DERİNER DAM GEOMETRY SOFTWARE by NZN

Deriner dam is the 3rd biggest arch dam in the world according to its height and excavation quantity (by year 2001)

Maximum flood water level	395.00 m
Maximum operation water level	392.00 m
Minimum operation water level	347.83 m
Thalweg level	195.00 m
Type of dam	Double curvature arch dam
Crest level	397.00 m
Height from thalweg	202.00 m
Height from foundation	253.00 m
Crest length	706.00 m
Crest width	12.00 – 21.00 m
Concrete volume	3.50 hm^3
Type of Powerhouse	Underground
Number of turbines	4
Installed capacity	670.00 MW
Total energy	2 117 75 GWH

GEOMETRICAL DEFINITION OF THE FINAL OPTIMISED DAM DESIGN

DAM AXIS LOCATION

The dam geometry is defined with respect to (w.r.t.) a local co-ordinate system (U, V), where U is positive in the upstream – downstream direction and V is positive in the left – right bank cross-valley direction. These co-ordinates may be transformed to a global (Y, X) system that is equivalent to the country co-ordinate system (N, E).

The origin of the local co-ordinate system has the following local and global co-ordinates:

U_O = 0.0000; Y_O = 4559061.9870
V_O = 0.0000; X_O = 488293.7154

Where subscript "o" represents "Origin".
The orientation of the dam within the valley is defined by the global azimuth Az (grad) where:

$Az = 369.44444^g$

The global azimuth is measured w.r.t. the global N or Y axis in a clockwise direction to the local U axis.
A key point in the geometrical definition of the dam is the point P, which defines the intersection of the crest elevation arch and the crown cantilever section. The co-ordinates of this point are given by:

U_P = 200.0000; Y_P = 4559701.1378
V_P = 1000.0000; X_P = 489088.3765

Where subscript "p" represents the "Dam Reference Point" P.

LOCAL – GLOBAL TRANSFORMATION SYSTEM

All co-ordinates can be described in both the local and global co-ordinate systems (N, E) using the following transformation equations:

Local to Global

$Y = Y_O + U \cos(Az) - V \sin(Az)$ (2.1)
$X = X_O + U \sin(Az) + V \cos(Az)$ (2.2)

Global to Local

$U = (Y_O - Y) \cos(Az) + (X_O - X) \sin(Az)$ (2.3)
$V = -(Y_O - Y) \sin(Az) + (X_O - X) \cos(Az)$ (2.4)

DAM GEOMETRY

The dam geometry is split into two main parts. The first defines the main dam arches without thickening using horizontal parabolas and the second defines abutment thickening using horizontal side parabolas.

DEFINITION OF MAIN SECTIONS USING PARABOLAS

The definition of the dam geometry involves firstly defining an appropriate crown cantilever section, which in turn defines thickening and mid-surface curves as presented in figure 1. In the case where abutment thickening is not required, both the upstream and downstream faces of the dam are defined using simple parabolic formulas. The parabola parameters P_i, (i = 1 (upstream face), i = 2 (downstream face)), which are based on the definition of the main axis line Uo, vary over the height of the dam as indicates in figure 1.

The following notation is used:

U_0 = Local U co-ordinate of the centre of curvature of the main parabola.
U_1 = Local U co-ordinate of the apex of the upstream parabola.
U_2 = Local U co-ordinate of the apex of the downstream parabola.
P_1 = Main upstream parabola parameter.
P_2 = Main downstream parabola parameter.
t = dam thickness.
k = dam mid-surface axis at the main section.
z = height (elevation (m.a.s.l.) – 146 (m.a.s.l.).)

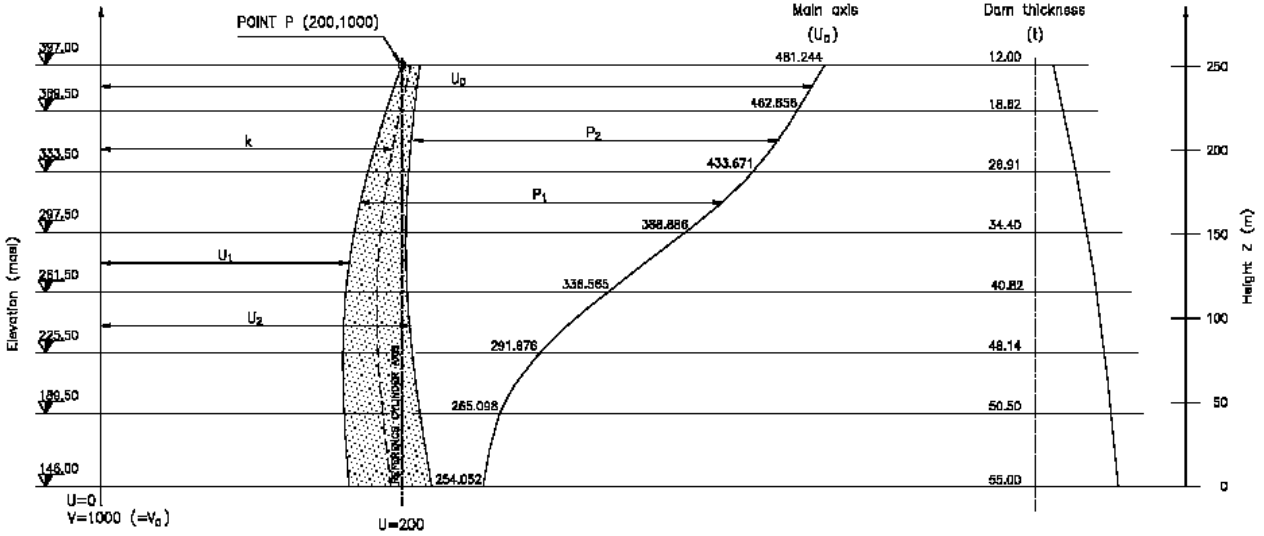


Figure 1. Definition of Main Parabolas and Crown Cantilever Section

DEFINITION OF ABUTMENT THICKENING USING SIDE PARABOLAS

Abutment thickening is added to the main downstream parabolas using side parabolas. The objective is to define a side parabola, which is tangent to the main parabola and gives a uniform increase in abutment thickening over the entire height of the dam. Figure 2 presents the basic concept of the side parabolas along with the notation used in geometrical equations. The following notation applies in figure 2:

C_0 (u_0, v_0) = Co-ordinate of the centre of the circle of curvature of the main parabola.
C_R (u_{CR}, v_{CR})= Co-ordinate of the centre of the circle of curvature of the right bank side parabola.
C_L (u_{CL}, v_{CL})= Co-ordinate of the centre of the circle of curvature of the left bank side parabola.
T_R (u_{TR}, v_{TR})= Co-ordinate of the point of contact between the main downstream parabola and the right bank side parabola.
T_L (u_{TL}, v_{TL})= Co-ordinate of the point of contact between the main downstream parabola and the left bank side parabola.
P_L = Left bank side parabola parameter. $P_L = (u_{CL} - u_3)$
P_R = Left bank side parabola parameter. $P_R = (u_{CR} - u_4)$

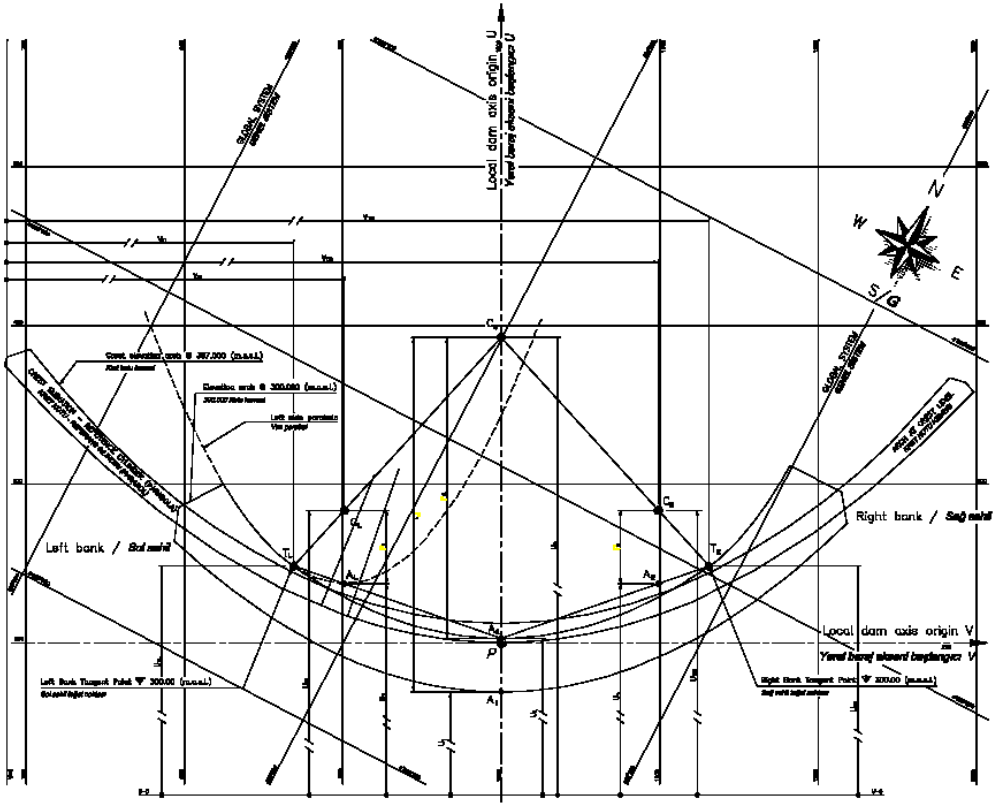


Figure 2. Definition of Side Parabolas for Abutment Thickening

OVERVIEW OF THE SOFTWARE

The geometry of the dam is defined between el. 146 and 397 and the concreting lifts are as follows:

- 146 - 147
- Intermediate lifts every 3 m from 147 to 393.
- 393 - 395
- 395 - 397

The program has 4 sections:

1. Horizontal
2. Vertical
3. Block
4. Formwork

General Notes:

- Before using any section, the user should decide which coordinate system to use. It is done by the "Dam Locals" and "Global" option buttons. And right of the "Global" option is the "Zoom Method" box, which is used for defining the zoom method when the user presses the "Zoom" button.
- When the user uses "Block" or "Formwork" sections the program draws the geometry and in the mean time it makes all necessary calculations for the dam, the user can then save this data to an Excel File by pressing the "Save" button.
- Anytime the user wants to erase the objects in AutoCAD, can press the "Erase" button.
- After using the program the user can apply standard AutoCAD commands to the drawings, like changing the views, 3D orbiting, rotating, …

1. Horizontal

This section is intended for producing horizontal sections. Figure 3 shows a typical section for a given elevation, the parabola is formed by given "Number of Points". After producing the cross section the user can press the datum button to indicate the centre, tangent and apex points of the parabolas. "Draw 3 More Joints" checkbox is for the decision stage of the dam blocks for each elevation.

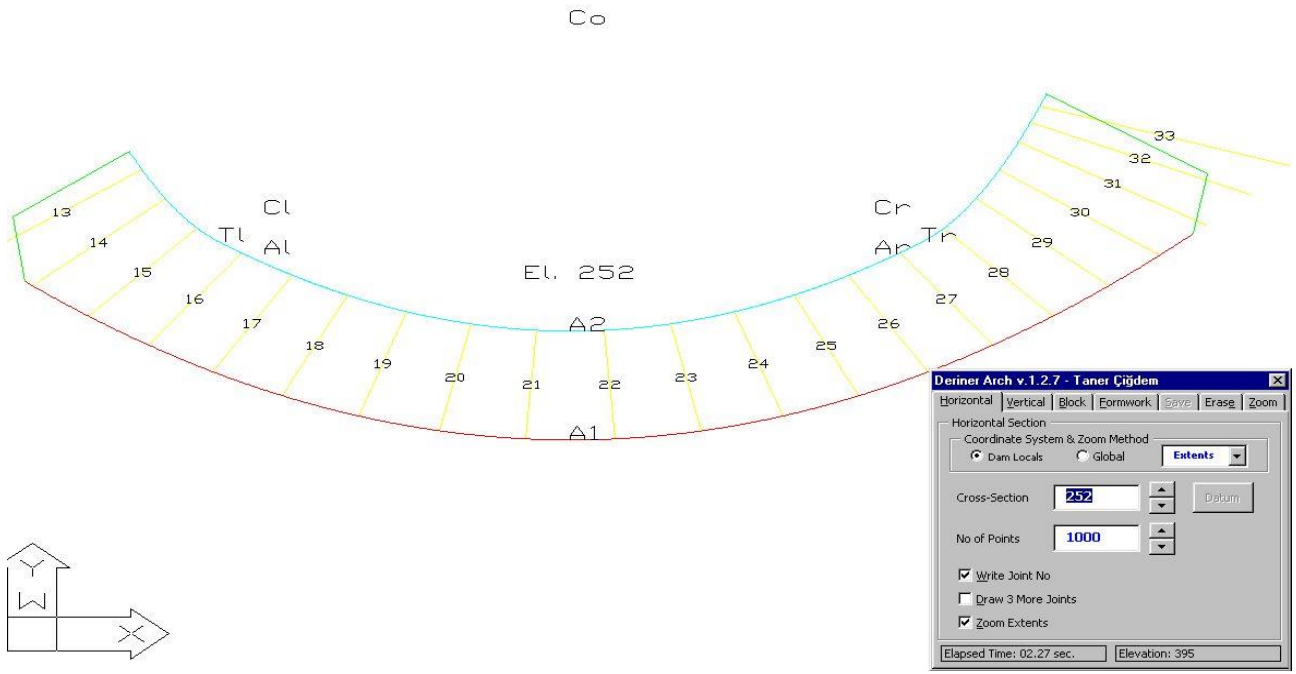


Figure 3. Typical horizontal section

2. Vertical

This section is intended for producing vertical sections. Figure 4 shows a typical plane section for a given joint. Joint numbers are between 1 and 40 from left to right. If the user wants a 3D vertical section, he can check the "Draw 3D" checkbox. Figure 5 shows all the vertical cross sections of the dam in a 3D view.

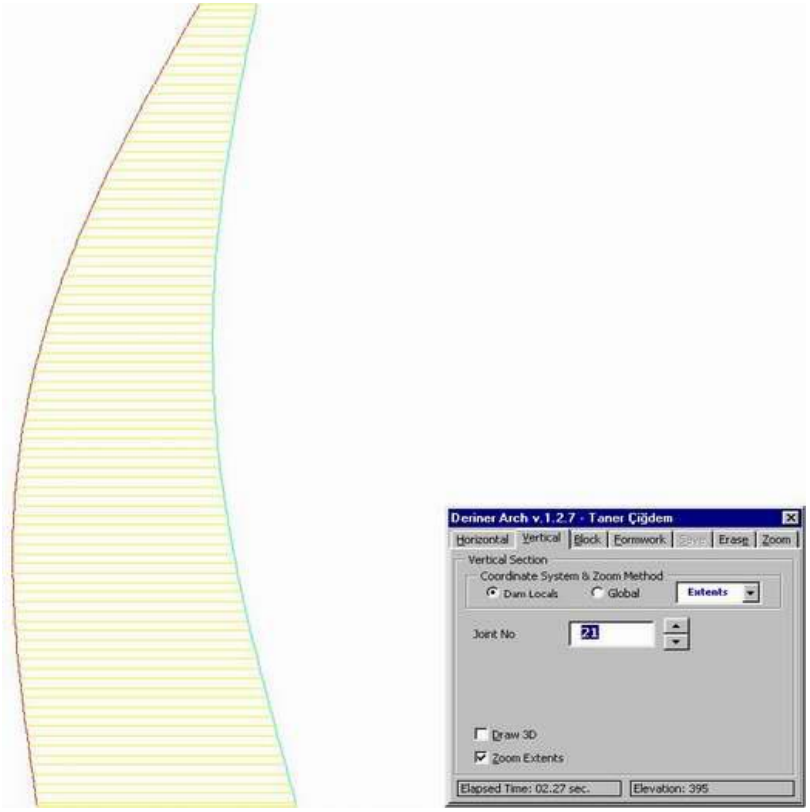


Figure 4. Plane vertical section of joint 21

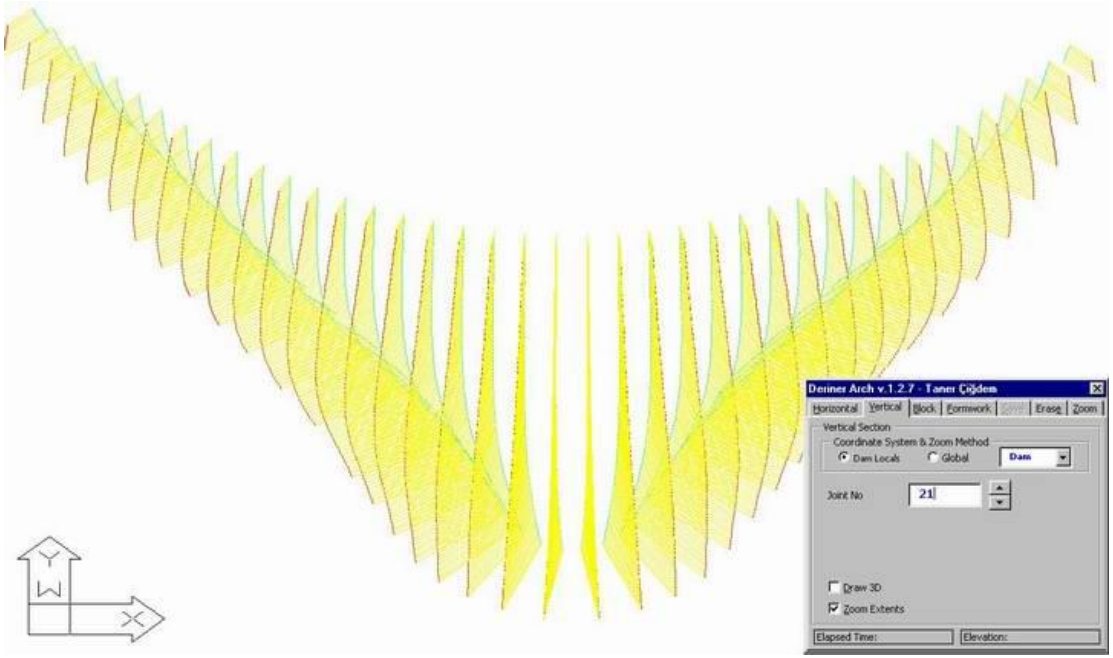


Figure 5. 3D vertical sections of all joints

3. Block

This section is intended for drawing near theoretical blocks, finding the areas of each sides of the blocks, the corner and origin coordinates and the concrete volumes of the blocks. If both "All Elevations" and "All Blocks" boxes are unchecked, the user has to define the "Lower Elevation" and "Block No" textboxes. The program finds the upper elevation of the block according to the concreting lifts mentioned above. And this will draw a specific bay for the given data (Figure 6). "All Elevations" option is for drawing a specific block in all elevations from the excavation surface to the crest elevation (Figure 7). "All Blocks" option is for drawing all blocks for a given elevation (Figure 8). If both of these boxes are checked the program will draw all dam (Figure 9). "Last elevation" textbox is for restricting the stop elevation in whole-drawing options, "Lower Elevation" textbox can also affect the start elevation in whole-drawings. "No of Points" defines the vertex number of both upstream and downstream parabolas, higher values approach to the theoretical parabola.

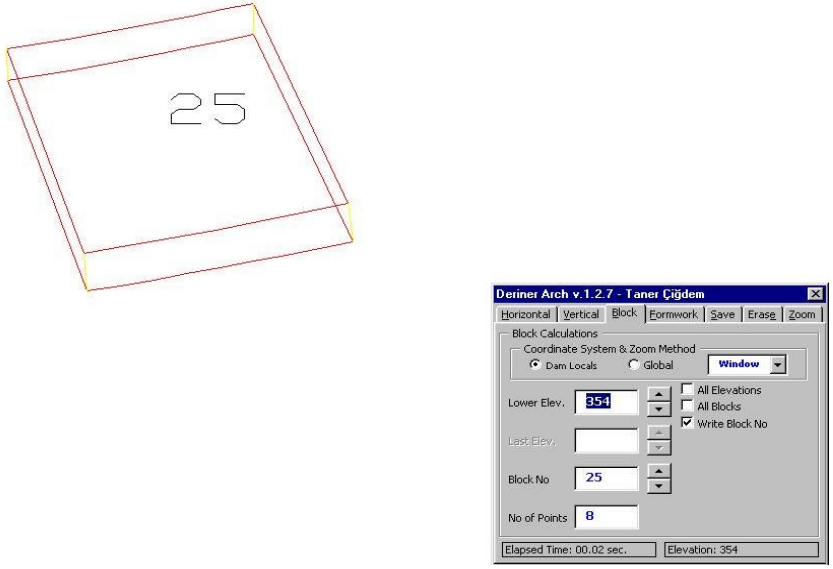


Figure 6.

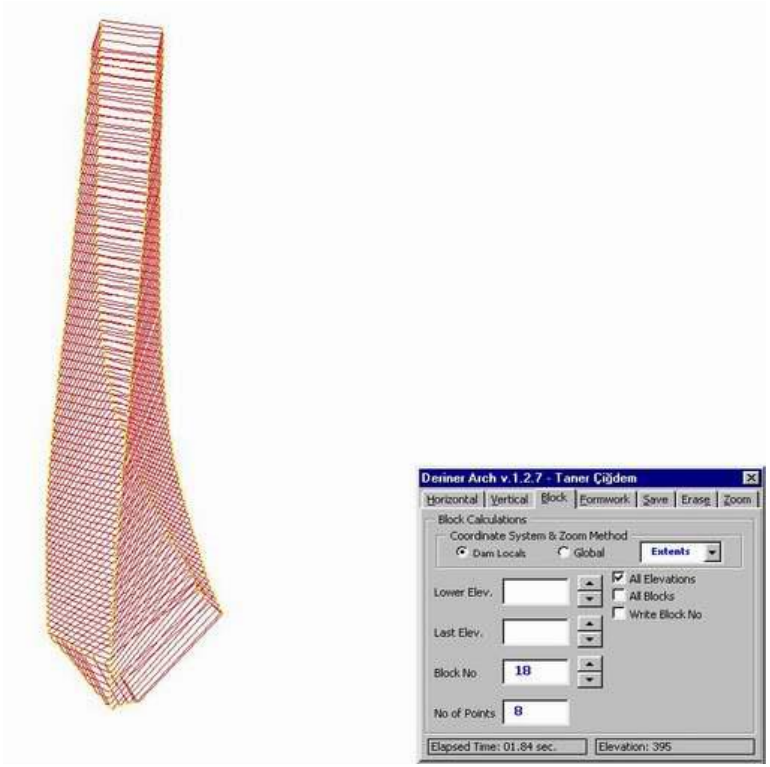

Deriner Arch v.1.2.7 - Taner Çiğdem
Horizontal
Vertical
Block
Formwork
Save
Erase
Zoom
Block Calculations
Coordinate System & Zoom Method
Dam Locals
Global
Extents
Lower Elev.
Last Elev.
Block No
18
No of Points
8
All Elevations
All Blocks
Write Block No
Elapsed Time: 01.84 sec.
Elevation: 395

Figure 7.

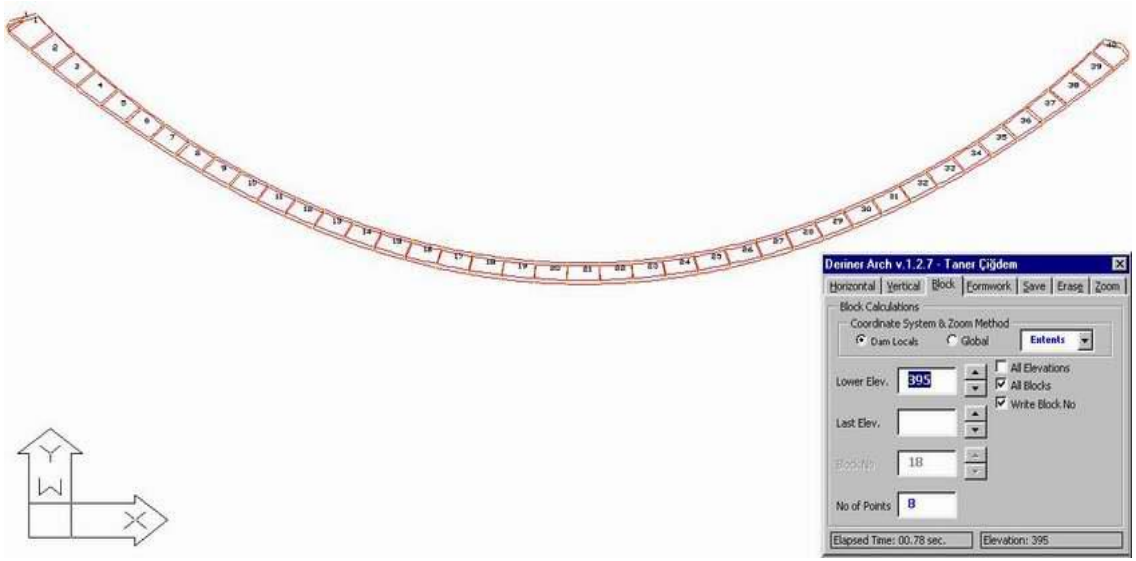

Deriner Arch v.1.2.7 - Taner Çiğdem
Horizontal
Vertical
Block
Formwork
Save
Erase
Zoom
Block Calculations
Coordinate System & Zoom Method
Dam Locals
Global
Extents
Lower Elev.
395
Last Elev.
Block No
18
No of Points
8
All Elevations
All Blocks
Write Block No
Elapsed Time: 00.78 sec.
Elevation: 395
Y
W
X

Figure 8.

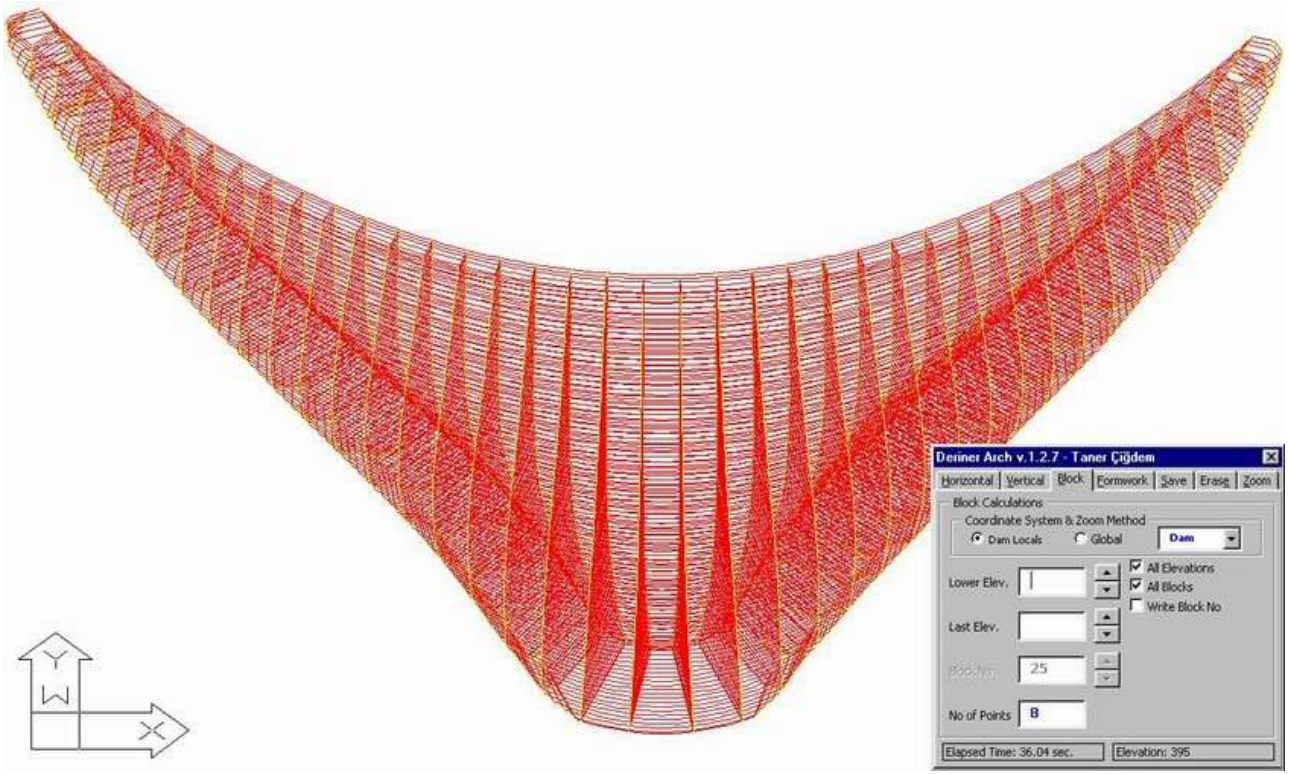

Y
W
X
Denner Arch v.1.2.7 - Taner Çiğdem
Horizontal
Vertical
Block
Formwork
Save
Erase
Zoom
Block Calculations
Coordinate System & Zoom Method
Dam Locals
Global
Dam
Lower Elev.
Last Elev.
25
No of Points
8
All Elevations
All Blocks
Write Block No
Elapsed Time: 36.04 sec.
Elevation: 395

Figure 9.

4. Formwork

This section works like the "Block" section. The difference is, "Block" section draws the parabolas by dividing them into face divisions by the given "No of Points" and the "Formwork" section works based on the given "Form Length" in meters. This section draws the formworks from left to right for blocks >= 21 and from right to left for the others. Its working structure is to find the intersection points of the formworks with the parabolas and to cross to the other corner of the block by placing each formwork like that. The "All Elevations" and the "All Blocks" checkboxes work the same as "Block" section. And if the user wants to draw all formworks, he can check the "Draw Formworks" checkbox (Figure 10), then the user can easily "Shade" and "Render" the drawings in AutoCAD. The "Max" notation shows the maximum openings of the formworks from the parabolas for each face and elevation for that bay. The user can restrict the maximum opening by entering in the "Tolerance" textbox in "cm". When the program finds a face exceeding this value it draws the same bay with the given "Alternative Form Length" and of a different colour. The program is now adjusted to use "Alternative Form Length" in bays where parabolas are tangent, the others are eliminated. The user should check the Excel File to see if there still exist some bays exceeding the "Tolerance" value, if so he has to change the standard form lengths by trying. This is useful for finding the optimal form length of the dam. If the user wants to see the parabolas and the formworks together he can leave the "Erase Parabolas" checkbox unchecked. The save data includes all faces form lengths, maximum openings, block areas and real concrete volumes.

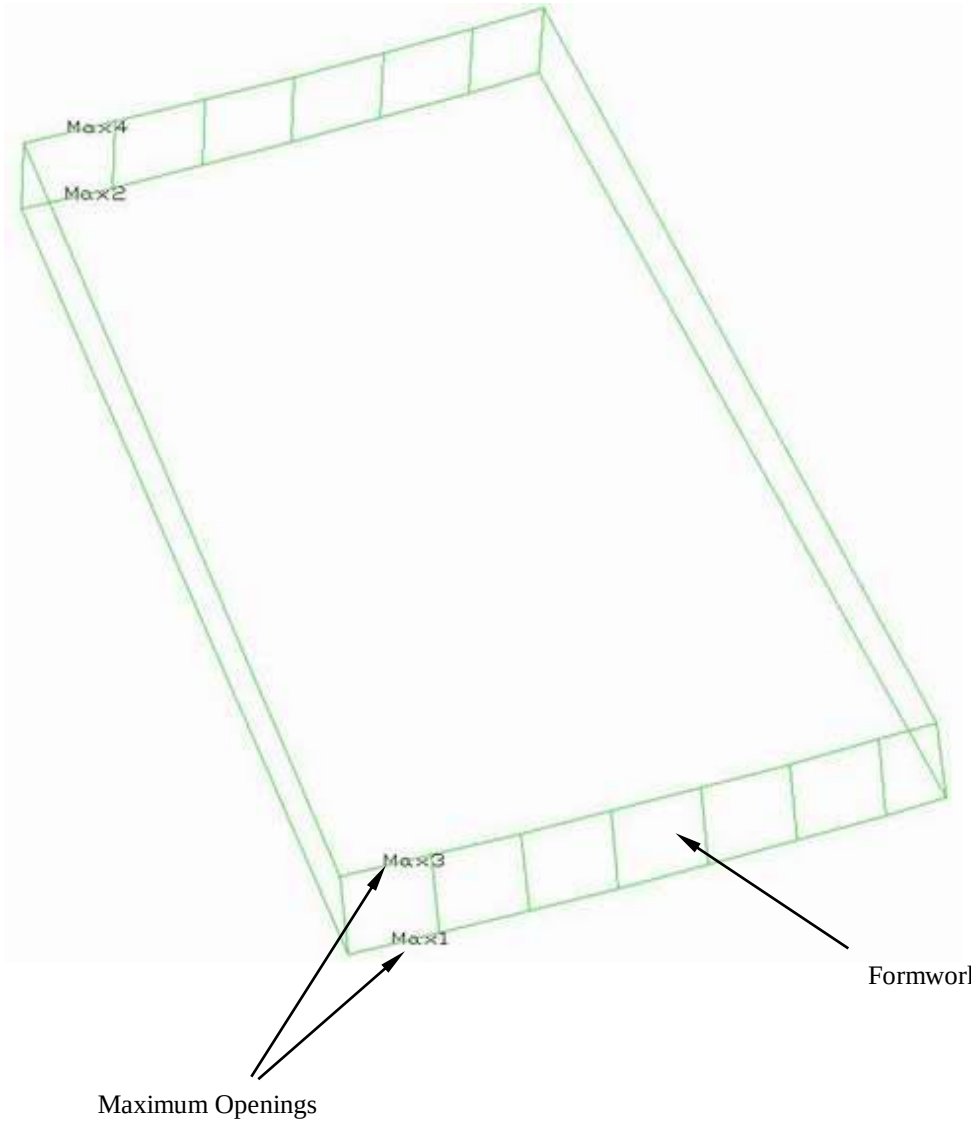


Figure 10.

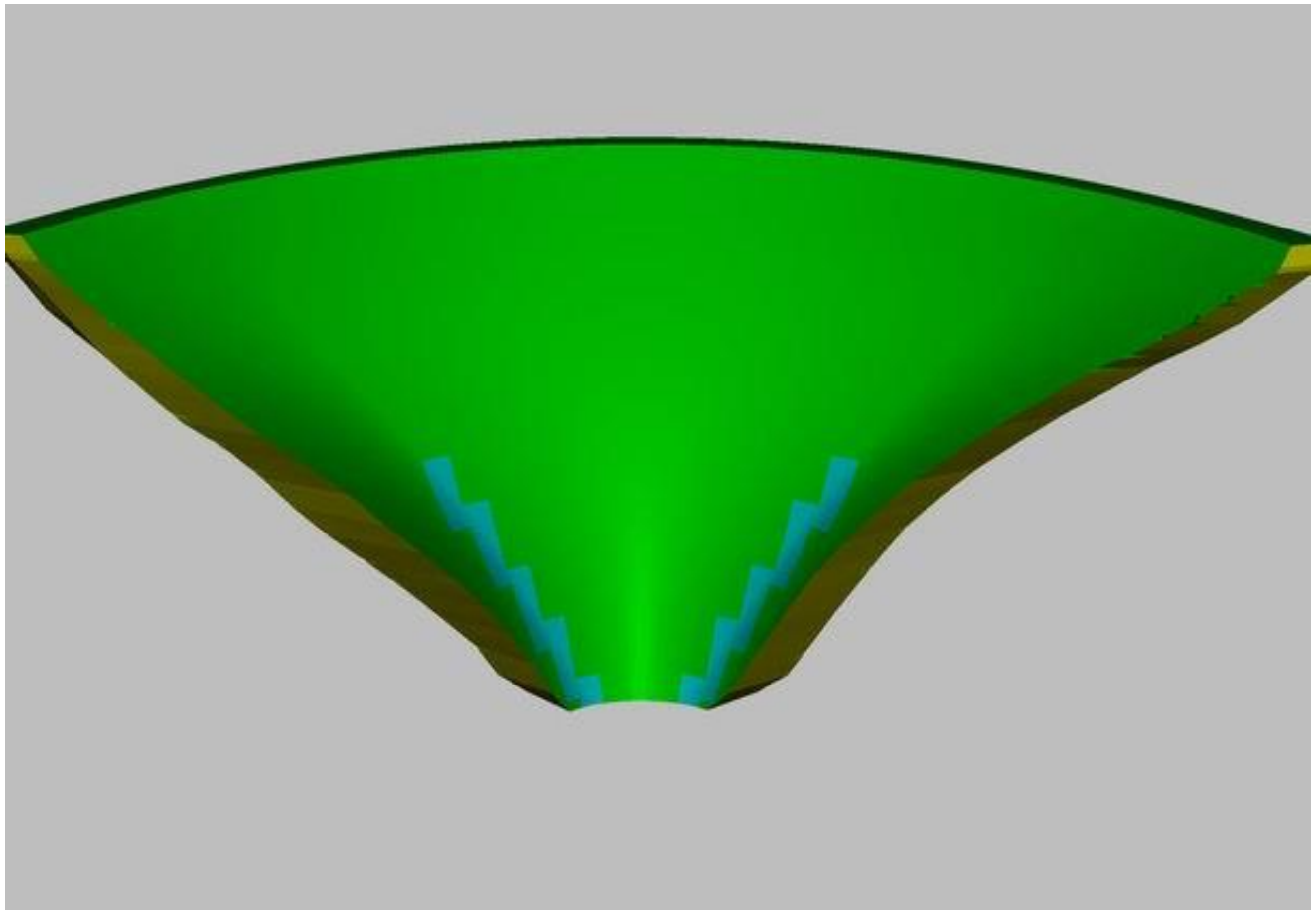
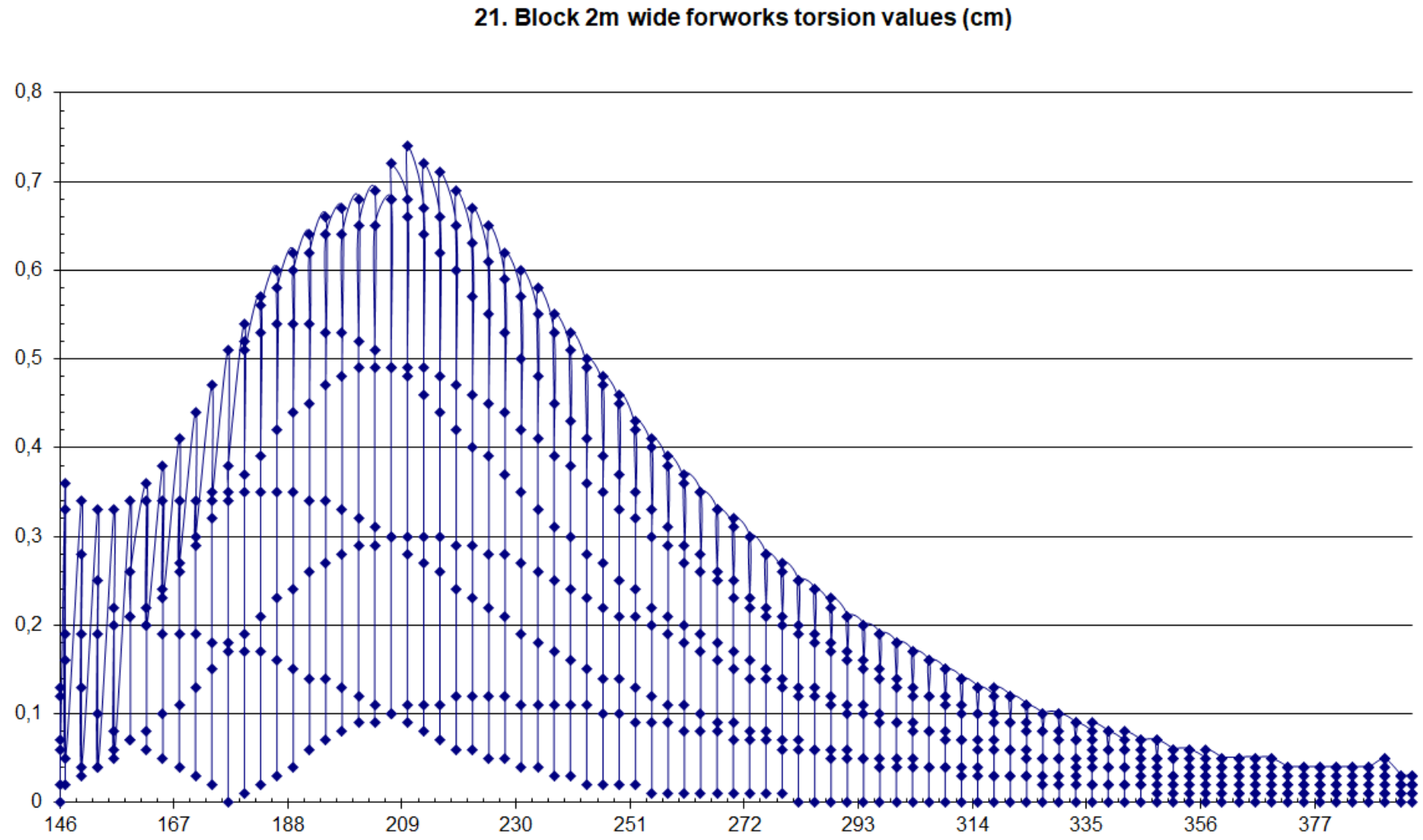


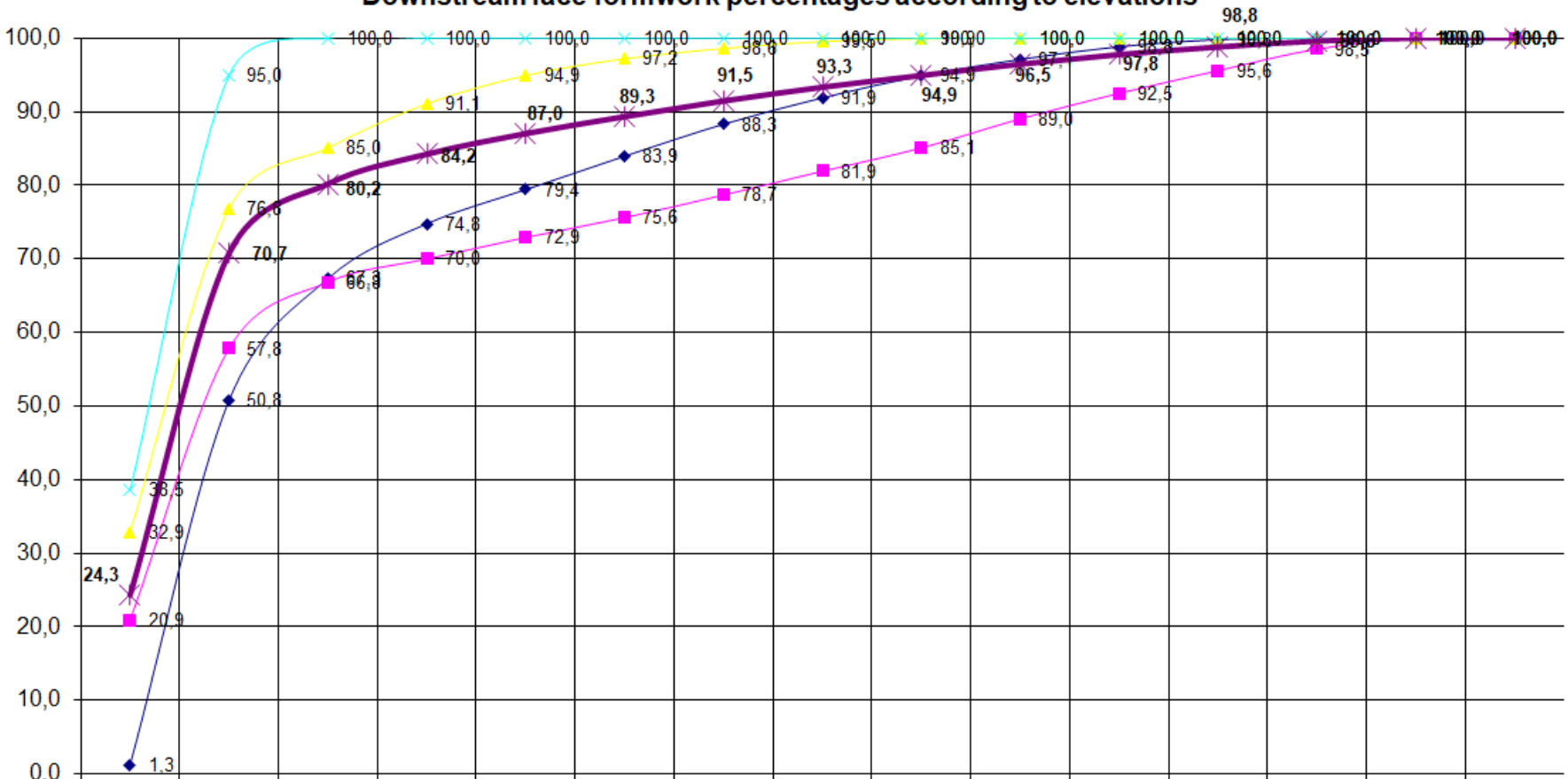
Figure 11. A rendered view of the dam from downstream

This software was initially designed as standard executable and was connecting to the AutoCAD by Automation, and has been converted to AutoCAD macro for better and faster performance.

Output:


21. Block 2m wide forworks torsion values (cm)
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
146
167
188
209
230
251
272
293
314
335
356
377

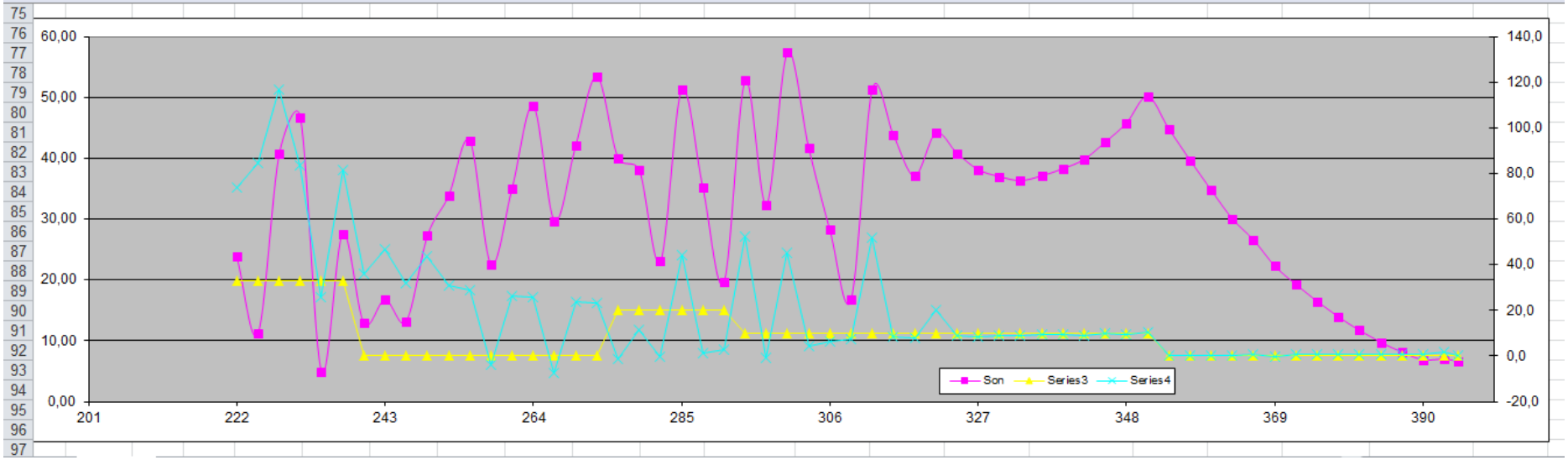
Downstream face formwork percentages according to elevations



	3,15	3,25	3,35	3,45	3,55	3,65	3,75	3,85	3,95	4,05	4,15	4,25	4,35	4,45	4,55
146-249	1,3	50,8	67,3	74,8	79,4	83,9	88,3	91,9	94,9	97,1	98,8	99,8	100,0	100,0	100,0
249-312	20,9	57,8	66,8	70,0	72,9	75,6	78,7	81,9	85,1	89,0	92,5	95,6	98,5	100,0	100,0
312-360	32,9	76,8	85,0	91,1	94,9	97,2	98,6	99,5	99,9	100,0	100,0	100,0	100,0	100,0	100,0
360-397	38,5	95,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
TOPLAM	24,3	70,7	80,2	84,2	87,0	89,3	91,5	93,3	94,9	96,5	97,8	98,8	99,6	100,0	100,0

	A	B	C	D	E	F	G	H	I	J	K	L	M
1			ID	ACTIVITY DESCRIPTION	UNIT	QUANTITY	DURATION	SHIFT	CREW NO	CREW HOUR	PPH	SUCCESSOR	RESOURCE
2	R01C18000	R01C18010	R01C18012	El. 146-147 Downstream Formwork Area	m²	6,71		2	1	10	7	R01C18014	22.52
3			R01C18014	El. 146-147 Right Formwork Area	m²	42,82		2	1	10	7	R01C18031	22.54
4		R01C18020	R01C18022	El. 146-147 Downstream Face Concrete	m³	28,7322		2	1	10	200	R01C18023	16.50/B
5			R01C18023	El. 146-147 Mass Concrete	m³	285,5351		2	1	10	240		16.50
6		R01C18030	R01C18031	El. 146-147 Waterstop	m	4		2	1	10	3	R01C18041	17.50
7		R01C18040	R01C18041	El. 146-147 Postcooling Installation	m²	283,015		2	1	10	30	R01C18051	17.60
8		R01C18050	R01C18051	El. 146-147 Joint Grouting Installation	m²	42,82		2	1	10	10	R01C18022	35.11
9	R01C19000	R01C19010	R01C19011	El. 146-147 Upstream Formwork Area	m²	3,08		2	1	10	7	R01C19012	22.51
10			R01C19012	El. 146-147 Downstream Formwork Area	m²	11,845		2	1	10	7	R01C19013	22.52
11			R01C19013	El. 146-147 Left Formwork Area	m²	42,82		2	1	10	7	R01C19014	22.53
12			R01C19014	El. 146-147 Right Formwork Area	m²	55,235		2	1	10	7	R01C19031	22.54
13		R01C19020	R01C19021	El. 146-147 Upstream Face Concrete	m³	17,2493		2	1	10	200	R01C19022	16.50/A
14			R01C19022	El. 146-147 Downstream Face Concrete	m³	60,2223		2	1	10	200	R01C19023	16.50/B
15			R01C19023	El. 146-147 Mass Concrete	m³	720,5566		2	1	10	240		16.50
16		R01C19030	R01C19031	El. 146-147 Waterstop	m	4		2	1	10	3	R01C19041	17.50
17		R01C19040	R01C19041	El. 146-147 Postcooling Installation	m²	785,631		2	1	10	30	R01C19051	17.60
18		R01C19050	R01C19051	El. 146-147 Joint Grouting Installation	m²	55,235		2	1	10	10	R01C19021	35.11
19	R01C20000	R01C20010	R01C20011	El. 146-147 Upstream Formwork Area	m²	24,32		2	1	10	7	R01C20012	22.51
20			R01C20012	El. 146-147 Downstream Formwork Area	m²	12,84		2	1	10	7	R01C20013	22.52
21			R01C20013	El. 146-147 Left Formwork Area	m²	55,235		2	1	10	7	R01C20014	22.53
22			R01C20014	El. 146-147 Right Formwork Area	m²	54,975		2	1	10	7	R01C20031	22.54
23		R01C20020	R01C20021	El. 146-147 Upstream Face Concrete	m³	130,8523		2	1	10	200	R01C20022	16.50/A
24			R01C20022	El. 146-147 Downstream Face Concrete	m³	73,9178		2	1	10	200	R01C20023	16.50/B
25			R01C20023	El. 146-147 Mass Concrete	m³	817,9799		2	1	10	240		16.50
26		R01C20030	R01C20031	El. 146-147 Waterstop	m	4		2	1	10	3	R01C20041	17.50
27		R01C20040	R01C20041	El. 146-147 Postcooling Installation	m²	1022,737		2	1	10	30	R01C20051	17.60
28		R01C20050	R01C20051	El. 146-147 Joint Grouting Installation	m²	54,975		2	1	10	10	R01C20021	35.11
29	R01C21000	R01C21010	R01C21011	El. 146-147 Upstream Formwork Area	m²	31,22		2	1	10	7	R01C21012	22.51
30			R01C21012	El. 146-147 Downstream Formwork Area	m²	10,265		2	1	10	7	R01C21013	22.52
31			R01C21013	El. 146-147 Left Formwork Area	m²	54,975		2	1	10	7	R01C21014	22.53
32			R01C21014	El. 146-147 Right Formwork Area	m²	54,975		2	1	10	7	R01C21064	22.54
33		R01C21020	R01C21021	El. 146-147 Upstream Face Concrete	m³	165,8719		2	1	10	200	R01C21022	16.50/A
34			R01C21022	El. 146-147 Downstream Face Concrete	m³	62,1918		2	1	10	200	R01C21023	16.50/B
35			R01C21023	El. 146-147 Mass Concrete	m³	911,1383		2	1	10	240		16.50
36		R01C21030	R01C21031	El. 146-147 Waterstop	m	4		2	1	10	3	R01C21041	17.50
37		R01C21040	R01C21041	El. 146-147 Postcooling Installation	m²	1140,356		2	1	10	30	R01C21051	17.60
38		R01C21050	R01C21051	El. 146-147 Joint Grouting Installation	m²	54,975		2	1	10	10	R01C21021	35.11
39		R01C21060	R01C21064	El. 146-147 Pendulum Shaft	m	1		2	1	10	1	R01C21031	18.50
40	01C22000	R01C22010	R01C22011	El. 146-147 Upstream Formwork Area	m²	24,32		2	1	10	7	R01C22012	22.51
41			R01C22012	El. 146-147 Downstream Formwork Area	m²	12,84		2	1	10	7	R01C22013	22.52
42			R01C22013	El. 146-147 Left Formwork Area	m²	54,975		2	1	10	7	R01C22014	22.53
43			R01C22014	El. 146-147 Right Formwork Area	m²	55,235		2	1	10	7	R01C22031	22.54
44		R01C22020	R01C22021	El. 146-147 Upstream Face Concrete	m³	130,8523		2	1	10	200	R01C22022	16.50/A
45			R01C22022	El. 146-147 Downstream Face Concrete	m³	73,9178		2	1	10	200	R01C22023	16.50/B

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Kot	Parabol Boyu	Kalan Max	Kalan Min	1. Kalıp	2. Kalıp	3. Kalıp	4. Kalıp	5. Kalıp	6. Kalıp	Toplam	Dağıtılacak Uzunluk	Dönme Açısı	Artırma	Kayma Mesafeleri	Kalıp Kaydırmaları	Dönme Açısı	Artırma	Kayma Mesafeleri	Kalıp Kaydırmaları	298 parça
2	201	4,16	0,26	0,61	0,44						0,44	38	0		5,00						
3	204	5,92	2,02	2,14	2,00						2,00	18	107,12	0,02	28,14	84,0					
4	207	7,76	3,86	3,84	4,00						4,00	34	97,99	0,15	42,28	84,0					
5	210	5,57	1,67	1,60	2,00						2,00	53	88,85	0,23	47,36	84,0					
6	213	6,17	2,27	2,24	2,00	1,00					3,00	93	79,74	0,26	43,36	84,0					
7	216	6,76	2,86	2,96	2,00	1,00					3,00	34	70,68	0,24	30,28	84,0					
8	219	7,35	3,45	3,77							0,00	-325	61,72	0,19	8,19	84,0	0		57,20		
9	222	7,92	0,12	0,64	0,44						0,44	52	52,95	0,07	28,21	33,0	107,32	0,26	23,79	73,7	
10	225	8,49	0,69	1,09	1,00						1,00	51	44,43	0,18	39,82	33,0	97,12	0,12	11,18	84,4	
11	228	9,04	1,24	1,61	1,00	0,44	0,44				1,88	84	36,28	0,26	43,36	33,0	87,13	0,06	40,64	116,5	
12	231	9,58	1,78	2,19	2,00	0,44					2,44	86	28,61	0,28	39,25	33,0	77,39	0,08	46,75	83,4	
13	234	10,11	2,31	2,83	2,00	0,44					2,44	33	21,52	0,28	28,05	33,0	68,02	0,22	4,95	26,0	
14	237	10,62	2,82	3,52	2,00	1,00					3,00	38	15,14	0,22	10,41	33,0	59,1	0,35	27,59	81,4	
15	240	11,11	3,31	3,91	2,00	1,00	0,44				3,44	33	9,59	0,11	20,11	0,0	50,73	0,26	12,89	35,8	
16	243	11,58	3,78	4,33	4,00						4,00	42	4,96	0,17	25,24	0,0	43,01	0,26	16,76	46,6	
17	246	12,04	4,24	4,77	4,00	0,44					4,44	40	1,32	0,23	26,79	0,0	36,04	0,37	13,21	32,1	
18	249	12,47	4,67	5,21	4,00	1,00					5,00	53	-1,17	0,14	25,76	0,0	29,89	0,5	27,24	43,4	
19	252	12,87	5,07	5,64	4,00	1,00	0,44				5,44	57	-2,69	0,13	23,20	0,0	24,63	0,48	33,80	30,7	
20	255	13,25	5,45	6,05	4,00	1,00	0,44	0,44			5,88	63	-3,2	0,1	20,10	0,0	20,29	0,47	42,90	28,9	
21	258	13,6	5,8	6,43	4,00	2,00					6,00	40	-2,75	0,05	17,40	0,0	16,89	0,49	22,60	-3,9	
22	261	13,93	6,13	6,77	4,00	2,00	0,44				6,44	51	-1,48	0,01	15,93	0,0	14,39	0,52	35,07	26,3	



	A	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	Block	Height	Block Volume	Total Volume	US Left Angle	Us Right Angle	DS Left Angle	DS Right Angle		US +	DS -
2	0	3	22,4948	3279875,052							
3	0	3	38,6964	3312111,891							
4	0	2	36,76	3342646,988							
5	0	2	46,5803	3362082,152		5,0512				5,0512	
6	1	3	277,8466	3136764,166							
7	1	3	592,9076	3174818,036		8,6546		20,7532		8,6546	
8	1	3	900,7359	3211646,297		8,6173		20,0116		8,6173	
9	1	3	1084,575	3247093,01		8,3897		19,4492		8,3897	
10	1	3	1089,286	3280964,338		7,9585		19,0795		7,9585	
11	1	3	1048,755	3313160,645		7,3098		18,9146		7,3098	
12	1	2	672,9639	3343319,951		6,5987		18,9364		6,5987	
13	1	2	649,6573	3362731,81		5,9046		19,0683		5,9046	
14	2	3	310,8568	2974482,971							
15	2	3	668,3124	3017036,999		7,8369				7,8369	
16	2	3	1032,226	3058548,385		8,4123		21,2739		8,4123	
17	2	3	1362,676	3098932,191		8,8552		20,0903		8,8552	
18	2	3	1381,97	3138146,136		9,1545		19,0438		9,1545	
19	2	3	1331,067	3176149,103	8,6546	9,2988	20,7532	18,1492		9,2988	
20	2	3	1254,854	3212901,151	8,6173	9,2762	20,0116	17,4205		9,2762	
21	2	3	1180,325	3248273,335	8,3897	9,0746	19,4492	16,8712		9,0746	
22	2	3	1107,524	3282071,862	7,9585	8,6812	19,0795	16,5138		8,6812	
23	2	3	1036,493	3314197,139	7,3098	8,0832	18,9146	16,3594		8,0832	
24	2	2	652,3668	3343972,318	6,5987	7,4243	18,9364	16,388		7,4243	
25	2	2	622,1404	3363353,95	5,9046	6,7795	19,0683	16,5239		6,7795	
26	3	3	324,3215	2796143,346							
27	3	3	723,2398	2842472,373		5,3405				5,3405	
28	3	3	1146,418	2887962,567		6,2696		24,2867		6,2696	
29	3	3	1536,528	2932509,201		7,1264		22,7173		7,1264	
30	3	3	1582,422	2976065,393		7,8934		21,2289		7,8934	
31	3	3	1546,106	3018583,105		8,5576		19,8364		8,5576	
32	3	3	1468,334	3060016,719	8,4123	9,1079	21,2739	18,5543		9,1079	
33	3	3	1391,913	3100324,104	8,8552	9,5338	20,0903	17,3968		9,5338	
34	3	3	1316,987	3139463,124	9,1545	9,825	19,0438	16,3776		9,825	
35	3	3	1243,621	3177392,724	9,2988	9,9708	18,1492	15,5097		9,9708	
36	3	3	1171,866	3214073,017	9,2762	9,9605	17,4205	14,8058		9,9605	
37	3	3	1101,767	3249375,102	9,0746	9,7827	16,8712	14,2779		9,7827	
38	3	3	1033,363	3283105,225	8,6812	9,4256	16,5138	13,9374		9,4256	
39	3	3	966,6864	3315163,825	8,0832	8,8772	16,3594	13,7948		8,8772	
40	3	2	608,2269	3344580,545	7,4243	8,2705	16,388	13,8291		8,2705	
41	3	2	579,9006	3363933,851	6,7795	7,6752	16,5239	13,9668		7,6752	
42	4	3	178,0646	2605315,412							
43	4	3	595,7955	2654319,586							
44	4	3	1123,097	2702857,077		3,5001		28,1702		3,5001	
45	4	3	1633,338	2750749,725		4,3752		26,3956		4,3752	
46	4	3	1752,692	2797896,039		5,3118		24,6548		5,3118	
47	4	3	1732,091	2844204,465		6,2374		22,9615		6,2374	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1																																											
2																																											
3		Blo																																									
4	kot	Veri	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	Genel Toplam
5	395	4x0.5																																									
6		2x0.5																																									
7		1x0.5																																									
8		0.44x0.5																																									
9	393	4x0.5																																									
10		2x0.5																																									
11		1x0.5																																									
12		0.44x0.5																																									
13	390	4x0.5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	158
14		2x0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	40
15		1x0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	40
16		0.44x0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	40
17	387	4x0.5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	158
18		2x0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	40
19		1x0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	40
20		0.44x0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	40
21	384	4x0.5	4	4	4	4	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	8	4	4	2	166
22		2x0.5	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	42
23		1x0.5	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	42
24		0.44x0.5	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	42
25	381	4x0.5	4	4	4	4	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	8	4	4		164
26		2x0.5	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1		41
27		1x0.5	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1		41
28		0.44x0.5	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1		41
29	378	4x0.5	4	4	4	4	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	8	4	3		163
30		2x0.5	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1		41
31		1x0.5	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1		41
32		0.44x0.5	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1		41
33	375	4x0.5	4	4	4	4	8	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	8	8	4	2		170
34		2x0.5	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1		43
35		1x0.5	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1		43
36		0.44x0.5	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1		43
37	372	4x0.5		4	4	4	4	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	8	4	4	2		158
38		2x0.5		1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		40
39		1x0.5		1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		40
40		0.44x0.5		1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		40
41	369	4x0.5		4	4	4	4	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	8	4	4	2		158
42		2x0.5		1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		40
43		1x0.5		1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		40
44		0.44x0.5		1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		40
45	366	4x0.5		4	4	4	4	4	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	8	4	4	4	2	158
46		2x0.5		1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	40
47		1x0.5		1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	40
48		0.44x0.5		1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	40
49	363	4x0.5		4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	2	148
50		2x0.5		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		38
51		1x0.5		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		38
52		0.44x0.5		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		38
53	360	4x0.5			2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3		142
54		2x0.5			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		38
55		1x0.5			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		36
56		0.44x0.5			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		36
57	357	4x0.5			2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2			145
58		2x0.5			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			36
59		1x0.5			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			36
60		0.44x0.5			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			36
61	354	4x0.5			2	4	4	4	4	4		4	4	4	4	4	4	4	4	4	5	5	5	5	5	4	4	4	4	4	4	4	4	4		4	4	4	4	2			137
62		2x0.5			1	1	1	1	1	1		1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1		1	1	1	1	1			36
63		1x0.5			1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1			34

Total Anchorages																																						
Elev.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	Gen. Total
399	20	40	22	38	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	38	22	40	16	1167
396	18	41	22	38	22	37	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	36	22	37	22	38	22	41	14	1169
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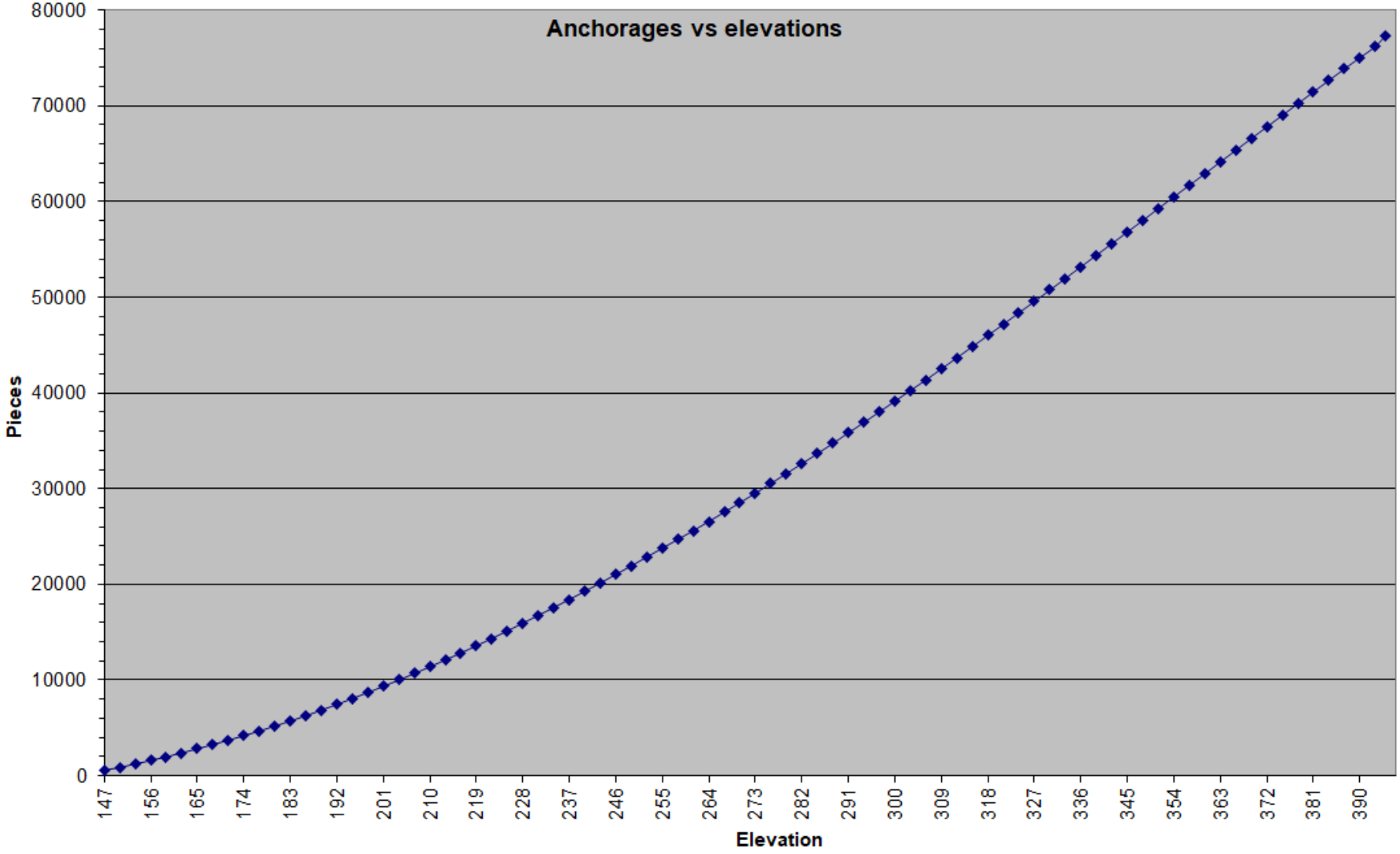
146																																											
Gen. Total	218	650	394	1031	546	1402	706	1789	880	2240	1102	2993	1457	3938	1690	4772	1852	5215	2052	5351	2052	5215	1852	4696	1613	4033	1387	3560	1179	3069	991	2344	796	1652	560	977	322	415	86	77368


Anchorages vs elevations
Pieces
80000
70000
60000
50000
40000
30000
20000
10000
0
147
156
165
174
183
192
201
210
219
228
237
246
255
264
273
282
291
300
309
318
327
336
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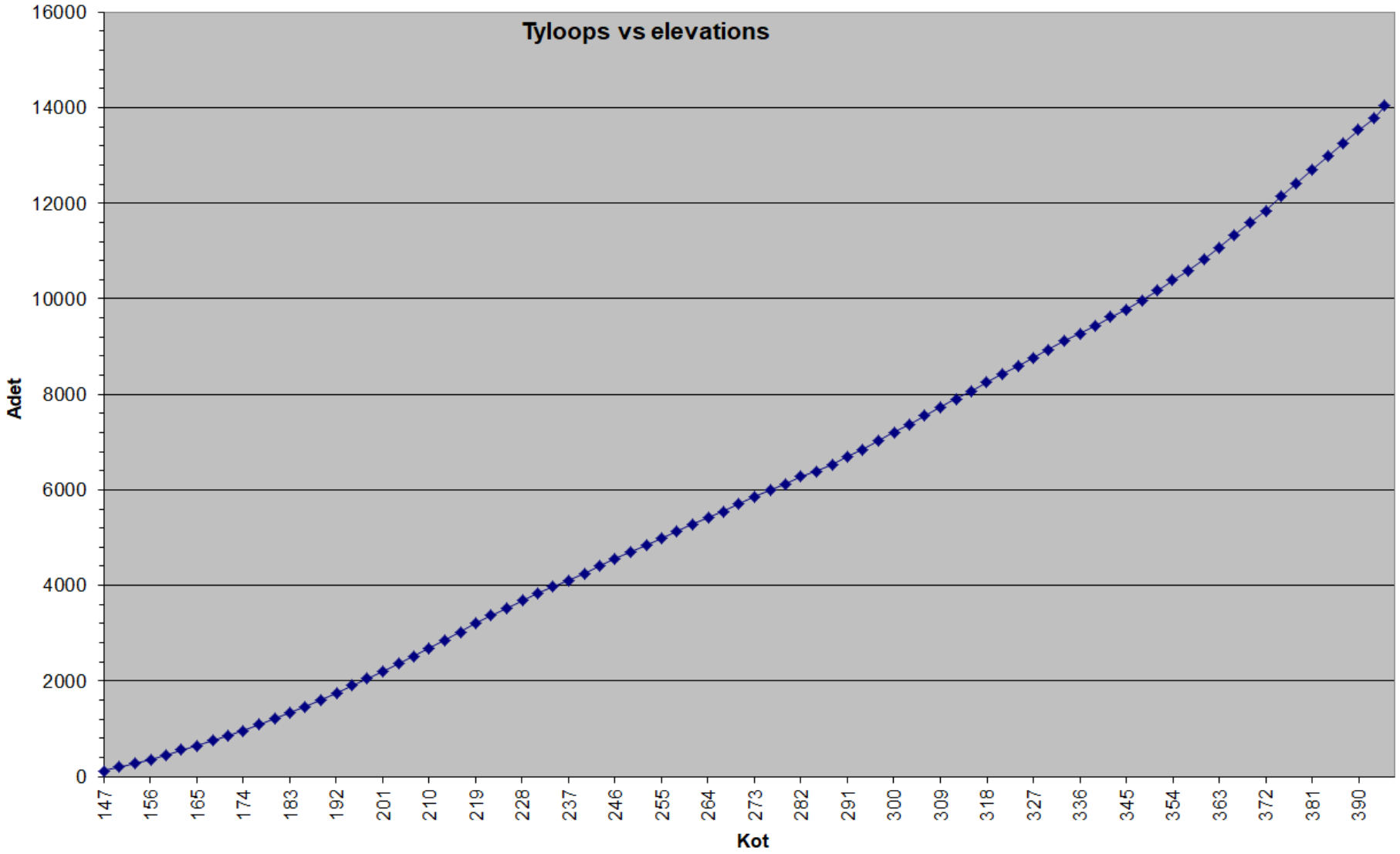
363
372
381
390
Elevation


Tyloops vs elevations
Adet
16000
14000
12000
10000
8000
6000
4000
2000
0
147
156
165
174
183
192
201
210
219
228
237
246
255
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273
282
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300
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318
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336
345
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372
381
390
Kot

Block ID	Lower Area	Upper Area	Left Area	Right Area	US Area	DS Area	Height	Volume	Total Volume	Lower US Left X	Lower US Left Y	Lower US Right X	Lower US Right Y
14. Block 213-216	236,728	305,193	0	127,413	0	27,963	3	812,882	812,8819	892,7631	228,6178	892,7631	228,6178
15. Block 213-216	586,103	614,687	127,413	145,883	0	32,039	3	1801,19	2614,0678	897,275	210,7148	897,275	210,7148
16. Block 213-216	777,633	785,783	145,883	147,288	40,483	39,796	3	2345,13	4959,1923	899,1357	203,3315	908,5813	195,7254
17. Block 213-216	825,241	824,904	147,288	145,429	59,622	42,138	3	2475,22	7434,4101	908,5813	195,7254	924,8389	184,384
18. Block 213-216	874,184	871,371	145,429	144,082	64,025	44,945	3	2618,33	10052,7419	924,8389	184,384	943,5121	174,0891
19. Block 213-216	913,777	908,779	144,082	143,068	66,556	48,074	3	2733,83	12786,5759	943,5121	174,0891	964,1934	166,0955
20. Block 213-216	953,8	947,048	143,068	142,684	70,452	49,42	3	2851,27	15637,8488	964,1934	166,0955	987,2051	161,4119
21. Block 213-216	1001,487	991,687	142,684	142,684	76,601	49,132	3	2989,76	18627,61	1012,7949	161,4119	987,2051	161,4119
22. Block 213-216	953,8	947,048	142,684	143,068	70,452	49,42	3	2851,27	21478,883	1035,8066	166,0955	1012,7949	161,4119
23. Block 213-216	913,777	908,779	143,068	144,082	66,556	48,074	3	2733,83	24212,717	1056,4879	174,0891	1035,8066	166,0955
24. Block 213-216	874,181	871,368	144,082	145,429	64,025	44,945	3	2618,32	26831,041	1075,1611	184,384	1056,4879	174,0891
25. Block 213-216	825,241	824,904	145,429	147,288	59,622	42,138	3	2475,22	29306,2592	1091,4186	195,7254	1075,1611	184,384
26. Block 213-216	791,655	790,848	147,288	156,435	55,743	39,797	3	2373,75	31680,0129	1105,6933	207,5086	1091,4186	195,7254
27. Block 213-216	733,746	752,797	156,435	161,326	39,705	32,039	3	2229,81	33909,8271	1113,7489	214,9116	1105,6933	207,5086
28. Block 213-216	586,318	630,872	161,326	148,458	0	26,683	3	1825,78	35735,6114	1115,4035	221,9219	1115,4035	221,9219
29. Block 213-216	388,915	466,095	148,458	98,461	0	19,399	3	1282,51	37018,1251	1119,0691	237,4528	1119,0691	237,4528
30. Block 213-216	67,823	127,929	98,461	18,039	0	13,041	3	293,627	37311,7521	1103,4549	258,2902	1103,4549	258,2902
31. Block 213-216	3,311	8,654	18,039	0	0	5,663	3	17,9477	37329,6998	1085,291	271,7172	1085,291	271,7172