

1. DATOS GENERALES DEL PROYECTO

Categoría de la ruta	III
Topografía del área	Montañoso
Velocidad de proyecto	40 Km/h
Pendiente máxima	8%
Tangente mínima	40m
Ancho de pista	7
Curva de transición	P/R<440
Curva espiral (Le)	P/Le>104m
Peralte máximo y mínimo (e)	2% / 8%
Distancia doble de visibilidad	50m
Derecho de vía	50m
Distancia de visibilidad de paso	300m

1.1. Longitudes máximas de rectas

$$L_r = 20 * V_p = 20 * 40 = 800$$

L_r : largo en m, alineamiento recta

V_p : Velocidad de proyecto (Km/h)

1.2. Longitudes mínimas en rectas

$$L_{r \min} = 1.4 * V_p = 1.4 * 40 = 56$$

2. PLANILLA DE COORDENADAS PARCIALES Y DISTANCIAS HORIZONTALES

Estación	Δ	Δi	Δf	Δ Parcial	$(\Delta \text{ Parcial})^2$	D. Horizontal
A - P1	N	50648,339	50679,939	31,600	998,560	117,673
	E	45127,411	45240,762	113,351	12848,449	
P1-P2	N	50679,939	50547,502	-132,437	17539,559	221,362
	E	45240,762	45418,136	177,374	31461,536	
P2-P3	N	50547,502	50384,602	-162,900	26536,410	229,106
	E	45418,136	45579,236	161,100	25953,210	
P3-P4	N	50384,602	50447,803	63,201	3994,366	225,487
	E	45579,236	45795,685	216,449	46850,170	
P4-P5	N	50447,803	50372,196	-75,607	5716,418	286,915
	E	45795,685	46072,459	276,774	76603,847	
P5-P6	N	50372,196	50615,074	242,878	58989,723	249,717
	E	46072,459	46130,503	58,044	3369,106	
P6-B	N	50615,074	50533,139	-81,935	6713,344	218,410
	E	46130,503	46332,962	202,459	40989,647	

3. COTAS DE LOS PERFILES LONGITUDINALES

ESTACA	PROGRESIVA	COTA
A	0+000,000	1601,41
1	0+020,000	1602,14
2	0+040,000	1602,31
3	0+060,000	1601,22
4	0+080,000	1599,94
5	0+100,000	1597,77
6	0+120,000	1597,50
7	0+140,000	1596,96
8	0+160,000	1594,36
9	0+180,000	1593,14
10	0+200,000	1592,50
11	0+220,000	1592,50
12	0+240,000	1592,50
13	0+260,000	1592,50
14	0+280,000	1592,50
15	0+300,000	1592,50
16	0+320,000	1592,50
17	0+340,000	1592,50
18	0+360,000	1592,50
19	0+380,000	1592,65
20	0+400,000	1593,29
21	0+420,000	1593,88
22	0+440,000	1593,88
23	0+460,000	1593,74
24	0+480,000	1592,56
25	0+500,000	1591,71
26	0+520,000	1592,57
27	0+540,000	1592,62
28	0+560,000	1592,50
29	0+580,000	1592,50
30	0+600,000	1592,50
31	0+620,000	1592,57
32	0+640,000	1593,43
33	0+660,000	1593,71
34	0+680,000	1592,75
35	0+700,000	1592,50
36	0+720,000	1592,50

ESTACA	PROGRESIVA	COTA
37	0+740,000	1593,71
38	0+760,000	1595,69
39	0+780,000	1597,50
40	0+800,000	1598,97
41	0+820,000	1599,42
42	0+840,000	1600,00
43	0+860,000	1600,00
44	0+880,000	1600,00
45	0+900,000	1600,00
46	0+920,000	1600,20
47	0+940,000	1601,28
48	0+960,000	1602,56
49	0+980,000	1604,07
50	1+000,000	1605,00
51	1+020,000	1604,67
52	1+040,000	1603,32
53	1+060,000	1602,93
54	1+080,000	1602,90
55	1+100,000	1603,72
56	1+120,000	1603,76
57	1+140,000	1602,70
58	1+160,000	1601,74
59	1+180,000	1601,39
60	1+200,000	1601,34
61	1+220,000	1601,07
62	1+240,000	1603,04
63	1+260,000	1605,00
64	1+280,000	1605,00
65	1+300,000	1605,66
66	1+320,000	1606,68
67	1+340,000	1605,86
68	1+360,000	1605,86
69	1+380,000	1605,70
70	1+400,000	1606,42
71	1+420,000	1607,20
72	1+440,000	1606,82
B	1+443,301	1606,55

4. ELEMENTOS DE LA CURVA CIRCULAR

4.1. Radio mínimo en curvas horizontales

$$R_{min} = \frac{Vp^2}{127(emax + f)} = \frac{40^2}{127(0.07 + 0.198)} = 47$$

Rmin : Radio mínimo absoluto

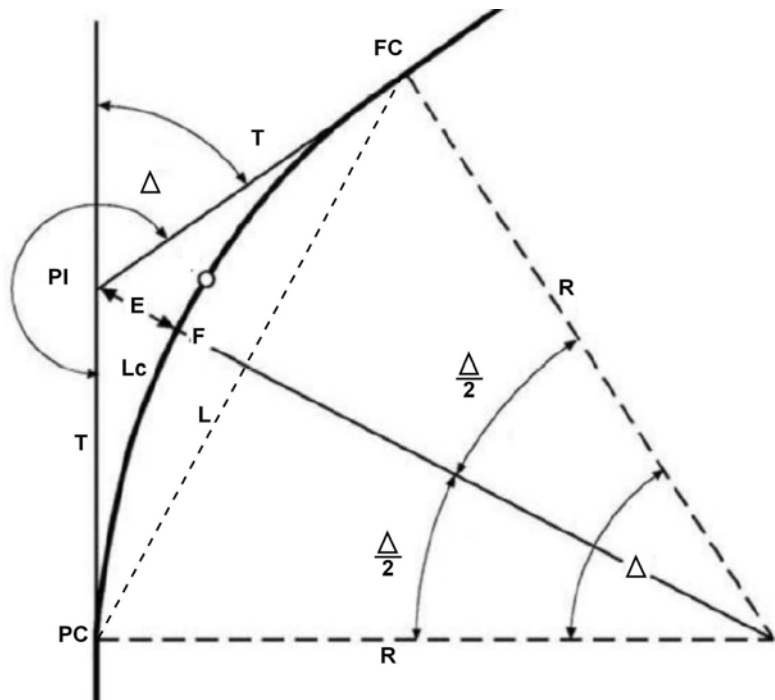
Vp : Velocidad de proyecto

emax : Peralte máximo correspondiente a la carretera

f : Coeficiente de fricción transversal máximo correspondiente a Vp

Vp [km/h]	emax [%]	f	Rmin [m]
40	7	0,198	50

4.2. Notación de las curvas horizontales



Donde:

- R : Radio de la curva circular
- T : Tangente de la curva
- E : Externa
- F : Flecha
- Δ : Ángulo de deflexión
- Lc : Longitud de curva
- PC : Principio de curva
- FC : Final de curva
- PI : Punto intersección

CALCULOS PARA LA CURVA Nº 1

Datos:

$R = 200$
 $\Delta = 52^{\circ}19'28''$
 $L = 182.65$
 $R_{min} = 47$
 $T = R * \tan\left(\frac{\Delta}{2}\right) = 98.25$
 $L_c = \Delta * R * \frac{\pi}{180} = 182.647m$
 $G = 2\text{sen}^{-1}\left(\frac{10}{R}\right) = 5.732$

$PC = Dh - T$
 $FC = PC + Lc$
 $ds1 = (20 - a) * \frac{G}{40}$
 $ds2 = ds3 = ds_{n-1} = \frac{G}{2}$
 $dsn = b * \frac{G}{2}$

Tabla 1.1. Datos obtenidos a partir de R, L y Δ

Radio	Δ	PI	T	Lc	PC	PT	G
[m]	[grad]	[m]	[m]	[m]	[m]	[m]	[grad]
200,000	52,324	117,674	98,248	182,647	19,426	202,072	5,732

Tabla 1.2. Datos a partir de la tabla 1.1.

	Estacion	Norte	Este
PC	0+019,426	50635,556	45146,123
PI	0+117,674	50679,939	45240,762
PT	0+202,072	50621,159	45319,487

Tabla 1.3. Planilla de deflexiones

Estaca	Deflexiones sucesivas	Deflexiones acumuladas
0+019,426	0,000	0,000
0+020,000	0,082	0,082
0+040,000	2,866	2,948
0+060,000	2,866	5,814
0+080,000	2,866	8,680
0+100,000	2,866	11,546
0+120,000	2,866	14,412
0+140,000	2,866	17,278
0+160,000	2,866	20,144
0+180,000	2,866	23,010
0+200,000	2,866	25,876
0+202,072	0,297	26,173

CALCULOS PARA LA CURVA N° 2

Datos:

$$R = 350$$

$$\Delta = 8^{\circ}34'17''$$

$$L = 52.360$$

$$R_{\min} = 47$$

$$T = R * \operatorname{tag}\left(\frac{\Delta}{2}\right) = 26.229m$$

$$L_c = \Delta * R * \frac{\pi}{180} = 52.360$$

$$G = 2\operatorname{sen}^{-1}\left(\frac{10}{R}\right) = 3.274$$

$$PC = Dh - T$$

$$FC = PC + L_c$$

$$ds_1 = (20 - a) * \frac{G}{40}$$

$$ds_2 = ds_3 = ds_{n-1} = \frac{G}{2}$$

$$ds_n = b * \frac{G}{2}$$

Tabla 2.1. Datos obtenidos a partir de R, L y Δ

Radio [m]	Δ [grad]	PI [m]	T [m]	Lc [m]	PC [m]	PT [m]	G [grad]
350,000	8,571	325,186	26,229	52,360	298,957	351,317	3,274

Tabla 2.2. Datos a partir de la tabla 1.1.

Estación		Norte	Este
PC	0+298,957	50563,194	45397,120
PI	0+325,186	50547,502	45418,136
PT	0+351,317	50528,853	45436,580

Tabla 2.3. Planilla de deflexiones

Estaca	Deflexiones sucesivas	Deflexiones acumuladas
0+298,957	0,000	0,000
0+300,000	0,085	0,085
0+320,000	1,637	1,723
0+340,000	1,637	3,360
0+351,317	0,926	4,286

CALCULOS PARA LA CURVA Nº 3

Datos:

R = 150
 $\Delta = 61^{\circ}35'44''$
 L = 161.257
 Rmin = 47

$$T = R * \text{tag}\left(\frac{\Delta}{2}\right) = 89.410m$$

$$Lc = \Delta * R * \frac{\pi}{180} = 68.238m$$

$$G = 2\text{sen}^{-1}\left(\frac{10}{R}\right) = 7.645$$

$$PC = Dh - T$$

$$FC = PC + Lc$$

$$ds1 = (20 - a) * \frac{G}{40}$$

$$ds2 = ds3 = ds_{n-1} = \frac{G}{2}$$

$$dsn = b * \frac{G}{2}$$

Tabla 3.1. Datos obtenidos a partir de R, L y Δ

Radio	Δ	PI	T	Lc	PC	PT	G
[m]	[grad]	[m]	[m]	[m]	[m]	[m]	[grad]
150,000	61,596	554,193	89,410	161,257	464,783	626,040	7,645

Tabla 3.2. Datos a partir de la tabla 1.1.

	Estación	Norte	Este
PC	0+464,783	50448,175	45516,365
PI	0+554,193	50384,602	45579,236
PT	0+626,040	50409,662	45623,019

Tabla 3.3. Planilla de deflexiones

Estaca	Deflexiones sucesivas	Deflexiones acumuladas
0+464,783	0,000	0,000
0+480,000	2,908	2,908
0+500,000	3,823	6,731
0+520,000	3,823	10,553
0+540,000	3,823	14,376
0+560,000	3,823	18,199
0+580,000	3,823	22,021
0+600,000	3,823	25,844
0+620,000	3,823	29,666
0+626,040	1,154	30,821

CALCULOS PARA LA CURVA Nº 4

Datos:

R = 200
 $\Delta = 31^{\circ}33'22''$
 L = 110.152
 Rmin = 47

$$T = R * \text{tag}\left(\frac{\Delta}{2}\right) = 56.512m$$

$$Lc = \Delta * R * \frac{\pi}{180} = 110.152m$$

$$G = 2\text{sen}^{-1}\left(\frac{10}{R}\right) = 5.732$$

$$PC = Dh - T$$

$$FC = PC + Lc$$

$$ds1 = (20 - a) * \frac{G}{40}$$

$$ds2 = ds3 = ds_{n-1} = \frac{G}{2}$$

$$dsn = b * \frac{G}{2}$$

Tabla 3.1. Datos obtenidos a partir de R, L y Δ

Radio [m]	Δ [grad]	PI [m]	T [m]	Lc [m]	PC [m]	PT [m]	G [grad]
200,000	31,556	762,118	56,512	110,152	705,606	815,758	5,732

Tabla 3.2. Datos a partir de la tabla 1.1.

	Estación	Norte	Este
PC	0+705,606	50431,964	45741,439
PI	0+762,118	50447,803	45795,685
PT	0+815,758	50432,911	45850,199

Tabla 3.3. Planilla de deflexiones

Estaca	Deflexiones sucesivas	Deflexiones acumuladas
0+705,606	0,000	0,000
0+720,000	2,063	2,063
0+740,000	2,866	4,929
0+760,000	2,866	7,795
0+780,000	2,866	10,661
0+800,000	2,866	13,527
0+815,758	2,258	15,785

CALCULOS PARA LA CURVA Nº 5

Datos:

R = 60
 $\Delta = 91^{\circ}50'17''$
 L = 96.173
 Rmin = 47

$$T = R * \text{tag}\left(\frac{\Delta}{2}\right) = 61.956m$$

$$Lc = \Delta * R * \frac{\pi}{180} = 96.173m$$

$$G = 2\text{sen}^{-1}\left(\frac{10}{R}\right) = 19.188$$

$$PC = Dh - T$$

$$FC = PC + Lc$$

$$ds1 = (20 - a) * \frac{G}{40}$$

$$ds2 = ds3 = ds_{n-1} = \frac{G}{2}$$

$$dsn = b * \frac{G}{2}$$

Tabla 3.1. Datos obtenidos a partir de R, L y Δ

Radio [m]	Δ [grad]	PI [m]	T [m]	Lc [m]	PC [m]	PT [m]	G [grad]
60,000	91,838	1046,160	61,956	96,173	984,204	1080,376	19,188

Tabla 3.2. Datos a partir de la tabla 1.1.

	Estación	Norte	Este
PC	0+984,204	50388,900	46010,400
PI	1+046,160	50372,580	46070,160
PT	1+080,376	50432,830	46084,560

Tabla 3.3. Planilla de deflexiones

Estaca	Deflexiones sucesivas	Deflexiones acumuladas
0+984,204	0,000	0,000
1+000,000	7,577	7,577
1+020,000	9,594	17,171
1+040,000	9,594	26,765
1+060,000	9,594	36,359
1+080,000	9,594	45,953
1+080,376	0,180	46,134

CALCULOS PARA LA CURVA N° 6

Datos:

R = 60
 $\Delta = 98^{\circ}35'32''$
 L = 103.246
 Rmin = 47

$$T = R * \text{tag}\left(\frac{\Delta}{2}\right) = 69.747m$$

$$Lc = \Delta * R * \frac{\pi}{180} = 103.246m$$

$$G = 2\text{sen}^{-1}\left(\frac{10}{R}\right) = 19.188$$

$$PC = Dh - T$$

$$FC = PC + Lc$$

$$ds1 = (20 - a) * \frac{G}{40}$$

$$ds2 = ds3 = ds_{n-1} = \frac{G}{2}$$

$$dsn = b * \frac{G}{2}$$

Tabla 3.1. Datos obtenidos a partir de R, L y Δ

Radio [m]	Δ [grad]	PI [m]	T [m]	Lc [m]	PC [m]	PT [m]	G [grad]
60,000	98,592	1268,140	69,747	103,246	1198,393	1301,639	19,188

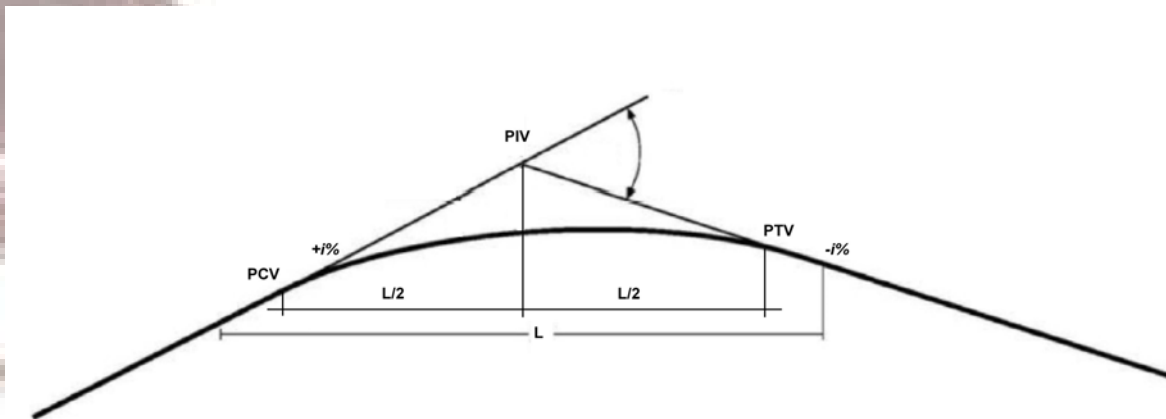
Tabla 3.2. Datos a partir de la tabla 1.1.

	Estacion	Norte	Este
PC	1+198,393	50547,620	46112,000
PI	1+268,140	50615,450	46128,210
PT	1+301,639	50589,290	46192,860

Tabla 3.3. Planilla de deflexiones

Estaca	Deflexiones sucesivas	Deflexiones acumuladas
1+198,393	0,000	0,000
1+200,000	0,771	0,771
1+220,000	9,594	10,365
1+240,000	9,594	19,959
1+260,000	9,594	29,553
1+280,000	9,594	39,147
1+300,000	9,594	48,741
1+301,639	0,786	49,527

5. ELEMENTOS DE LA CURVA VERTICAL

**Donde:**

$i\%$: Pendiente

L : Longitud

PCV : Principio de curva vertical

PIV : Punto intersección vertical

PTV : Punto final curva vertical

CALCULOS PARA LA CURVA VERTICAL N° 1

Datos:

$$L = 150m$$

$$i_1 = -4.088\%$$

$$i_2 = 0.461\%$$

Progresivas

$$PIV = 0 + 220.00$$

$$PCV = PIV - \left(\frac{L}{2}\right) = 0 + 145.00$$

$$PTV = PIV + \left(\frac{L}{2}\right) = 0 + 295.00$$

Calculo de cotas

$$PIV = 1592.500$$

$$PCV = PIV - i_1 \left(\frac{L}{2}\right) = 1595.566$$

$$PTV = PIV + i_2 \left(\frac{L}{2}\right) = 1592.846$$

Calculo de K

$$K = \frac{P}{200 * L} = \frac{(i_2 - i_1)}{200 * 150}$$

Calculo de cota en la tangente

- de ida
Cota en la tang = $i_1 * X + Cota$

Donde X es distancia parcial

- de vuelta
Cota en la tang = $i_2 * X + Cota$

Calculo de Y

$$Y = K * X^2$$

Calculo de cota en la curva

$$Cota \text{ en la curva} = Cota \text{ tag} \pm Y$$

Tabla 1.2. Planilla de la curva vertical y sus respectivas componentes

PROG	DIST. PARCIAL	DIST. ACUM	X	X ²	K	COTA TAG	Y	COTA CURVA
PCV						1595,56	0,00	1595,56
0+145,000	0,000	0,000	0,000	0,000	1,52E-04	6	0	6
			15,00			1594,95	0,03	1594,98
0+160,000	15,000	15,000	0	225,000	1,52E-04	3	4	7
			20,00			1594,13	0,06	1594,19
0+180,000	20,000	35,000	0	400,000	1,52E-04	5	1	6
			40,00	1600,00		1593,31	0,24	1593,56
0+200,000	20,000	55,000	0	0	1,52E-04	8	3	0
PIV			60,00	3600,00		1592,50	0,54	1593,04
0+220,000	20,000	75,000	0	0	1,52E-04	0	6	6
			40,00	1600,00		1592,59	0,24	1592,83
0+240,000	20,000	95,000	0	0	1,52E-04	2	3	5
		115,00	20,00			1592,68	0,06	1592,74
0+260,000	20,000	0	0	400,000	1,52E-04	4	1	5
		135,00	15,00			1592,77	0,03	1592,81
0+280,000	20,000	0	0	225,000	1,52E-04	7	4	1
PTV		150,00				1592,84	0,00	1592,84
0+295,000	15,000	0	0,000	0,000	1,52E-04	6	0	6

CALCULOS PARA LA CURVA VERTICAL Nº 2

Datos:

$L = 120m$
 $i_1 = 0.461\%$
 $i_2 = 3.970\%$

Progresivas

$PIV = 0 + 754.104$
 $PCV = PIV - (\frac{L}{2}) = 0 + 694.104$
 $PTV = PIV + (\frac{L}{2}) = 0 + 814.104$

Calculo de cotas

$PIV = 1594.961$
 $PCV = PIV - i_1(\frac{L}{2}) = 1594.684$
 $PTV = PIV + i_2(\frac{L}{2}) = 1597.343$

Calculo de K

$$K = \frac{P}{200 * L} = \frac{(i_2 - i_1)}{200 * 120}$$

Calculo de cota en la tangente

- de ida
 Cota en la tang = $i_1 * X + Cota$

Donde X es distancia parcial

- de vuelta
 Cota en la tang = $i_2 * X + Cota$

Calculo de Y

$Y = K * X^2$

Calculo de cota en la curva

Cota en la curva = Cota tag \pm Y

Tabla 1.2. Planilla de la curva vertical y sus respectivas componentes

PROG	DIST. PARCIA L	DIST. ACUM	X	X ²	K	COTA TAG	Y	COTA CURVA
PCV						1594,68	0,00	1594,68
0+694,104	0,000	0,000	0,000	0,000	1,46E-04	1594,71	0,00	1594,71
0+700,000	5,896	5,896	5,896	34,763	1,46E-04	1594,80	0,05	1594,86
0+720,000	20,000	25,896	0	400,000	1,46E-04	1594,89	0,23	1595,13
0+740,000	20,000	45,896	0	1600,000	1,46E-04	1594,96	0,42	1595,38
PIV			54,10			1594,96	0,42	1595,38
0+754,104	14,104	60,000	4	2927,243	1,46E-04	1595,19	0,23	1595,42
0+760,000	5,896	65,896	0	1600,000	1,46E-04	1595,98	0,05	1596,04
0+780,000	20,000	85,896	0	400,000	1,46E-04	1596,78	0,02	1596,81
0+800,000	20,000	105,89	14,10	198,923	1,46E-04	1597,34	0,00	1597,34
PTV		120,00				1597,34	0,00	1597,34
0+814,104	14,104	0	0,000	0,000	1,46E-04	1597,34	0,00	1597,34

CALCULOS PARA LA CURVA VERTICAL Nº 3

Datos:

$$L = 100m$$

$$i_1 = 3.970\%$$

$$i_2 = -1.939\%$$

Progresivas

$$PIV = 1+006.974$$

$$PCV = PIV - \left(\frac{L}{2}\right) = 0+956.974$$

$$PTV = PIV + \left(\frac{L}{2}\right) = 1+056.974$$

Calculo de cotas

$$PIV = 1605.00$$

$$PCV = PIV - i_1\left(\frac{L}{2}\right) = 1603.015$$

$$PTV = PIV + i_2\left(\frac{L}{2}\right) = 1604.031$$

Calculo de K

$$K = \frac{P}{200 * L} = \frac{(i_2 - i_1)}{200 * 100}$$

Calculo de cota en la tangente

- de ida
Cota en la tang = $i_1 * X + Cota$

Donde X es distancia parcial

- de vuelta
Cota en la tang = $i_2 * X + Cota$

Calculo de Y

$$Y = K * X^2$$

Calculo de cota en la curva

$$Cota \text{ en la curva} = Cota \text{ tag} \pm Y$$

Tabla 1.2. Planilla de la curva vertical y sus respectivas componentes

PROG	DIST. PARCIAL	DIST. ACUM	X	X ²	K	COTA TAG	Y	COTA CURVA
PCV 0+956,974	0,000	0,000	0,000	0,000	-2,95E-04	1603,015	0,000	1603,015
0+960,000	3,026	3,026	3,026	9,157	-2,95E-04	1603,135	-0,003	1603,132
0+980,000	20,000	23,026	20,000	400,000	-2,95E-04	1603,929	-0,118	1603,811
1+000,000	20,000	43,026	40,000	1600,000	-2,95E-04	1604,723	-0,473	1604,250
PIV 1+006,974	6,974	50,000	6,974	48,637	-2,95E-04	1605,000	-0,014	1604,986
1+020,000	13,026	63,026	20,000	400,000	-2,95E-04	1604,747	-0,118	1604,629
1+040,000	20,000	83,026	16,974	288,117	-2,95E-04	1604,360	-0,085	1604,275
PTV 1+056,974	16,974	100,000	0,000	0,000	-2,95E-04	1604,031	0,000	1604,031

CALCULOS PARA LA CURVA VERTICAL N° 4

Datos:

$$L = 150m$$

$$i_1 = -1.393\%$$

$$i_2 = 2.5\%$$

Progresivas

$$PIV = 1+220.00$$

$$PCV = PIV - \left(\frac{L}{2}\right) = 1+145.00$$

$$PTV = PIV + \left(\frac{L}{2}\right) = 1+295.00$$

Calculo de cotas

$$PIV = 1600.870$$

$$PCV = PIV - i_1 \left(\frac{L}{2}\right) = 1602.324$$

$$PTV = PIV + i_2 \left(\frac{L}{2}\right) = 1602.745$$

Calculo de K

$$K = \frac{P}{200 * L} = \frac{(i_2 - i_1)}{200 * 150}$$

Calculo de cota en la tangente

- de ida
Cota en la tang = $i_1 * X + Cota$

Donde X es distancia parcial

- de vuelta
Cota en la tang = $i_2 * X + Cota$

Calculo de Y

$$Y = K * X^2$$

Calculo de cota en la curva

$$Cota \text{ en la curva} = Cota \text{ tag} \pm Y$$

Tabla 1.2. Planilla de la curva vertical y sus respectivas componentes

PROG	DIST. PARCIAL	DIST. ACUM	X	X ²	K	COTA TAG	Y	COTA CURVA
PCV								
1+145,000	0,000	0,000	0,000	0,000	1,48E-04	1602,324	0,000	1602,324
1+160,000	15,000	15,000	15,000	225,000	1,48E-04	1602,033	0,033	1602,066
1+180,000	20,000	35,000	20,000	400,000	1,48E-04	1601,645	0,059	1601,705
1+200,000	20,000	55,000	40,000	1600,000	1,48E-04	1601,258	0,237	1601,494
PIV 1+220,000	20,000	75,000	60,000	3600,000	1,48E-04	1600,870	0,533	1601,402
1+240,000	20,000	95,000	40,000	1600,000	1,48E-04	1601,370	0,237	1601,606
1+260,000	20,000	115,000	20,000	400,000	1,48E-04	1601,870	0,059	1601,929
1+280,000	20,000	135,000	15,000	225,000	1,48E-04	1602,370	0,033	1602,403
PTV 1+295,000	15,000	150,000	0,000	0,000	1,48E-04	1602,745	0,000	1602,745

6. VOLUMENES DE CORTE Y DE RELLENO (Mov. de Tierras)

PROG.	AREAS [m2]		VOLUMENES [m3]		VOLUMEN ACUMULADO	
	CORTE	RELLENO	CORTE	RELLENO	CORTE	RELLENO
0+000,000	0,419	1,096	142,910	10,641	142,910	10,641
0+019,425	14,295	0,000	8,391	0,000	151,301	10,641
0+020,000	14,913	0,000	200,757	0,000	352,058	10,641
0+030,000	25,238	0,000	274,563	0,000	626,621	10,641
0+040,000	29,674	0,000	287,000	0,000	913,621	10,641
0+050,000	27,726	0,000	253,673	0,000	1167,294	10,641
0+060,000	23,009	0,000	208,506	0,000	1375,800	10,641
0+070,000	18,692	0,000	175,173	0,000	1550,973	10,641
0+080,000	16,342	0,000	128,285	0,000	1679,258	10,641
0+090,000	9,315	0,000	62,367	0,000	1741,625	10,641
0+100,000	3,158	0,017	36,857	0,000	1778,482	10,641
0+110,000	4,213	0,000	58,375	0,000	1836,857	10,641
0+120,000	7,462	0,000	96,337	0,000	1933,194	10,641
0+130,000	11,806	0,000	113,129	0,000	2046,323	10,641
0+140,000	10,820	0,000	57,980	7,814	2104,303	18,455
0+150,000	0,776	1,563	3,879	35,171	2108,182	53,626
0+160,000	0,000	5,471	0,000	74,457	2108,182	128,083
0+170,000	0,000	9,420	0,000	102,597	2108,182	230,680
0+180,000	0,000	11,099	0,000	123,644	2108,182	354,324
0+190,000	0,000	13,630	0,000	124,064	2108,182	478,388
0+200,000	0,000	11,183	0,000	22,602	2108,182	500,990
0+202,072	0,000	10,633	0,000	155,272	2108,182	656,262
0+220,000	0,000	6,689	0,000	104,304	2108,182	760,566
0+240,000	0,000	3,742	0,000	57,435	2108,182	818,001
0+260,000	0,000	2,002	0,000	32,505	2108,182	850,506
0+280,000	0,000	1,249	0,000	24,489	2108,182	874,995
0+298,957	0,000	1,335	0,000	1,402	2108,182	876,397
0+300,000	0,000	1,353	0,000	14,414	2108,182	890,811
0+310,000	0,000	1,530	0,000	16,185	2108,182	906,996
0+320,000	0,000	1,707	0,000	17,972	2108,182	924,968
0+330,000	0,000	1,887	0,000	19,775	2108,182	944,743
0+340,000	0,000	2,068	0,000	21,595	2108,182	966,338
0+350,000	0,000	2,251	0,000	2,979	2108,182	969,317
0+351,317	0,000	2,275	0,000	20,450	2108,182	989,767
0+360,000	0,000	2,435	0,491	44,821	2108,673	1034,588
0+380,000	0,049	2,047	30,290	20,469	2138,963	1055,057
0+400,000	2,980	0,000	108,632	0,000	2247,595	1055,057
0+420,000	7,883	0,000	154,963	0,000	2402,558	1055,057
0+440,000	7,613	0,000	133,151	0,000	2535,709	1055,057
0+460,000	5,702	0,000	22,166	0,000	2557,875	1055,057
0+464,783	3,566	0,000	11,726	0,252	2569,601	1055,309
0+470,000	0,929	0,096	4,646	24,309	2574,247	1079,618
0+480,000	0,000	4,765	0,000	83,456	2574,247	1163,074
0+490,000	0,000	11,926	0,000	129,141	2574,247	1292,215
0+500,000	0,000	13,902	0,000	114,920	2574,247	1407,135
0+510,000	0,000	9,082	0,000	74,530	2574,247	1481,665
0+520,000	0,000	5,824	0,000	52,685	2574,247	1534,350

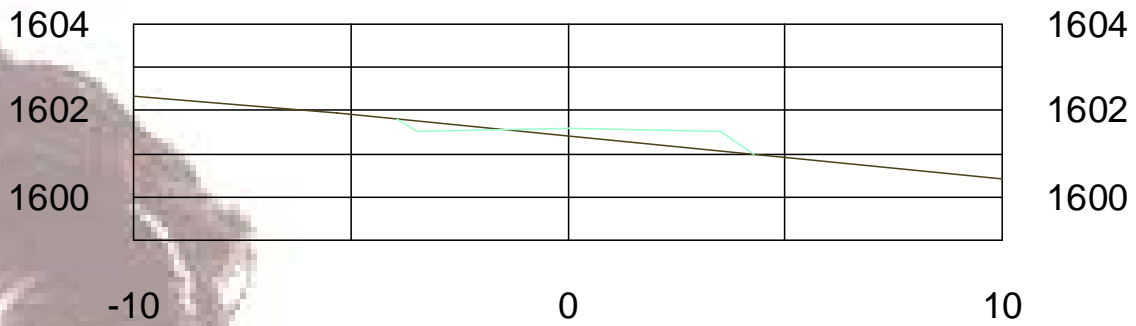
0+530,000	0,000	4,713	0,000	46,651	2574,247	1581,001
0+540,000	0,000	4,617	0,000	51,911	2574,247	1632,912
0+550,000	0,000	5,765	0,000	61,096	2574,247	1694,008
0+560,000	0,000	6,454	0,000	65,649	2574,247	1759,657
0+570,000	0,000	6,675	0,000	67,852	2574,247	1827,509
0+580,000	0,000	6,895	0,000	70,055	2574,247	1897,564
0+590,000	0,000	7,116	0,000	72,274	2574,247	1969,838
0+600,000	0,000	7,339	0,000	74,509	2574,247	2044,347
0+610,000	0,000	7,563	0,000	70,482	2574,247	2114,829
0+620,000	0,000	6,533	0,000	34,521	2574,247	2149,350
0+626,040	0,000	4,897	3,284	39,911	2577,531	2189,261
0+640,000	0,470	0,821	21,377	9,587	2598,908	2198,848
0+660,000	1,667	0,138	16,673	69,221	2615,581	2268,069
0+680,000	0,000	6,784	0,000	174,499	2615,581	2442,568
0+700,000	0,000	10,665	0,000	61,631	2615,581	2504,199
0+705,606	0,000	11,320	0,000	51,045	2615,581	2555,244
0+710,000	0,000	11,916	0,000	127,365	2615,581	2682,609
0+720,000	0,000	13,557	0,000	129,771	2615,581	2812,380
0+730,000	0,000	12,397	0,000	89,067	2615,581	2901,447
0+740,000	0,000	5,416	2,658	29,790	2618,239	2931,237
0+750,000	0,532	0,542	37,876	2,709	2656,115	2933,946
0+760,000	7,044	0,000	124,400	0,000	2780,515	2933,946
0+770,000	17,836	0,000	190,665	0,000	2971,180	2933,946
0+780,000	20,297	0,000	221,788	0,000	3192,968	2933,946
0+790,000	24,061	0,000	272,815	0,000	3465,783	2933,946
0+800,000	30,502	0,000	308,193	0,000	3773,976	2933,946
0+810,000	31,137	0,000	170,172	0,000	3944,148	2933,946
0+815,758	27,974	0,000	112,412	0,000	4056,560	2933,946
0+820,000	25,023	0,000	442,811	0,000	4499,371	2933,946
0+840,000	19,258	0,000	299,798	0,000	4799,169	2933,946
0+860,000	10,721	0,000	135,316	0,000	4934,485	2933,946
0+880,000	2,810	0,000	28,102	36,647	4962,587	2970,593
0+900,000	0,000	3,665	0,000	134,161	4962,587	3104,754
0+920,000	0,000	9,751	0,000	170,143	4962,587	3274,897
0+940,000	0,000	7,263	0,000	95,221	4962,587	3370,118
0+960,000	0,000	2,259	54,690	22,593	5017,277	3392,711
0+980,000	5,469	0,000	28,337	0,000	5045,614	3392,711
0+984,205	8,009	0,000	58,389	0,000	5104,003	3392,711
0+990,000	12,142	0,000	115,775	0,000	5219,778	3392,711
1+000,000	11,013	0,000	109,891	0,000	5329,669	3392,711
1+010,000	10,965	0,000	85,008	0,000	5414,677	3392,711
1+020,000	6,036	0,000	30,738	2,194	5445,415	3394,905
1+030,000	0,111	0,439	0,556	31,878	5445,971	3426,783
1+040,000	0,000	5,937	0,000	81,471	5445,971	3508,254
1+050,000	0,000	10,357	0,000	101,434	5445,971	3609,688
1+060,000	0,000	9,929	0,000	100,527	5445,971	3710,215
1+070,000	0,000	10,176	0,000	89,242	5445,971	3799,457
1+080,000	0,000	7,672	0,000	2,856	5445,971	3802,313
1+080,378	0,000	7,457	31,051	73,162	5477,022	3875,475
1+100,000	3,165	0,000	124,168	0,000	5601,190	3875,475
1+120,000	9,252	0,000	130,660	0,000	5731,850	3875,475

1+140,000	3,814	0,000	40,299	19,081	5772,149	3894,556
1+160,000	0,216	1,908	2,721	41,284	5774,870	3935,840
1+180,000	0,056	2,220	6,862	29,223	5781,732	3965,063
1+198,391	0,690	0,958	1,070	1,629	5782,802	3966,692
1+200,000	0,640	1,068	3,747	16,255	5786,549	3982,947
1+210,000	0,109	2,183	0,547	36,634	5787,096	4019,581
1+220,000	0,000	5,144	0,000	79,277	5787,096	4098,858
1+230,000	0,000	10,712	0,000	99,502	5787,096	4198,360
1+240,000	0,000	9,189	0,000	59,443	5787,096	4257,803
1+250,000	0,000	2,700	15,315	13,499	5802,411	4271,302
1+260,000	3,063	0,000	71,355	0,000	5873,766	4271,302
1+270,000	11,208	0,000	152,017	0,000	6025,783	4271,302
1+280,000	19,195	0,000	221,241	0,000	6247,024	4271,302
1+290,000	25,053	0,000	233,862	0,000	6480,886	4271,302
1+300,000	21,720	0,000	35,267	0,000	6516,153	4271,302
1+301,637	21,372	0,000	368,336	0,000	6884,489	4271,302
1+320,000	18,745	0,000	481,319	0,000	7365,808	4271,302
1+340,000	29,387	0,000	475,734	0,000	7841,542	4271,302
1+360,000	18,186	0,000	235,361	0,000	8076,903	4271,302
1+380,000	5,350	0,000	114,666	0,000	8191,569	4271,302
1+400,000	6,117	0,000	158,030	0,000	8349,599	4271,302
1+420,000	9,686	0,000	158,298	0,000	8507,897	4271,302
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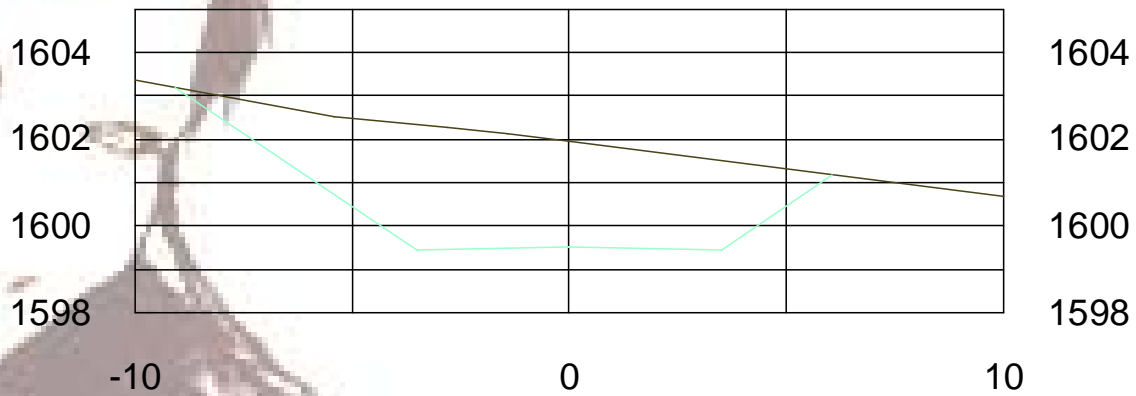
VOLUMEN DE CORTE [m3] 8.507,897
VOLUMEN DE RELLENO [m3] 4.271,302

PERFILES TRANSVERSALES

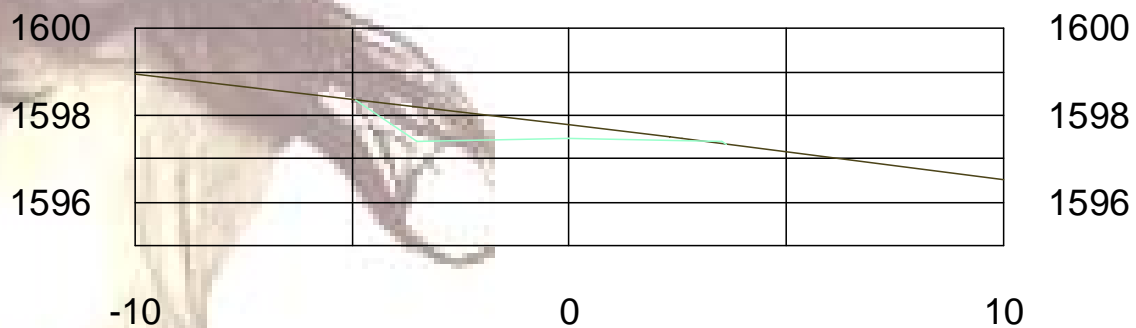
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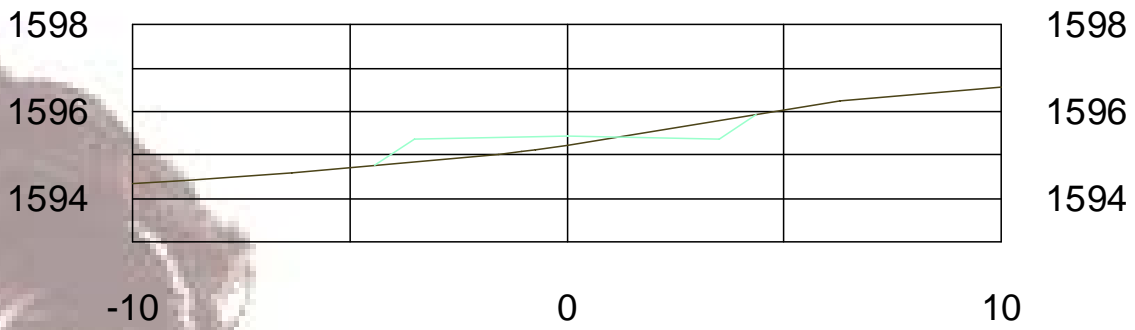
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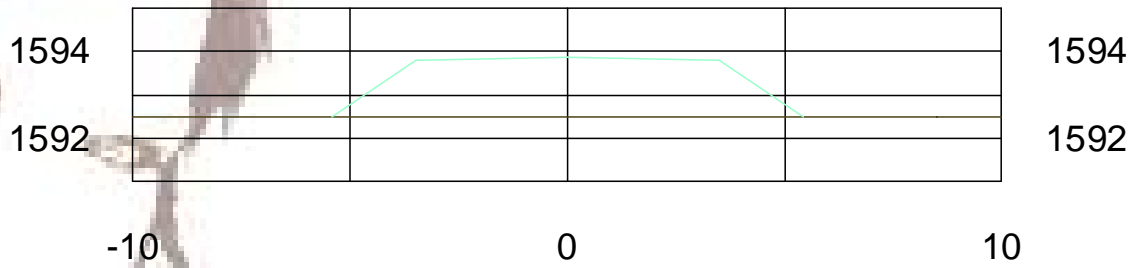
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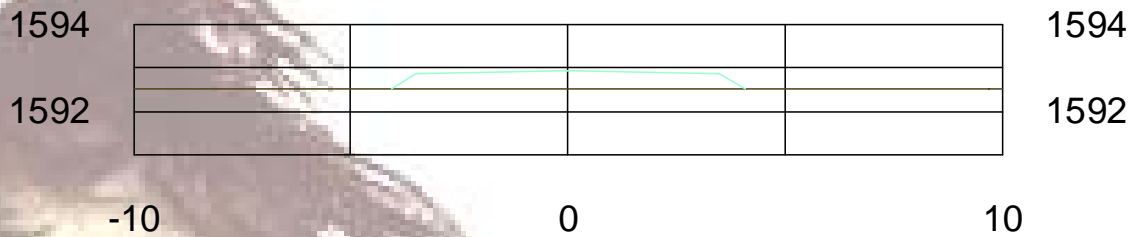
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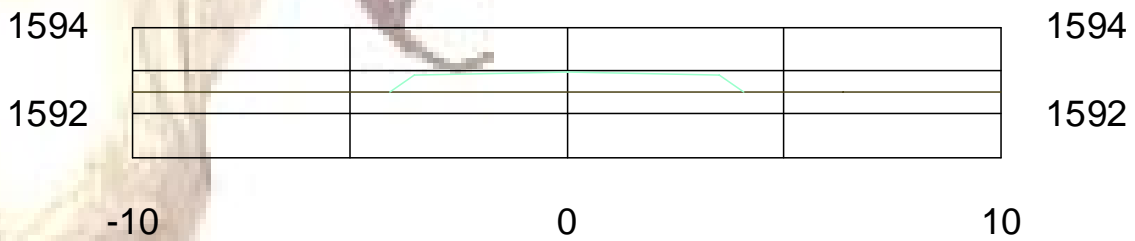
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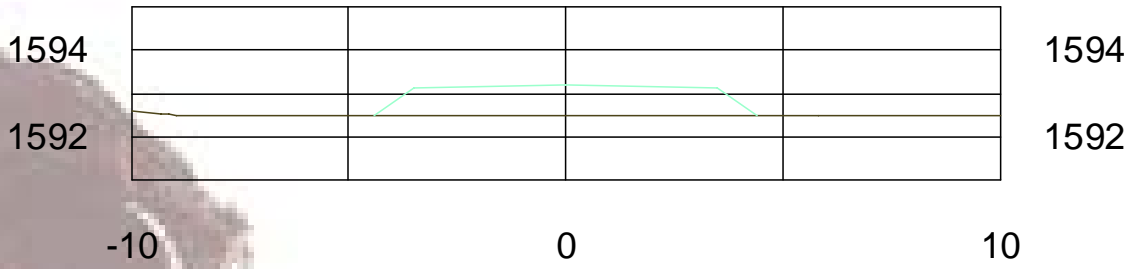
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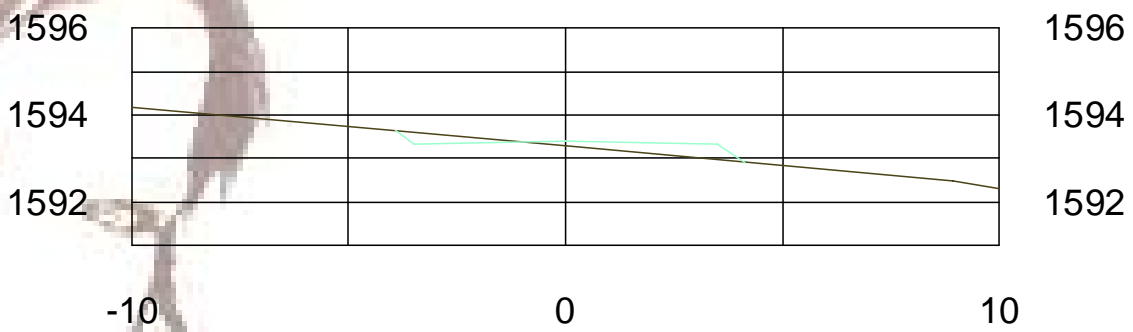
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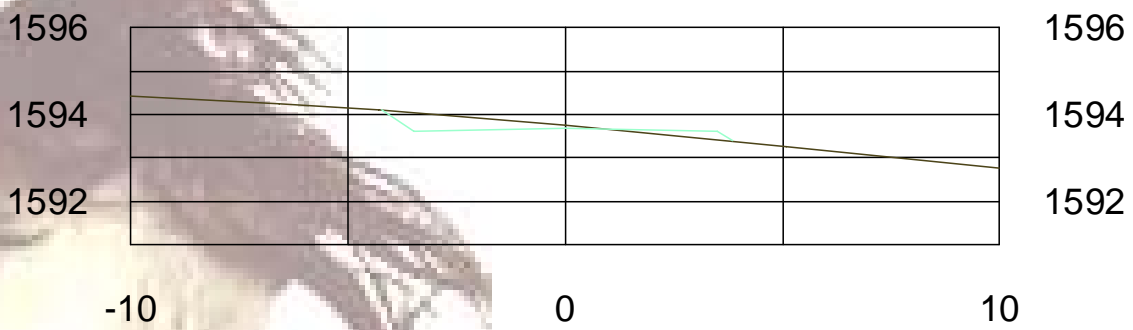
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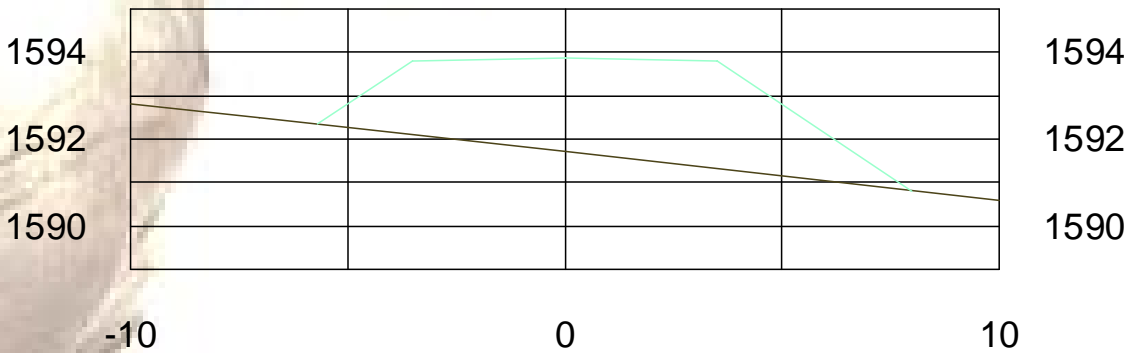
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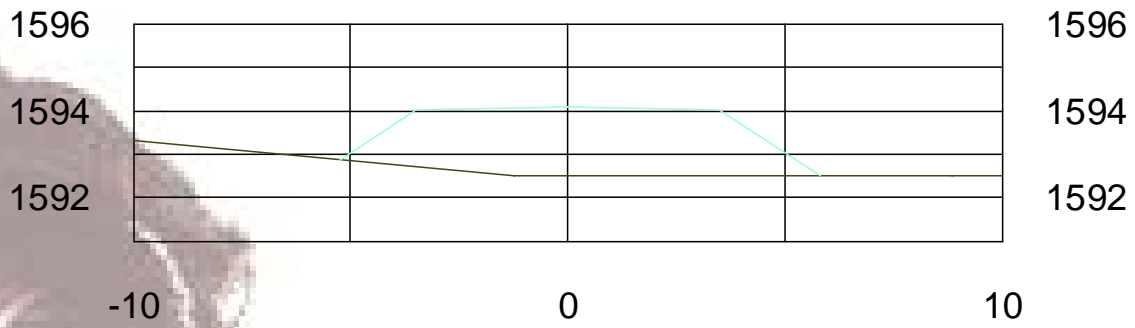
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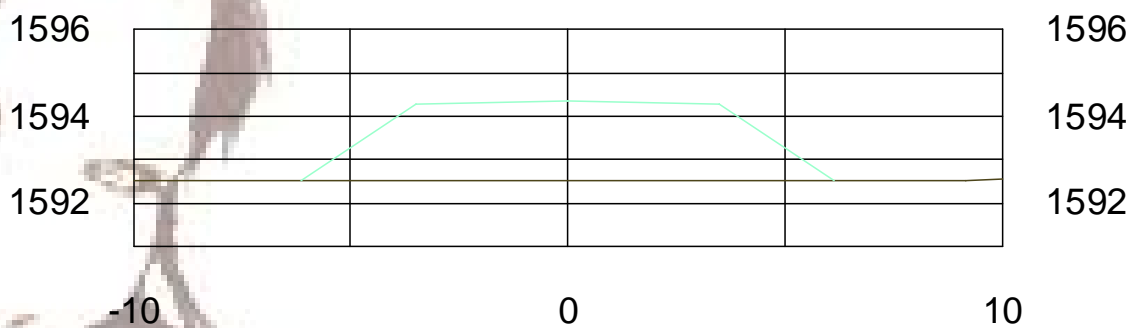
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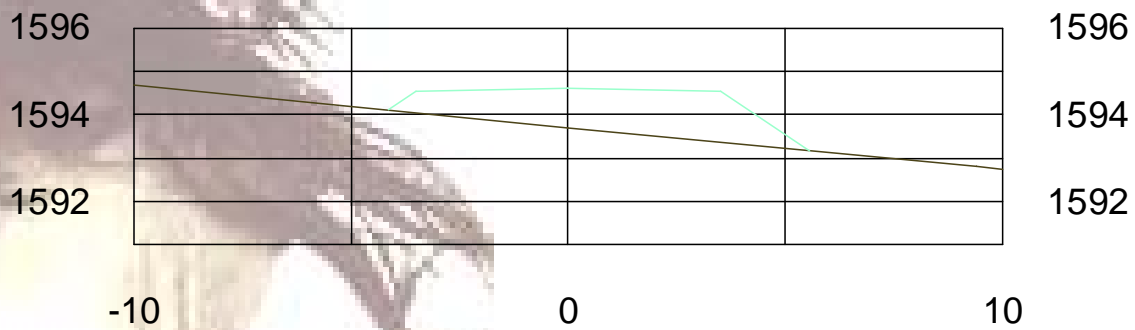
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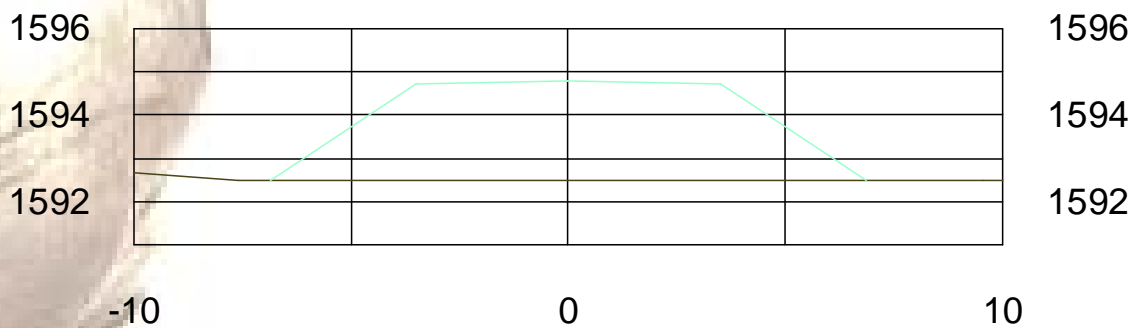
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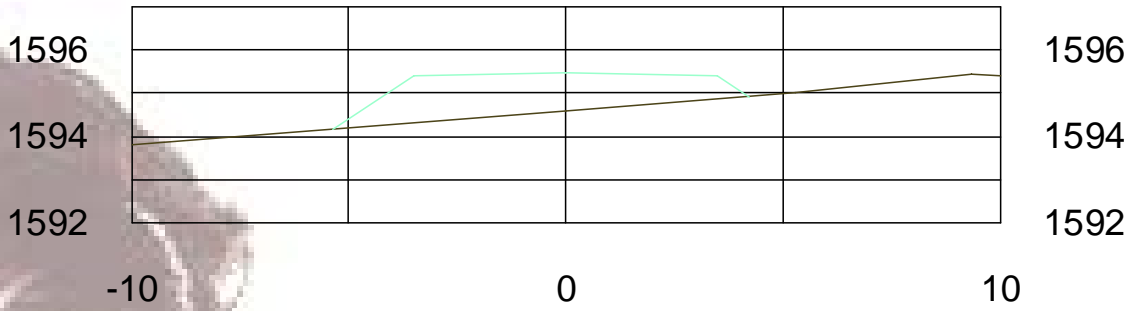
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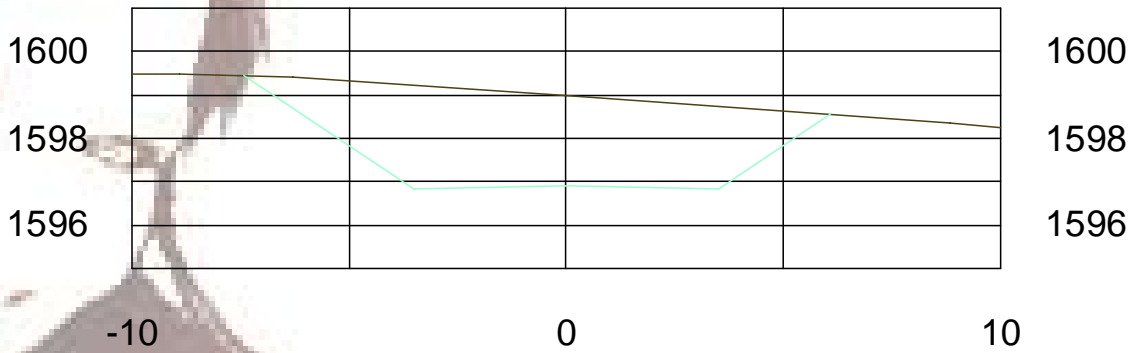
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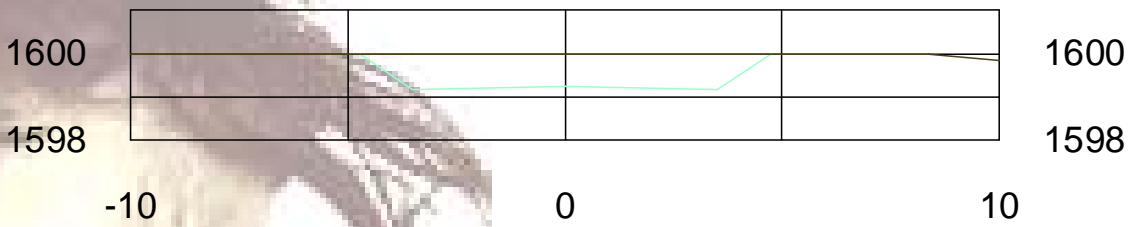
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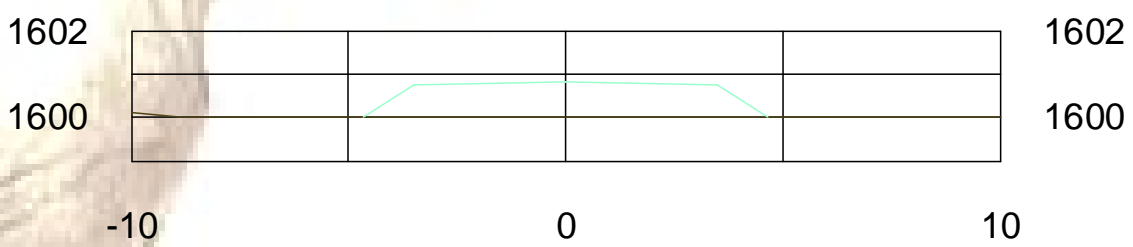
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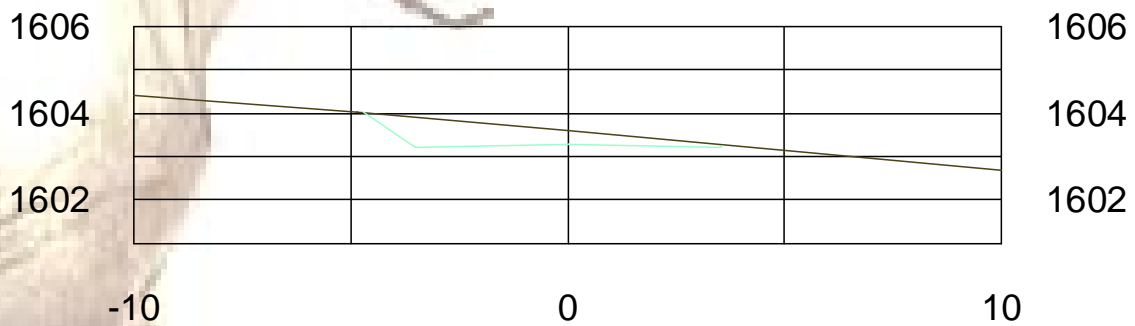
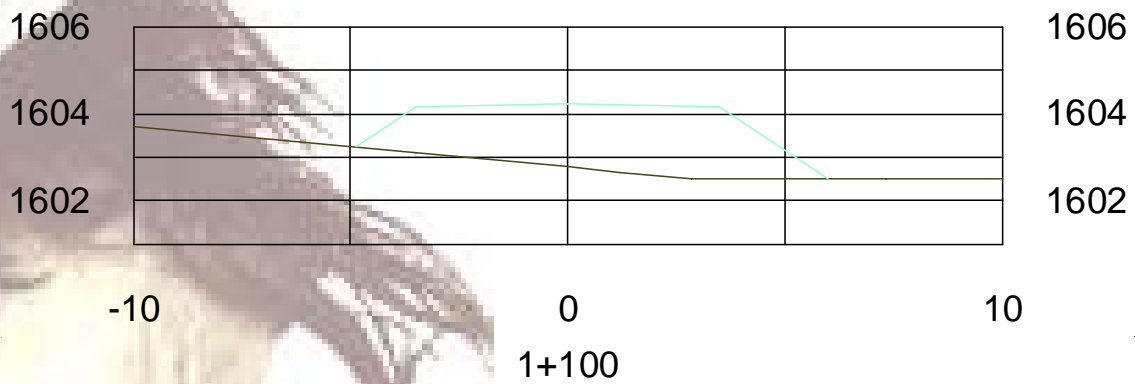
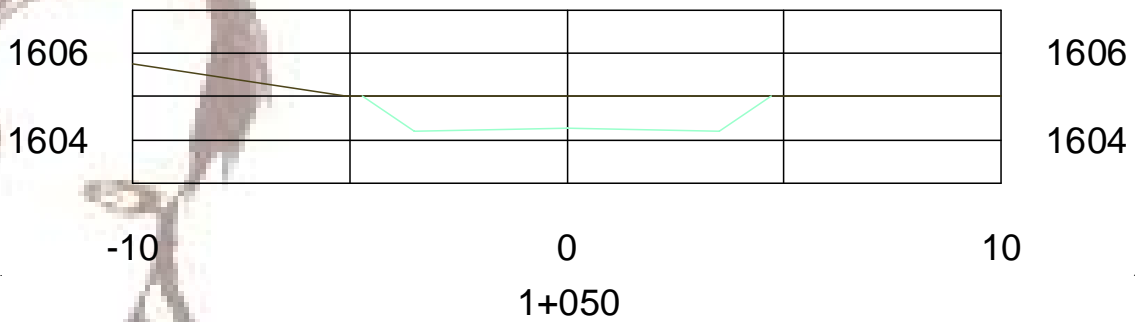
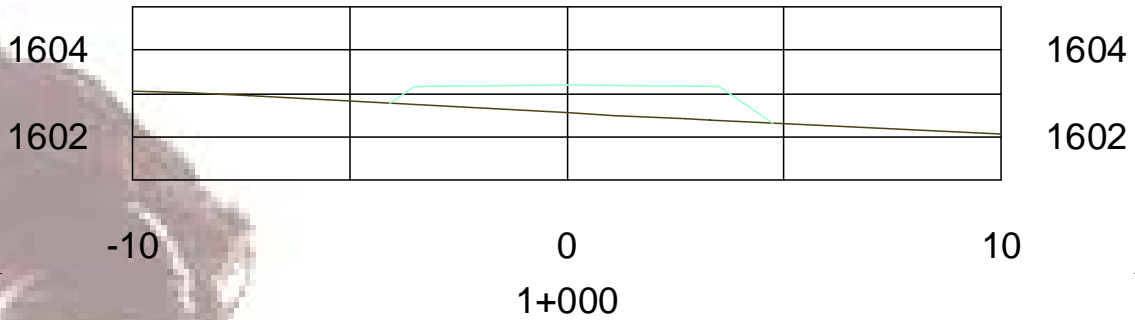
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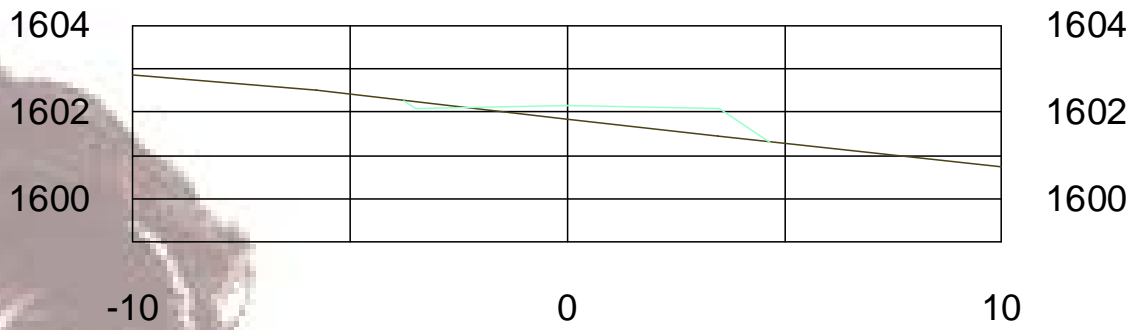
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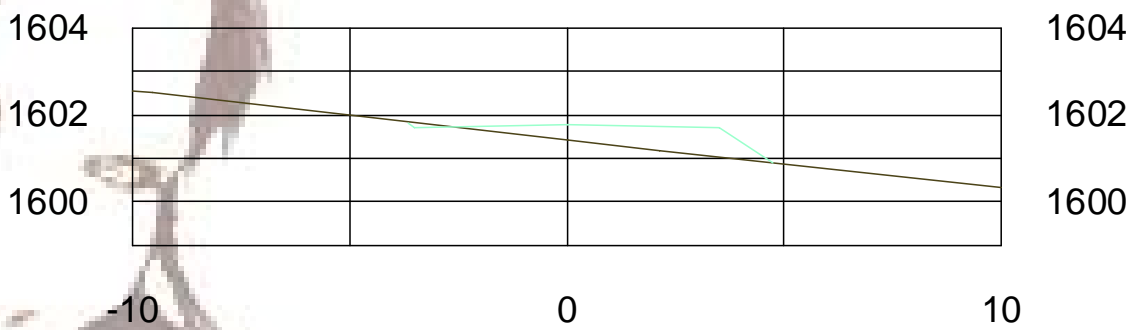
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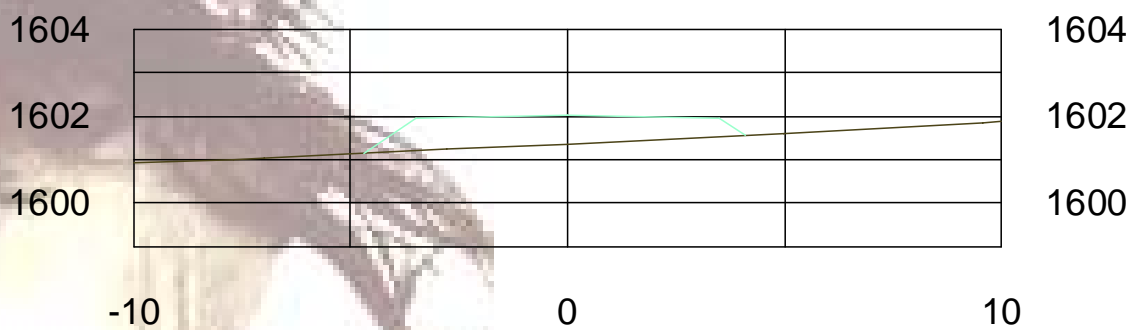
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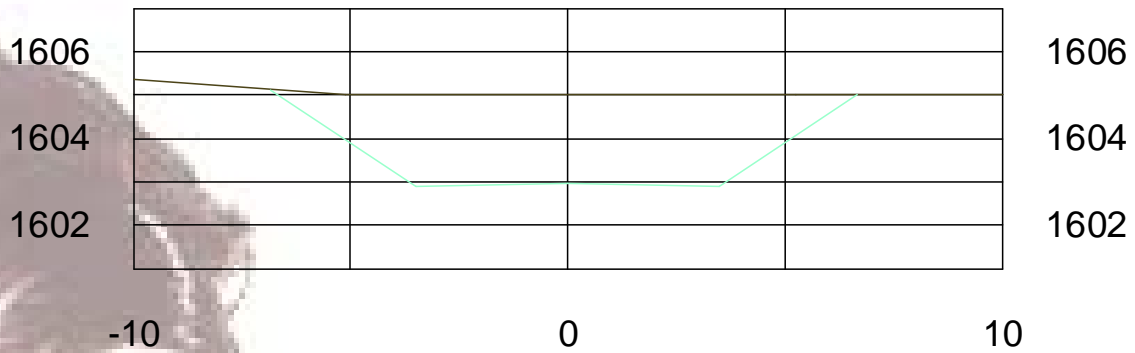
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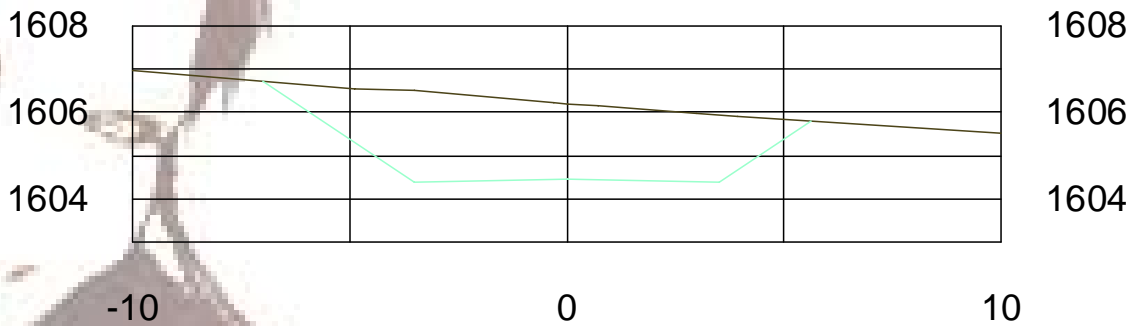
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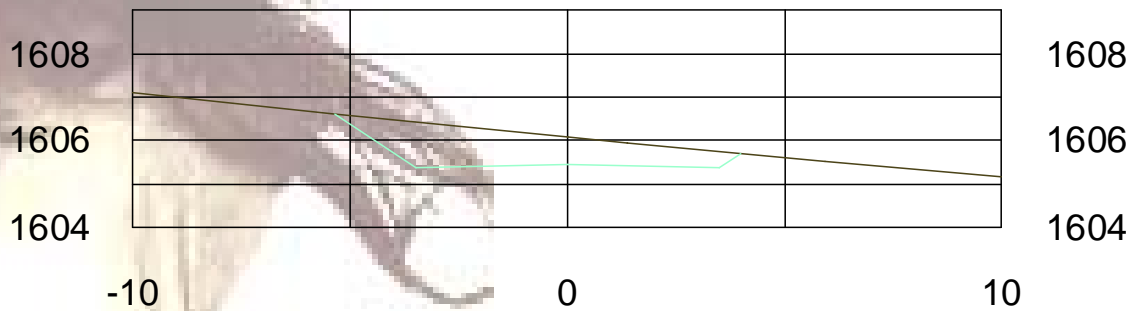
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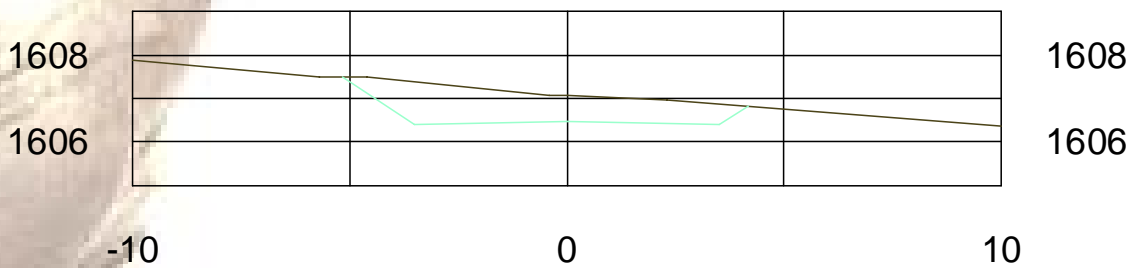
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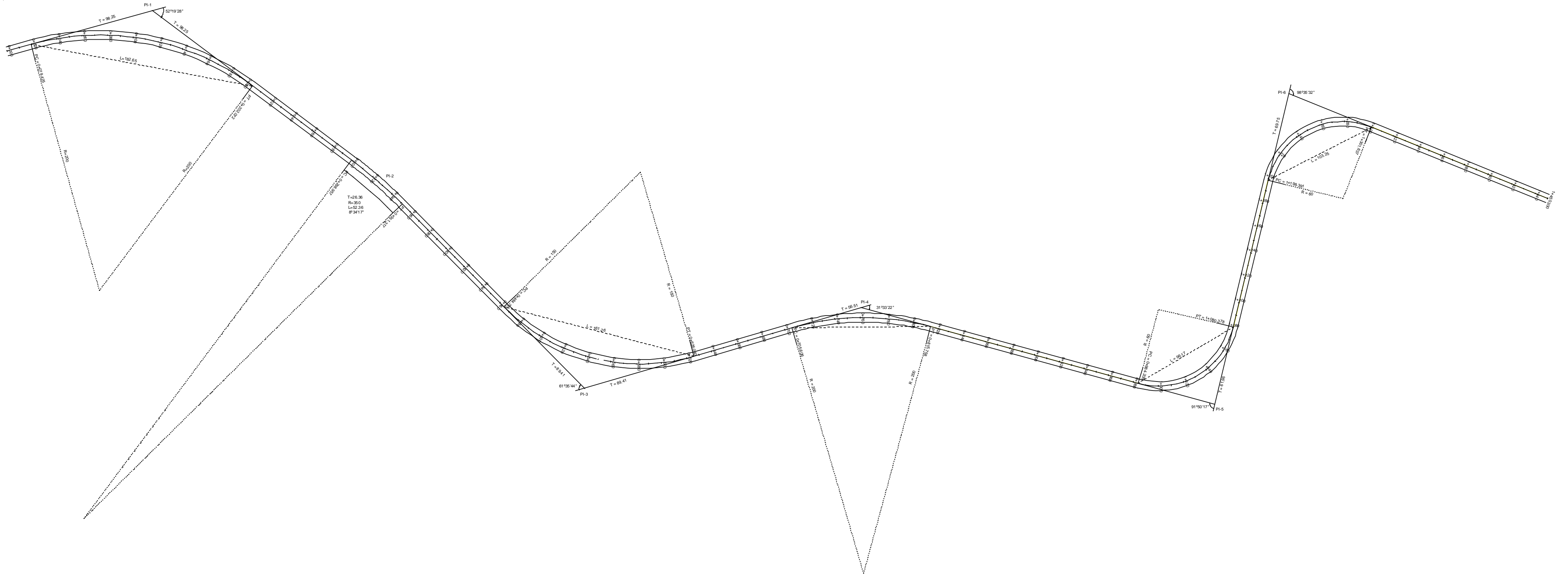


1+400



1+440





Ref. Horizontal
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 E 45127.411
 Coordenada Final: N 50533.139
 E 46332.962
 Ref. Vertical Cota inicio 1601.410
 m.s.n.m. Cota Final 1606.550
 FECHA: JULIO - 2008

NOTA:

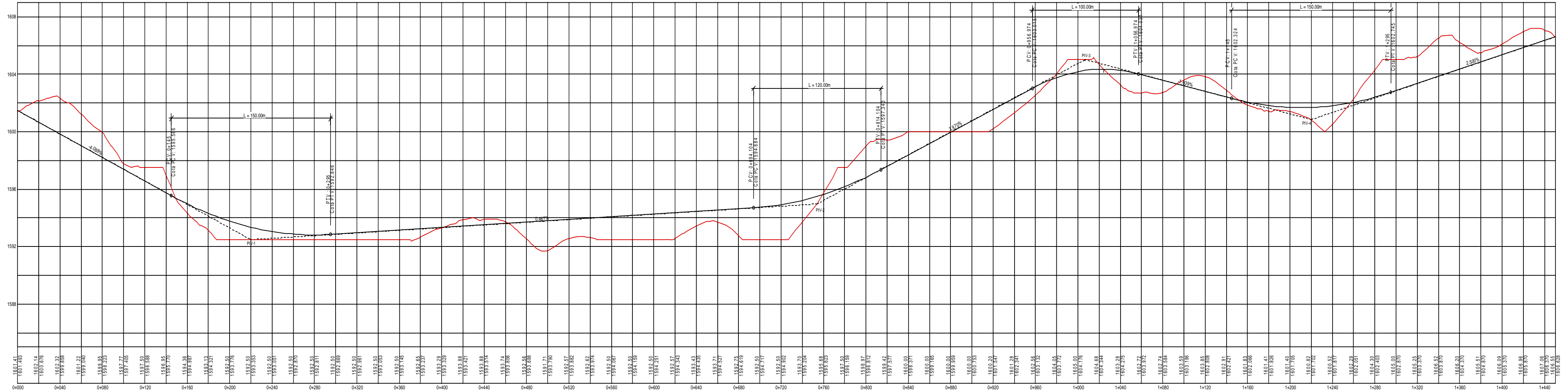
REV.	CONCEPTO DE REMISIÓN	FECHA	REVISO	APROBO

Ing. Peroy F. Camacho R.
 DOCENTE DE LA MATERIA

Santa Cruz - Bolivia

MATERIA Carretera I
DOCENTE Ing. Peroy Camacho R.
ESTUDIANTE Sergio Chambi Villan
FECHA
NOTA

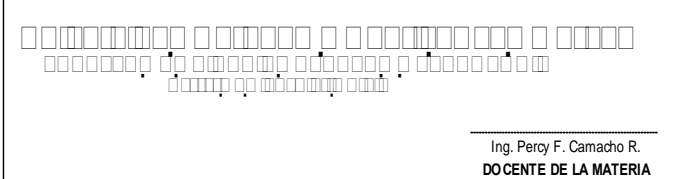
ESCALA: 1:1500
 LAM. Nº 0001-08
 REV. 1



Ref. Horizontal	
Coordenada Inicial:	N 50648.339 E 45127.411
Coordenada Final:	N 50533.139 E 46332.962
Ref. Vertical	Cota inicio 1601.410 m.s.n.m. Cota Final 1606.550
FECHA: JULIO - 2008	

NOTA :

REV.	CONCEPTO DE REMISION	FECHA	REVISO	APROBO



Santa Cruz - Bolivia

MATERIA	Caretera I
DOCENTE	Ing. Percy Camacho R.
ESTUDIANTE	Sergio Chambi Villan
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NOTA

ESCALA:	REV.
1:1500	1
LAM. Nº	0002-08

