1	11/29/2010	-186.127	311996.241	1306811.894	10.000
114	1	01/27/2021	-151.855	311980.233	1306781.590	10.000
115	1	02/03/2000	-195.167	312106.798	1306846.134	10.000
115	1	11/29/2010	-154.133	312085.032	1306811.348	10.000
115	1	01/27/2021	-141.573	312078.370	1306800.701	10.000
116	1	02/03/2000	-173.028	312184.196	1306811.265	10.000
116	1	11/29/2010	-120.284	312153.734	1306768.207	10.000
116	1	01/27/2021	-101.729	312143.018	1306753.059	10.000
117	1	02/03/2000	-200.958	312264.201	1306752.941	10.000
117	1	11/29/2010	-127.735	312220.885	1306693.904	10.000
117	1	01/27/2021	-104.233	312206.982	1306674.955	10.000
118	1	02/03/2000	-216.688	312335.260	1306693.608	10.000
118	1	11/29/2010	-144.619	312294.045	1306634.488	10.000
118	1	01/27/2021	-102.160	312269.763	1306599.657	10.000
119	1	02/03/2000	-246.270	312418.980	1306648.392	10.000
119	1	11/29/2010	-156.754	312368.890	1306574.202	10.000
119	1	01/27/2021	-101.893	312338.192	1306528.734	10.000
120	1	02/03/2000	-250.728	312498.457	1306576.820	10.000
120	1	11/29/2010	-164.828	312448.205	1306507.151	10.000
120	1	01/27/2021	-101.327	312411.058	1306455.650	10.000
121	1	02/03/2000	-242.168	312566.201	1306494.012	10.000
121	1	11/29/2010	-167.856	312521.440	1306434.692	10.000
121	1	01/27/2021	-102.050	312481.803	1306382.163	10.000
122	1	02/03/2000	-240.241	312629.662	1306410.638	10.000
122	1	11/29/2010	-171.523	312587.258	1306356.563	10.000
122	1	01/27/2021	-102.752	312544.822	1306302.446	10.000
123	1	02/03/2000	-231.096	312686.980	1306320.028	10.000
123	1	11/29/2010	-171.655	312649.341	1306274.023	10.000
123	1	01/27/2021	-105.313	312607.332	1306222.676	10.000

124	1	02/03/2000	-242.683	312728.573	1306231.984	10.000
124	1	11/29/2010	-190.952	312695.221	1306192.439	10.000
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125	1	02/03/2000	-253.891	312759.534	1306139.987	10.000
125	1	11/29/2010	-195.816	312721.363	1306096.220	10.000
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126	1	02/03/2000	-239.906	312796.311	1306042.321	10.000
126	1	11/29/2010	-230.926	312790.426	1306035.538	10.000
126	1	01/27/2021	-101.957	312705.907	1305938.124	10.000
127	1	02/03/2000	-218.563	312856.808	1305977.451	10.000
127	1	11/29/2010	-223.326	312859.755	1305981.192	10.000
127	1	01/27/2021	-103.174	312785.404	1305886.808	10.000
128	1	02/03/2000	-169.919	312914.313	1305914.007	10.000
128	1	11/29/2010	-177.844	312918.878	1305920.485	10.000
128	1	01/27/2021	-108.716	312879.058	1305863.978	10.000
129	1	02/03/2000	-134.743	312973.597	1305841.682	10.000
129	1	11/29/2010	-138.260	312975.612	1305844.563	10.000
129	1	01/27/2021	-111.882	312960.494	1305822.949	10.000
130	1	02/03/2000	-198.662	313045.592	1305802.781	10.000
130	1	11/29/2010	-183.776	313037.141	1305790.527	10.000
130	1	01/27/2021	-114.483	312997.800	1305733.484	10.000
131	1	02/03/2000	-206.308	313121.341	1305743.929	10.000
131	1	11/29/2010	-188.651	313111.499	1305729.269	10.000
131	1	01/27/2021	-100.034	313062.101	1305655.696	10.000
132	1	02/03/2000	-159.930	313183.548	1305663.876	10.000
132	1	11/29/2010	-181.776	313195.450	1305682.195	10.000
132	1	01/27/2021	-102.065	313152.023	1305615.353	10.000
133	1	02/03/2000	-153.399	313272.922	1305626.122	10.000
133	1	11/29/2010	-167.635	313280.553	1305638.140	10.000
133	1	01/27/2021	-105.925	313247.474	1305586.045	10.000
134	1	02/03/2000	-129.292	313354.886	1305594.833	10.000
134	1	11/29/2010	-133.780	313357.160	1305598.703	10.000
134	1	01/27/2021	-116.509	313348.409	1305583.812	10.000
135	1	02/03/2000	-105.762	313437.437	1305566.538	10.000
135	1	11/29/2010	-105.963	313437.531	1305566.716	10.000
135	1	01/27/2021	-101.938	313435.646	1305563.159	10.000
136	1	02/03/2000	-137.055	313545.604	1305577.360	10.000

136	1	11/29/2010	-148.039	313550.407	1305587.238	10.000
136	1	01/27/2021	-109.203	313533.424	1305552.312	10.000
137	1	02/03/2000	-172.106	313659.245	1305611.947	10.000
137	1	11/29/2010	-169.324	313658.052	1305609.434	10.000
137	1	01/27/2021	-127.577	313640.139	1305571.725	10.000
138	1	02/03/2000	-140.579	313744.287	1305605.358	10.000
138	1	11/29/2010	-110.226	313731.010	1305578.063	10.000
138	1	01/27/2021	-109.063	313730.501	1305577.018	10.000
139	1	02/03/2000	-144.893	313814.781	1305546.133	10.000
139	1	11/29/2010	-120.919	313804.367	1305524.539	10.000
139	1	01/27/2021	-109.098	313799.233	1305513.892	10.000
140	1	02/03/2000	-132.551	313881.253	1305476.166	10.000
140	1	11/29/2010	-125.295	313878.458	1305469.470	10.000
140	1	01/27/2021	-102.353	313869.623	1305448.298	10.000
141	1	02/03/2000	-140.514	313963.678	1305429.480	10.000
141	1	11/29/2010	-121.974	313957.034	1305412.171	10.000
141	1	01/27/2021	-103.079	313950.263	1305394.531	10.000
142	1	02/03/2000	-141.458	314043.454	1305371.478	10.000
142	1	11/29/2010	-124.260	314037.410	1305355.377	10.000
142	1	01/27/2021	-105.646	314030.868	1305337.951	10.000
143	1	02/03/2000	-144.899	314118.817	1305307.172	10.000
143	1	11/29/2010	-129.840	314113.493	1305293.085	10.000
143	1	01/27/2021	-107.889	314105.733	1305272.551	10.000