Idejni projekt lokalne ceste

Flegar, Antea

SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE

ZAVRŠNI RAD

ANTEA FLEGAR

Split, 2021.

SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE

IDEJNI PROJEKT LOKALNE CESTE

Završni rad

Split, 2021.

SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE

Split, Matice hrvatske 15

STUDIJ: **PREDDIPLOMSKI STUDIJ GRAĐEVINARSTVA**

KANDIDAT: **Antea Flegar**

MATIČNI BROJ (JMBAG): **0083223345**

KATEDRA: **Katedra za prometnice**

PREDMET: **Ceste**

ZADATAK ZA ZAVRŠNI RAD

Tema: Idejni projekt lokalne ceste

Opis zadatka: Uz pomoć programa za projektiranje cesta AutoCAD Civil 3D potrebno je izraditi idejni projekt ceste na geodetskoj podlozi koja je korištena za izradu programa u okviru kolegija Ceste. Trasa se treba položiti od točke A do točke B koristeći podatke iz programskog zadatka.

Zadatak treba sadržavati:
1. Kopiju programskog zadatka
2. Tehnički opis s prikazom korištenja programa Civil 3D
3. Građevinsku situaciju u mjerilu 1:1000
4. Uzdužni presjek u mjerilu 1:1000/100
5. Karakteristične poprečne presjeke u mjerilu 1:200
6. Obradu na računalu
7. Računalne ispise koordinatnih točaka osi
8. Proračun količina zemljanih radova
9. Proračun količine radova po presjecima

U Splitu, srpanj 2021.

Voditelj Završnog rada:
Prof. dr. sc. Dražen Cvitanić

Idejni projekt lokalne ceste

Sažetak:

Idejni projekt lokalne ceste izrađen je između točaka A i B postavljenih na geodetskoj podlozi prema programskom zadatku kolegija Ceste. Idejni projekt se izrađuje služeći se računalnim programom AutoCAD Civil 3D. Cesta je projektirana na brdovitom terenu i za prosječni godišnji dnevni promet od 950 vozila/dan. Za 5. kategoriju ceste odabrana projektna brzina je 40 km/h. Idejni projekt izrađen je prema Pravilniku o osnovnim uvjetima za projektiranje cesta.

Ključne riječi:

Idejni projekt, lokalna cesta, projektna brzina, os ceste, niveleta, poprečni presjek

Conceptual project of local road

Abstract:

The conceptual project of the local road was made between points A and B placed on a geodetic basis according to the task of the course Roads. Conceptual project is made using the computer program AutoCAD Civil 3D. The road is designed on hilly terrain and for an average annual daily traffic of 950 vehicles/day. For the 5th road category, the selected design speed is 40 km/h. The conceptual design was made according to the Ordinance on the basic conditions for road design.

Keywords:

Conceptual project, local road, design speed, the road axis, profile, cross-section

SADRŽAJ

1. PROGRAMSKI ZADATAK

SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA, ARHITEKTURE
I GEODEZIJE

Split, ak.god. 2020/2021.

Katedra za prometnice

Studij: Preddiplomski

Nastavni predmet: CESTE

Student/ica: Antea Flegar

ZADATAK

Treba izraditi idejni projekt dionice ceste između točaka A i B naznačenih na priloženoj geodetskoj podlozi u mjerilu 1:1000.

Zadano je:

- PGDP - prosječni godišnji dnevni promet: **950 voz/dan**
- vrsta terena: **brdoviti.**

Idejni projekt treba sadržavati:

1. Tehnički opis
2. Proračun horizontalne geometrije
3. Proračun proširenja kolnika u krivini
4. Proračun vertikalne geometrije i kota nivelete
5. Proračun vitoperenja kolnika
6. Građevinska situacija MJ. 1:1000
7. Uzdužni presjek MJ. 1:1000/100
8. Normalni poprečni presjek MJ. 1:50
9. Karakteristični poprečni presjeci MJ. 1:100
10. Predmjer radova
11. Aproksimativni troškovnik

Predmetna nastavnica:

izv.prof.dr.sc. Deana Breški, dipl.ing.građ.

2. TEHNIČKI OPIS

2.1 Općenito
Na priloženoj geodetskoj podlozi u mjerilu 1:1000 izrađen je idejni projekt ceste na dionici od točke A, koja se nalaz na 170 metara nadmorske visine, do točke B koja se nalazi na 152 metra nadmorske visine.
Cesta je projektirana na prosječni godišnji dnevni promet od 950 vozila na dan i pripada cestama 5. kategorije na brdovitom terenu. Zbog zahtjevne konfiguracije terena odabrana projektna brzina za ovu kategoriju ceste je Vp = 40 km/h.

2.2 Horizontalni elementi
Za 5. kategoriju ceste prema pravilniku minimalni radijus krivine je 25 m, a prijelaznice 30 m. Duljina trase iznosi 321.73 m te se sastoji od tri pravca, četiri prijelazne krivine i dva kružna luka. Prvi kružni luk je radijusa R = 60 m, duljina prijelaznice L = 30 m. Drugi kružni luk je radijusa R = 90 m, duljina prijelaznice L = 40 m. Krivine su konstruirane uz pomoć dvije prijelazne krivine oblika klotoide i jednog kružnog luka.

2.3 Vertikalni elementi
Minimalni dozvoljeni nagib nivelete je 0.5%, a maksimalni 12%.
Uzdužni presjek idejnog projekta sastoji se od dva pravca i jedne vertikalne konveksne krivine. Odabrani radijus konveksne krivine iznosi R = 4900 m.

Nagib prve tangente iznosi S1 =6.25%, a druge S2 = 4.95%.

2.4 Poprečni presjek
Cesta 5. kategorije ima dva kolnička traka svaki širine 2.75 m, rubni trak širine 0.2 m, bankine širine 1.0 m i nagiba 4% te berme širine 1.05 m i nagiba 5%.
Cesta se većim dijelom nalazi u zasjeku. U zasjeku se izvodi jedan, u usjeku po dva rigola širine 0.65 m za odvodnju vode i drenažna cijev koja je postavljena u posteljicu. Nagibi usjeka su 2:1, dok su nagibi nasipa 1:1.

2.5 Kolnička konstrukcija
Projektom je predviđena kolnička konstrukcija sa sljedećim slojevima:
- Habajući sloj AC 11 surf (BIT50/70) AG4 M4 u debljini 4 cm
- Nosivi sloj AC 22 base (BIT50/70) AG6 M2 u debljini 6 cm
- Mehanički zbijeni nosivi sloj debljine 25 cm

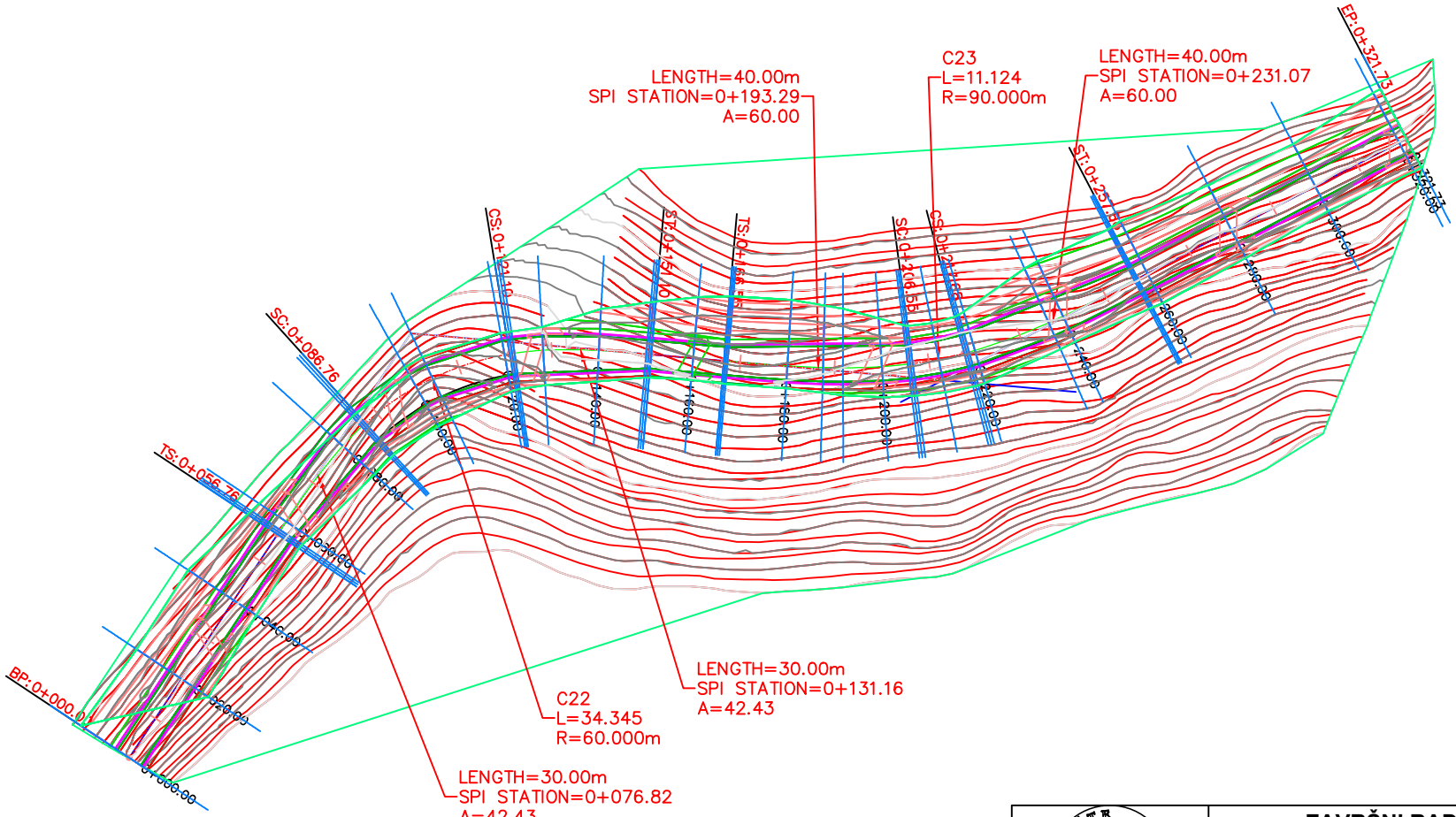
2.6 Odvodnja
Odvodnja kolnika predviđa se otvorenim sustavom odvodnje prihvaćanjem vode u zasjeku i usjeku u betonske rigole te kontroliranim ispuštanjem vode u teren direktno.

2.7 Oprema ceste
Idejnim rješenjem je predviđena horizontalna signalizacija koja se sastoji od jedne pune razdjelne crte širine 10 cm koja se postavlja u osi prometnice i punih rubnih crta širine 10 cm koje se postavljaju na svaki od rubnih trakova. Na nasip se postavlja jednostrana zaštitna čelična ograda.

3. GRAFIČKI PRILOZI

3.1 Situacija M 1:1000

SITUACIJA M 1:1000



SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA ARHITEKTURE I GEODEZIJE
2100 SPLIT, MATICE HRVATSKE 15

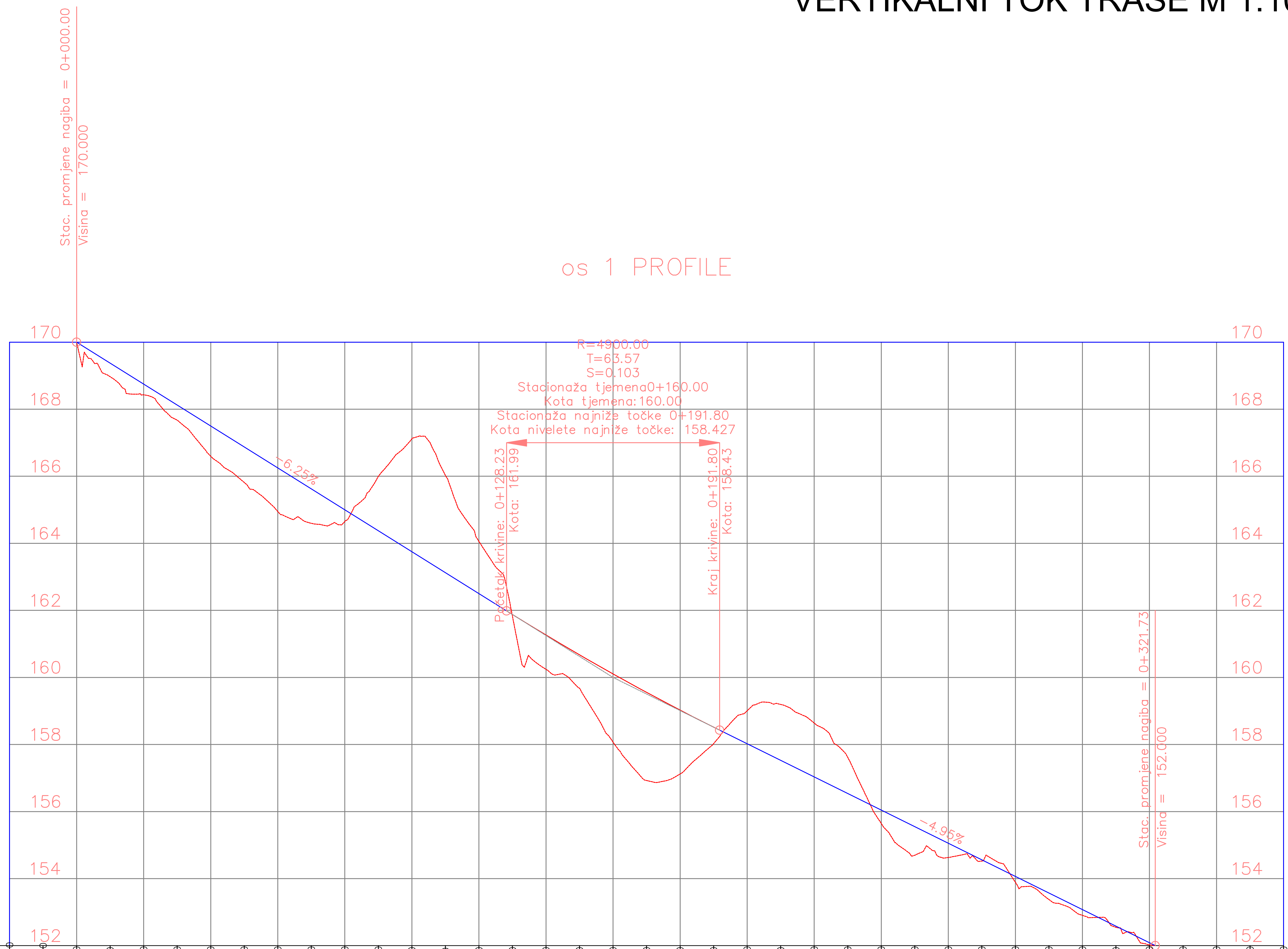
ZAVRŠNI RAD - CESTE

IDEJNI PROJEKT LOKALNE CESTE

IZRADILA: ANTEA FLEGAR	MENTOR: Prof.dr.sc. Dražen Cvitanić
SADRŽAJ: SITUACIJA	MJERILO: M 1 : 1000
DATUM: 15.07.2021.	PRILOG: 1

3.2 Uzdužni presjek M 1:1000/100

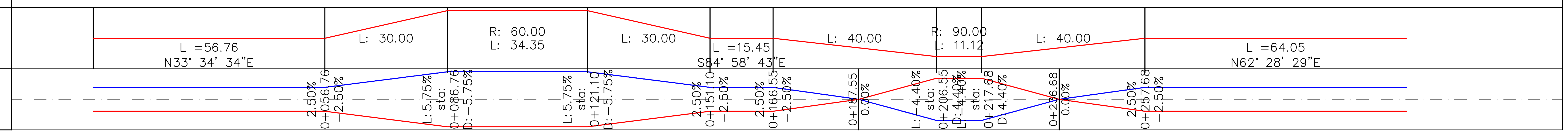
VERTIKALNI TOK TRASE M 1:1000/100



Stacionaža	Kote nivelete	Kote terena
-0+020.00		
-0+010.00		
0+000.00	170.00	170.00
0+010.00	169.38	168.97
0+020.00	168.75	168.43
0+030.00	168.12	167.67
0+040.00	167.50	166.60
0+050.00	166.87	165.81
0+060.00	166.25	164.95
0+070.00	165.62	164.60
0+080.00	165.00	164.65
0+090.00	164.37	166.00
0+100.00	163.75	167.12
0+110.00	163.12	166.03
0+120.00	162.50	164.06
0+130.00	161.88	161.82
0+140.00	161.26	160.24
0+150.00	160.67	159.67
0+160.00	160.10	158.07
0+170.00	159.55	156.93
0+180.00	159.02	157.12
0+190.00	158.52	158.02
0+200.00	158.02	159.00
0+210.00	157.53	159.20
0+220.00	157.03	158.64
0+230.00	156.54	157.62
0+240.00	156.04	155.64
0+250.00	155.55	154.70
0+260.00	155.05	154.63
0+270.00	154.56	154.52
0+280.00	154.06	153.89
0+290.00	153.57	153.38
0+300.00	153.07	152.90
0+310.00	152.58	152.55
0+320.00	152.09	152.02
0+330.00		
0+340.00		
0+350.00		
0+360.00		

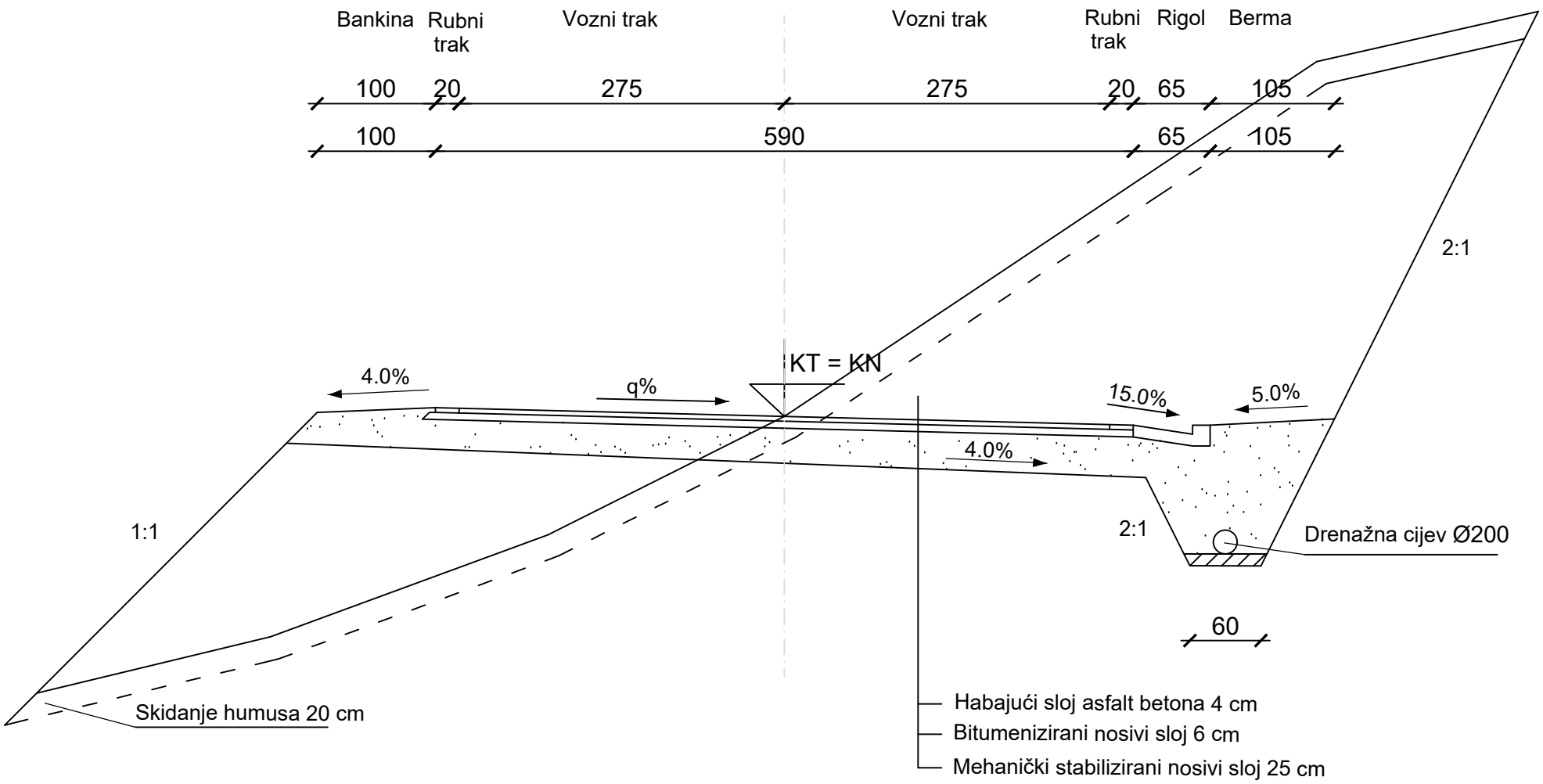
Horizontalni elementi

Vitoperenje



3.3 Normalni poprečni presjek M 1:50

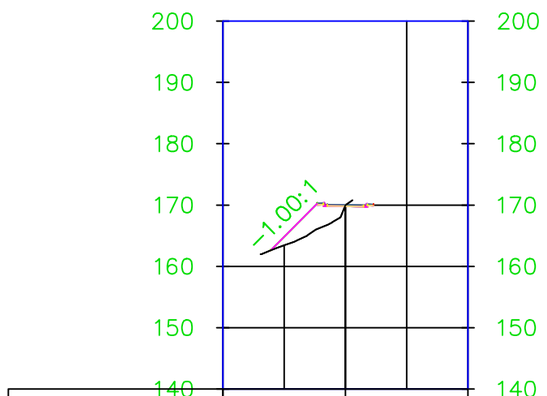
NORMALNI POPREČNI PRESJEK M 1:50



3.4 Karakteristični poprečni presjeci M 1:200

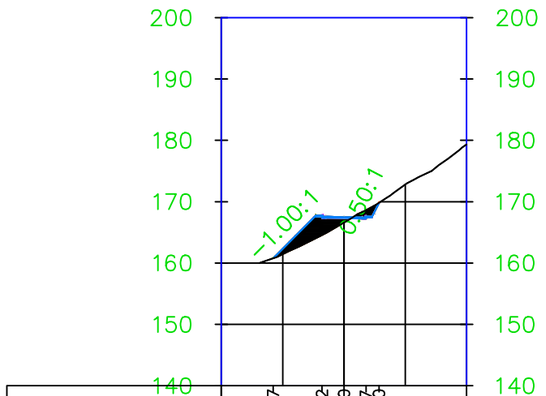
KARAKTERISTIČNI POPREČNI PRESJECI M 1:100

0+000.00



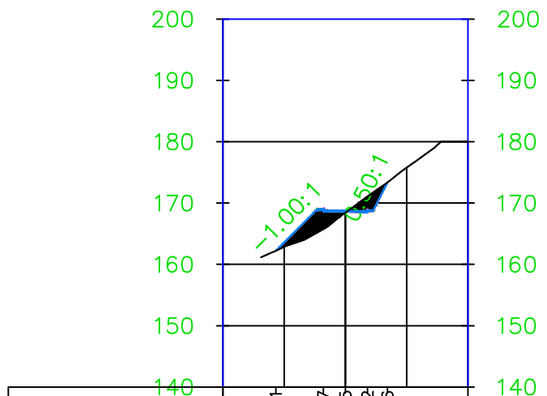
Kote projekta			
Udaljenost od osi	20.000	0.000	20.000
Kote terena			

0+040.00



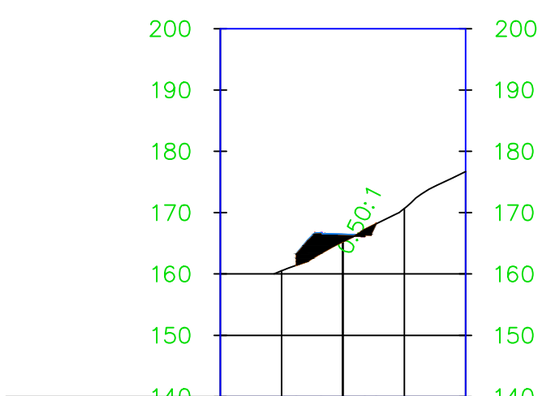
Kote projekta		160.77	167.32	167.30	167.17	169.80	
Udaljenost od osi	20.000	11.55	3.59	0.000	3.59	5.70	20.000
Kote terena		160.77	167.32	167.30	167.17	169.80	

0+020.00



Kote projekta		162.21	168.57	168.55	168.42	173.36	
Udaljenost od osi	20.000	11.36	3.59	0.00	3.59	6.86	20.000
Kote terena		162.21	168.57	168.55	168.42	173.36	

0+056.76



Kote projekta		163.22	166.27	166.25	166.17	168.18	
Udaljenost od osi	20.000	7.59	3.59	0.000	3.59	5.42	20.000
Kote terena		163.22	166.27	166.25	166.17	168.18	

SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA ARHITEKTURE I GEODEZIJE
2100 SPLIT, MATICE HRVATSKE 15

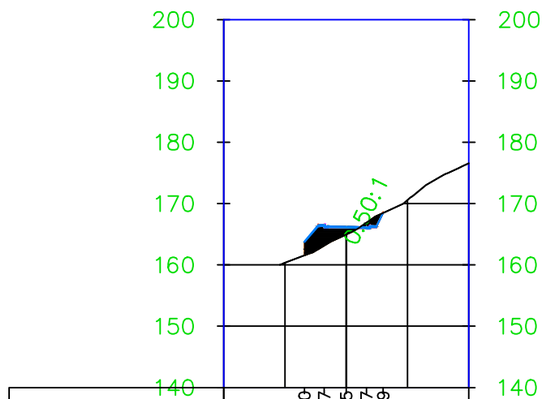
ZAVRŠNI RAD - CESTE

IDEJNI PROJEKT LOKALNE CESTE

IZRADILA: ANTEA FLEGAR		MENTOR: Prof.dr.sc. Dražen Cvitanić	
SADRŽAJ: KARAK. POPREČNI PRESJECI		MJERILO:	M 1 : 100
DATUM: 15.07.2021.		PRILOG:	3

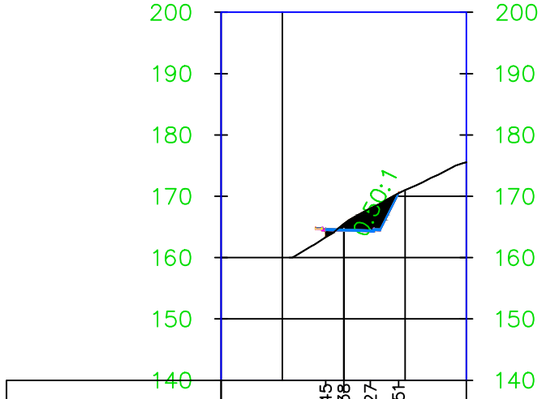
KARAKTERISTIČNI POPREČNI PRESJECI M 1:100

0+060.00



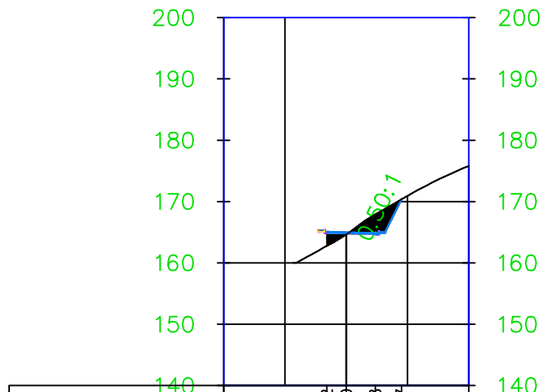
Kote projekta		163.70	166.07	166.05	165.97	168.49
Udaljenost od osi	20.000	−6.82	−3.59	0.00	3.30	6.02	20.000
Kote terena		163.70	166.07	166.05	165.97	168.49

0+086.76



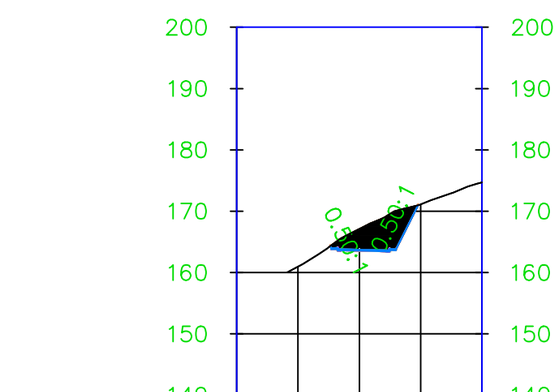
Kote projekta		164.45	164.38	164.27	170.51	
Udaljenost od osi	20.000	−2.94	0.000	4.35	8.94	20.000
Kote terena		164.45	164.38	164.27	170.51	

0+080.00



Kote projekta		164.82	164.80	164.68	170.37	
Udaljenost od osi	20.000	−3.18	0.00	4.72	9.02	20.000
Kote terena		164.82	164.80	164.68	170.37	

0+100.00



Kote projekta		164.37	163.55	163.44	170.96	
Udaljenost od osi	20.000	−4.76	0.00	4.35	9.57	20.000
Kote terena		164.37	163.55	163.44	170.96	

SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA ARHITEKTURE I GEODEZIJE
2100 SPLIT, MATICE HRVATSKE 15

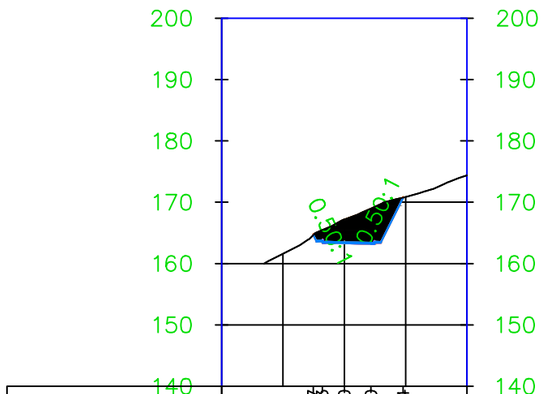
ZAVRŠNI RAD - CESTE

IDEJNI PROJEKT LOKALNE CESTE

IZRADILA: ANTEA FLEGAR		MENTOR: Prof.dr.sc. Dražen Cvitanić	
SADRŽAJ: KARAK. POPREČNI PRESJECI		MJERILO: M 1 : 100	
DATUM: 15.07.2021.		PRILOG: 3	

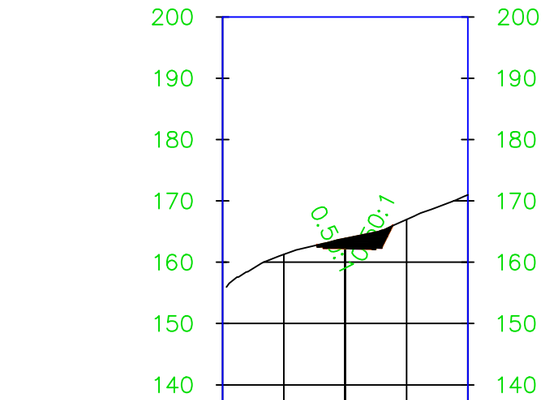
KARAKTERISTIČNI POPREČNI PRESJECI M 1:100

0+103.93



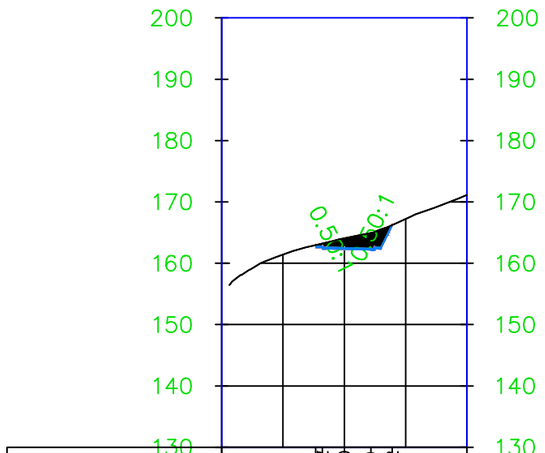
Kote projekta		164.67	164.53	163.30	163.20	170.74			
Udaljenost od osi	20.000	-5.06	-3.59	0.00	4.35	9.58	20.000		
Kote terena		164.67	164.53	163.30	163.20	170.74			

0+121.10



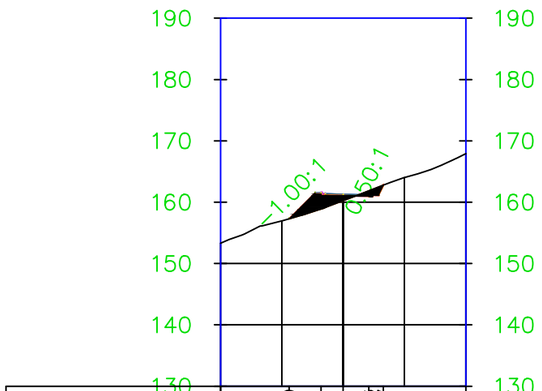
Kote projekta		162.77	162.25	162.23	162.12	165.94			
Udaljenost od osi	20.000	-4.65	-3.59	0.000	4.35	7.72	20.000		
Kote terena		162.77	162.25	162.23	162.12	165.94			

0+120.00



Kote projekta		162.94	162.92	162.30	162.19	166.22			
Udaljenost od osi	20.000	-4.70	-3.59	0.00	4.35	7.83	20.000		
Kote terena		162.94	162.92	162.30	162.19	166.22			

0+140.00



Kote projekta		157.29	161.09	161.06	160.96	162.77			
Udaljenost od osi	20.000	-8.79	-3.59	0.000	4.19	6.56	20.000		
Kote terena		157.29	161.09	161.06	160.96	162.77			

SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA ARHITEKTURE I GEODEZIJE
2100 SPLIT, MATICE HRVATSKE 15

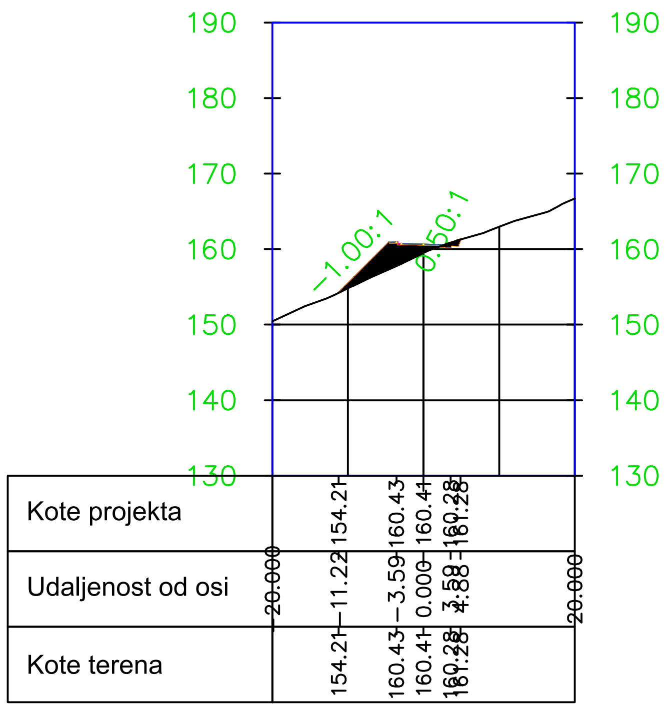
ZAVRŠNI RAD - CESTE

IDEJNI PROJEKT LOKALNE CESTE

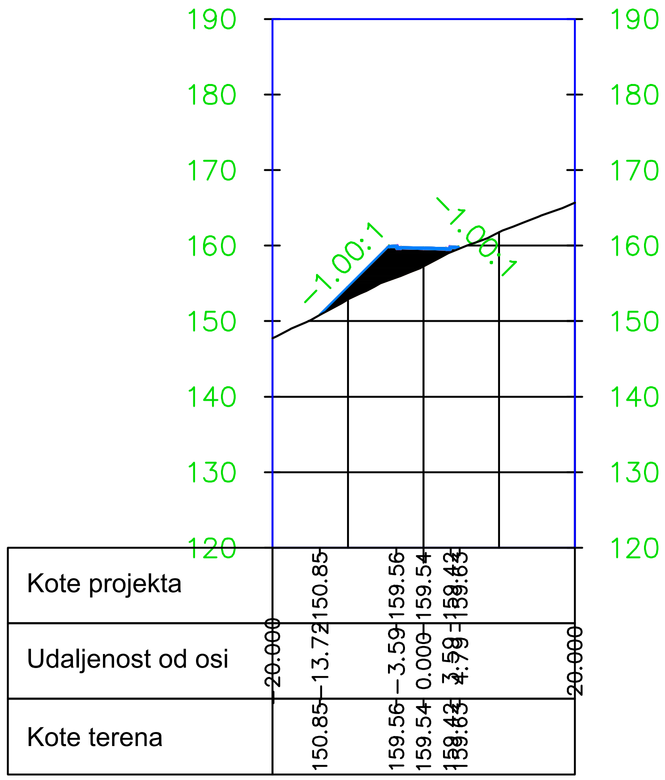
IZRADILA: ANTEA FLEGAR		MENTOR: Prof.dr.sc. Dražen Cvitanić	
SADRŽAJ: KARAK. POPREČNI PRESJECI		MJERILO: M 1 : 100	
DATUM: 15.07.2021.		PRILOG: 3	

KARAKTERISTIČNI POPREČNI PRESJECI M 1:100

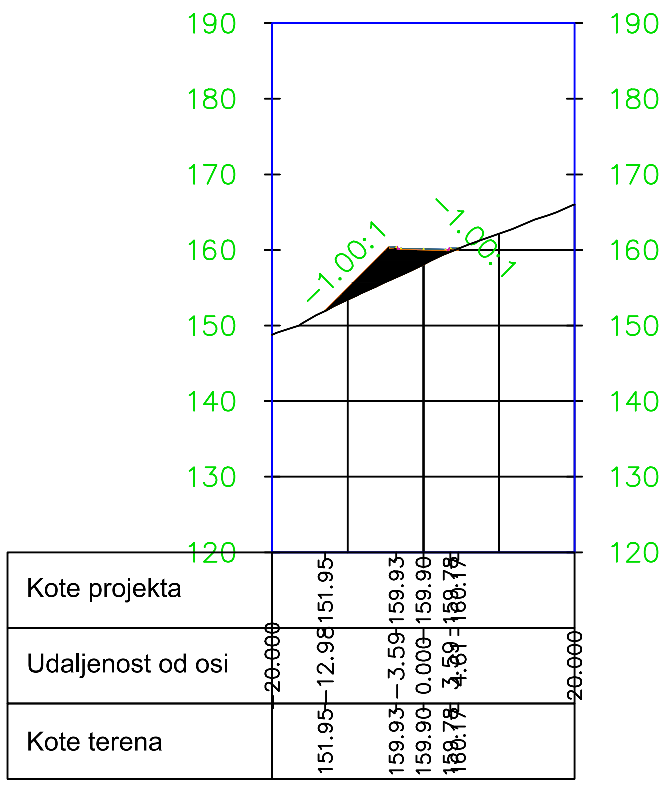
0+151.10



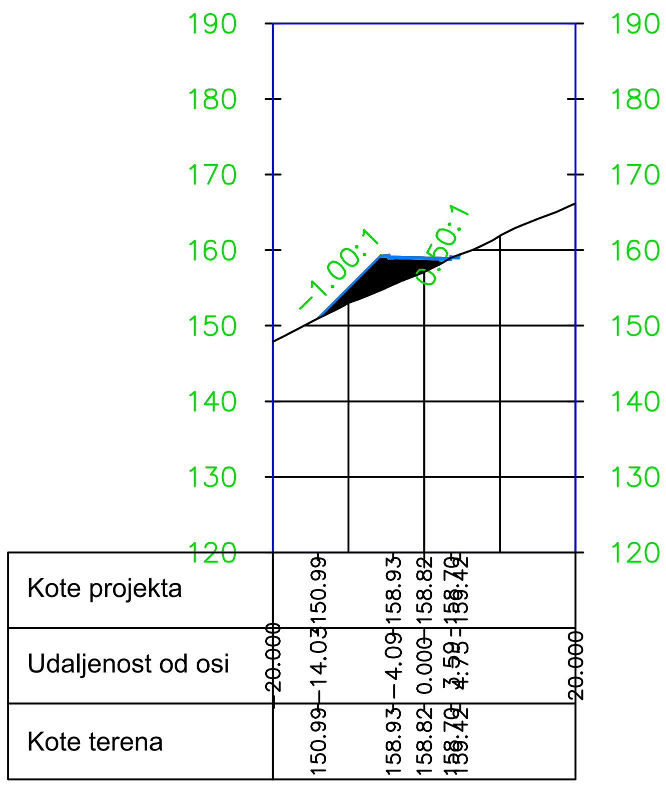
0+166.55



0+160.00



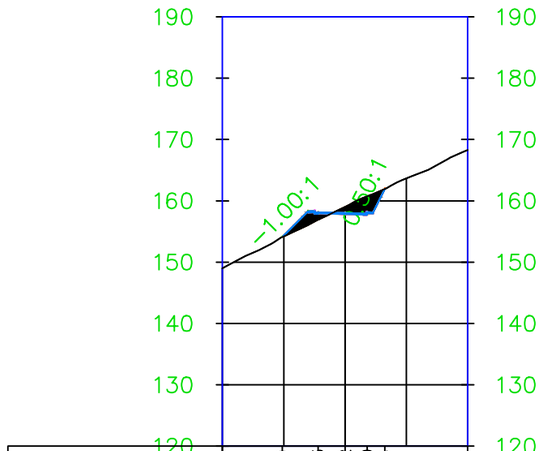
0+180.00



SVEUČILIŠTE U SPLITU, FAKULTET GRAĐEVINARSTVA ARHITEKTURE I GEODEZIJE 2100 SPLIT, MATICE HRVATSKE 15	**ZAVRŠNI RAD - CESTE**		
	IDEJNI PROJEKT LOKALNE CESTE		
	IZRADILA: ANTEA FLEGAR	MENTOR: Prof.dr.sc. Dražen Cvitanić	
	SADRŽAJ: KARAK. POPREČNI PRESJECI	MJERILO: M 1 : 100	
	DATUM: 15.07.2021.	PRILOG: 3	

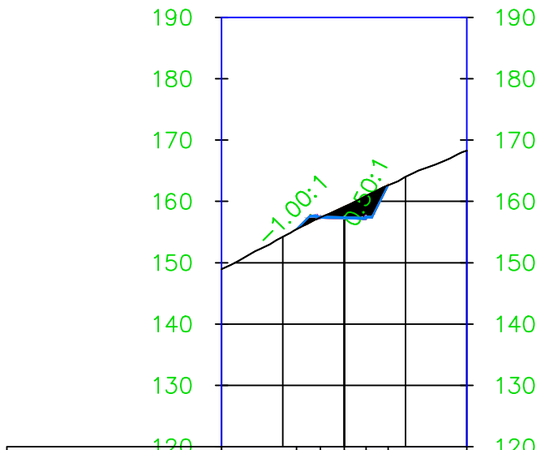
KARAKTERISTIČNI POPREČNI PRESJECI M 1:100

0+200.00



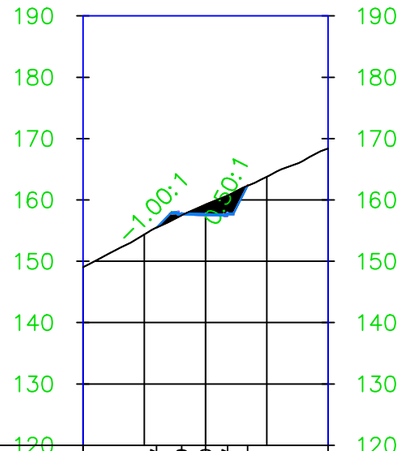
Kote projekta		154.10	157.93	157.82	157.70	161.94			
Udaljenost od osi	20.000	10.24	4.40	0.00	3.59	6.51	20.000		
Kote terena		154.10	157.93	157.82	157.70	161.94			

0+212.12



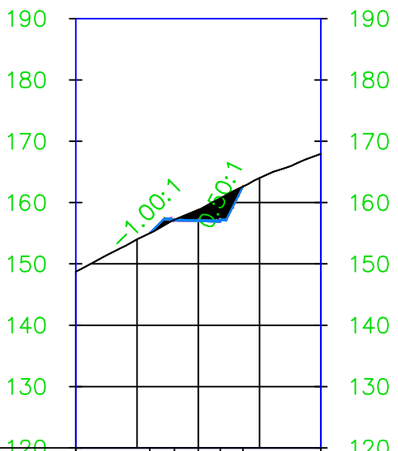
Kote projekta		155.44	157.32	157.22	157.10	162.63			
Udaljenost od osi	20.000	7.77	3.89	0.00	3.59	7.15	20.000		
Kote terena		155.44	157.32	157.22	157.10	162.63			

0+206.55



Kote projekta		155.47	157.59	157.50	157.37	162.31			
Udaljenost od osi	20.000	8.01	3.89	0.00	3.59	6.86	20.000		
Kote terena		155.47	157.59	157.50	157.37	162.31			

0+217.68



Kote projekta		155.00	157.04	156.95	156.82	162.60			
Udaljenost od osi	20.000	7.93	3.89	0.00	3.59	7.28	20.000		
Kote terena		155.00	157.04	156.95	156.82	162.60			

SVEUČILIŠTE U SPLITU

SVEUČILIŠTE U SPLITU,
FAKULTET GRAĐEVINARSTVA
ARHITEKTURE I GEODEZIJE
2100 SPLIT, MATICE HRVATSKE 15

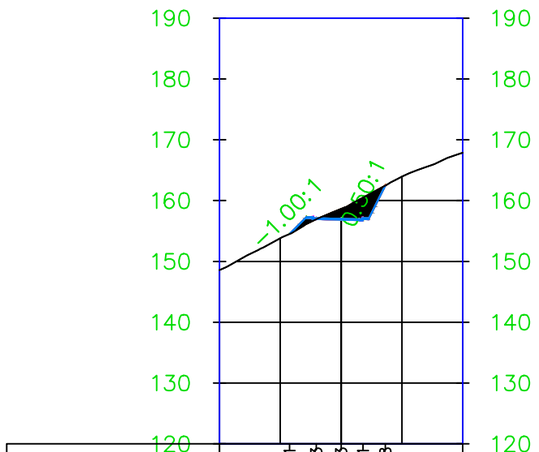
ZAVRŠNI RAD - CESTE

IDEJNI PROJEKT LOKALNE CESTE

IZRADILA: ANTEA FLEGAR		MENTOR: Prof.dr.sc. Dražen Cvitanić	
SADRŽAJ: KARAK. POPREČNI PRESJECI		MJERILO: M 1 : 100	
DATUM: 15.07.2021.		PRILOG: 3	

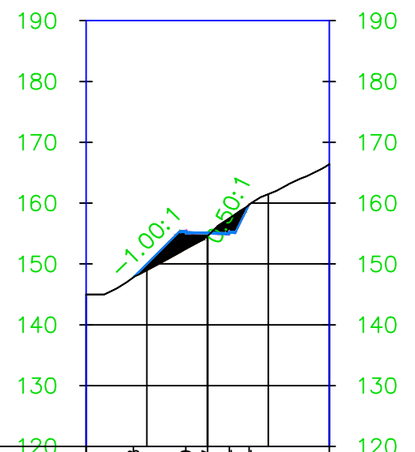
KARAKTERISTIČNI POPREČNI PRESJECI M 1:100

0+220.00



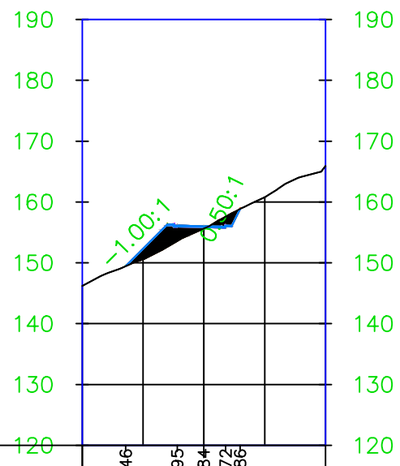
Kote projekta		154.51	156.93	156.83	156.71	162.48		
Udaljenost od osi	20.000	8.50	4.08	0.00	3.59	7.27		20.000
Kote terena		154.51	156.93	156.83	156.71	162.48		

0+257.68



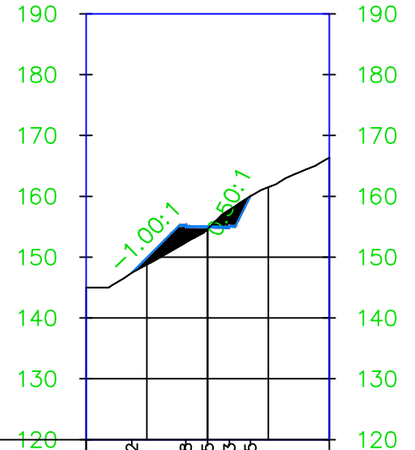
Kote projekta		147.78	154.99	154.97	154.84	159.74		
Udaljenost od osi	20.000	12.21	3.59	0.00	3.59	6.83		20.000
Kote terena		147.78	154.99	154.97	154.84	159.74		

0+240.00



Kote projekta		149.46	155.95	155.84	155.72	158.86		
Udaljenost od osi	20.000	12.84	4.35	0.00	3.59	5.96		20.000
Kote terena		149.46	155.95	155.84	155.72	158.86		

0+260.00



Kote projekta		147.42	154.88	154.85	154.73	160.05		
Udaljenost od osi	20.000	12.46	3.59	0.00	3.59	7.05		20.000
Kote terena		147.42	154.88	154.85	154.73	160.05		

SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA ARHITEKTURE I GEODEZIJE
2100 SPLIT, MATICE HRVATSKE 15

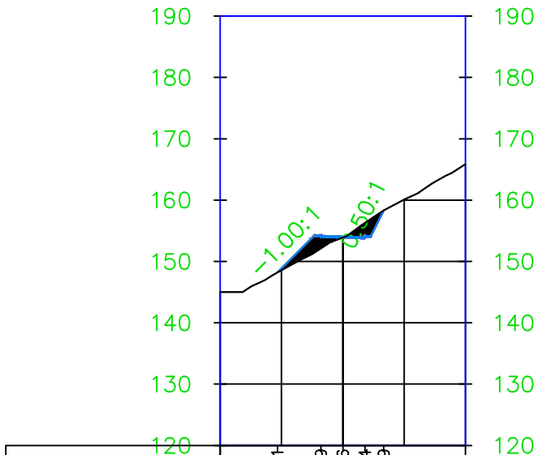
ZAVRŠNI RAD - CESTE

IDEJNI PROJEKT LOKALNE CESTE

IZRADILA: ANTEA FLEGAR	MENTOR: Prof.dr.sc. Dražen Cvitanić
SADRŽAJ: KARAK. POPREČNI PRESJECI	MJERILO: M 1 : 100
DATUM: 15.07.2021.	PRILOG: 3

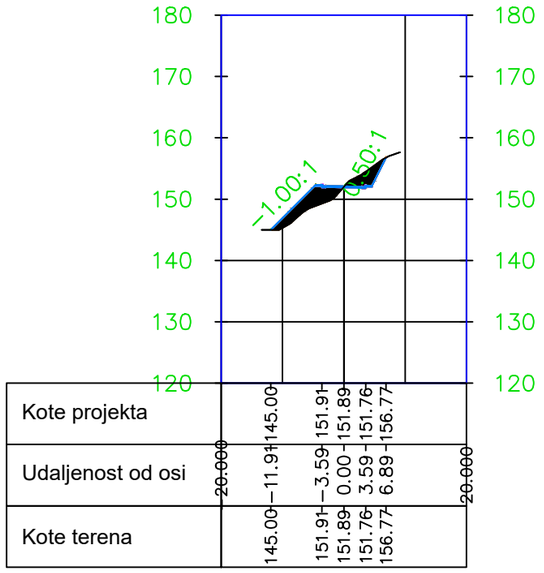
KARAKTERISTIČNI POPREČNI PRESJECI M 1:100

0+280.00



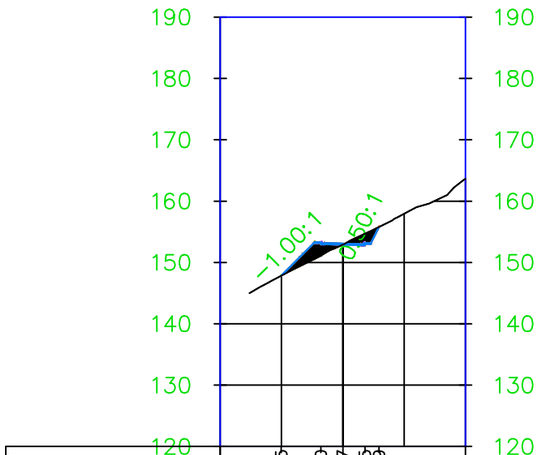
Kote projekta		148.21	153.89	153.86	153.74	158.29		
Udaljenost od osi	20.000	10.67	3.59	0.00	3.59	6.66		20.000
Kote terena		148.21	153.89	153.86	153.74	158.29		

0+320.00



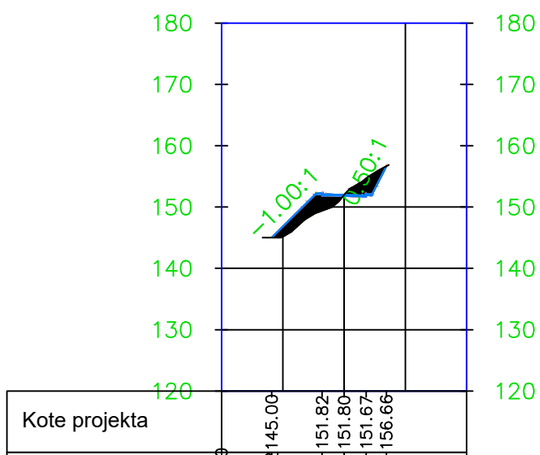
Kote projekta		145.00	151.91	151.89	151.76	156.77		
Udaljenost od osi	20.000	11.91	3.59	0.00	3.59	6.89		20.000
Kote terena		145.00	151.91	151.89	151.76	156.77		

0+300.00



Kote projekta		147.85	152.90	152.87	152.75	155.79		
Udaljenost od osi	20.000	10.05	3.59	0.000	3.59	5.91		20.000
Kote terena		147.85	152.90	152.87	152.75	155.79		

0+321.73



Kote projekta		145.00	151.82	151.80	151.67	156.66		
Udaljenost od osi	20.000	11.82	3.59	0.00	3.59	6.88		20.000
Kote terena		145.00	151.82	151.80	151.67	156.66		

SVEUČILIŠTE U SPLITU,
FAKULTET GRAĐEVINARSTVA
ARHITEKTURE I GEODEZIJE
2100 SPLIT, MATICE HRVATSKE 15

ZAVRŠNI RAD - CESTE

IDEJNI PROJEKT LOKALNE CESTE

IZRADILA: ANTEA FLEGAR		MENTOR: Prof.dr.sc. Dražen Cvitanić	
SADRŽAJ: KARAK. POPREČNI PRESJECI		MJERILO: M 1 : 100	
DATUM: 15.07.2021.		PRILOG: 3	

4. TABLICA UKUPNOG VOLUMENA ZEMLJANIH RADOVA

Tablica 1. Ukupni volumen zemljanih radova

Stacionaža	Površina usjeka	Volumen usjeka	Površina nasipa	Volumen nasipa	Kumulativni volumen usjeka	Kumulativni volumen nasipa	Kumulativni volumen
0+000.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0+020.000	10.52	105.24	22.18	221.81	105.24	221.81	-116.57
0+040.000	4.22	147.41	23.16	453.46	252.65	675.28	-422.63
0+056.757	2.67	57.67	19.96	361.33	310.32	1036.61	-726.29
0+056.760	2.67	0.00	19.96	0.05	310.33	1036.66	-726.33
0+057.278	2.75	1.40	19.74	10.29	311.73	1046.95	-735.22
0+057.797	2.91	1.47	19.51	10.19	313.20	1057.14	-743.93
0+060.000	3.78	7.36	18.43	41.79	320.56	1098.93	-778.37
0+080.000	18.41	213.83	3.74	227.13	534.39	1326.06	-791.67
0+085.727	23.79	112.57	1.28	14.82	646.96	1340.88	-693.91
0+086.241	24.17	12.33	1.12	0.62	659.29	1341.49	-682.20
0+086.757	24.69	12.60	0.97	0.54	671.90	1342.03	-670.14
0+100.000	51.95	477.94	0.00	6.69	1149.84	1348.72	-198.88
0+103.930	54.72	199.22	0.00	0.00	1349.05	1348.72	0.34
0+120.000	22.52	592.35	0.00	0.00	1941.41	1348.72	592.69
0+121.103	20.87	22.94	0.00	0.00	1964.35	1348.72	615.63
0+121.619	20.27	10.61	0.00	0.00	1974.96	1348.72	626.24
0+122.133	19.81	10.30	0.00	0.00	1985.26	1348.72	636.55
0+128.227	12.93	95.81	0.07	0.24	2081.08	1348.96	732.12
0+140.000	3.28	92.33	15.17	93.04	2173.41	1442.00	731.41
0+150.063	1.14	21.89	20.58	182.51	2195.30	1624.51	570.79
0+150.582	1.09	0.58	21.31	10.87	2195.88	1635.38	560.50
0+151.100	1.04	0.55	22.09	11.24	2196.43	1646.62	549.81
0+151.103	1.04	0.00	22.09	0.06	2196.43	1646.68	549.75
0+160.000	0.03	4.76	35.17	254.72	2201.20	1901.40	299.79
0+166.550	0.00	0.11	40.05	246.34	2201.31	2147.74	53.57
0+166.553	0.00	0.00	40.05	0.12	2201.31	2147.86	53.45
0+166.939	0.00	0.00	40.30	15.51	2201.31	2163.37	37.94
0+167.324	0.00	0.00	40.63	15.59	2201.31	2178.96	22.35
0+180.000	0.38	2.45	38.09	494.04	2203.76	2672.99	-469.24

0+187.553	2.67	11.72	27.43	240.72	2215.48	2913.71	-698.23
0+191.797	6.18	19.19	21.19	99.10	2234.67	3012.81	-778.14
0+200.000	15.04	89.16	8.26	114.62	2323.83	3127.43	-803.60
0+205.505	19.10	96.46	3.21	29.61	2420.29	3157.04	-736.75
0+206.028	19.36	10.06	2.89	1.60	2430.35	3158.64	-728.28
0+206.553	19.59	10.23	2.65	1.45	2440.58	3160.09	-719.51
0+212.115	22.76	121.09	1.86	11.72	2561.67	3171.81	-610.14
0+217.677	23.66	132.79	1.96	9.93	2694.46	3181.75	-487.29
0+218.202	23.57	12.40	2.10	1.07	2706.85	3182.81	-475.96
0+218.726	23.39	12.29	2.25	1.14	2719.14	3183.95	-464.81
0+220.000	22.69	29.36	2.46	3.00	2748.51	3186.95	-438.45
0+236.677	8.77	268.38	18.67	166.88	3016.89	3353.83	-336.95
0+240.000	6.27	25.45	23.63	67.84	3042.33	3421.67	-379.34
0+256.906	10.41	142.33	22.15	381.08	3184.66	3802.76	-618.10
0+257.291	10.52	4.03	21.98	8.50	3188.69	3811.26	-622.57
0+257.677	10.71	4.10	21.94	8.48	3192.79	3819.73	-626.95
0+257.680	10.71	0.03	21.94	0.06	3192.81	3819.79	-626.98
0+260.000	12.76	27.22	22.12	51.11	3220.04	3870.90	-650.86
0+280.000	9.86	226.24	13.59	357.08	3446.27	4227.98	-781.71
0+300.000	6.75	166.16	12.64	262.23	3612.43	4490.20	-877.77
0+320.000	12.12	188.70	23.39	360.26	3801.14	4850.46	-1049.33
0+321.730	13.02	21.74	22.71	39.87	3822.87	4890.33	-1067.46

5. OBRADA NA RAČUNALU

5. OBRADA NA RAČUNALU

Koristeći se računalnim programom AutoCAD Civil 3D izbjegava se sporija i kompliciranija izrada idejnog projekta ceste klasičnim ručnim načinom izrade.

Za geodetsku podlogu korištena je već postojeća podloga koju je potrebno skenirati i dodatno prilagoditi mjerilu. Zatim se pomoću podloge iscrtavaju slojnice koristeći se naredbom polyline i definira se nadmorska visina pojedine slojnice. Naredni korak je izrada prostornog modela terena koji nastaje postupkom triangulacije na temelju iscrtanih slojnica.

Izrada horizontalnog toka trase obuhvaća iscrtavanje tangenti i definiranje horizontalne geometrije (prijelaznice, kružni lukovi) koristeći se naredbom alignment. Osim brze i jednostavne izrade same geometrije, računalni program također ispisuje sve potrebne karakteristike i oznake horizontalnog toka trase.

Sljedeći korak je izrada dijagrama vitoperenja pomoću naredbe edit superelevation. Zbog američkih standarda vitoperenja koji se razlikuju od europskih potrebno je provesti dodatne korekcije na području prijelaznica.

Izrada vertikalnog toka trase obuhvaća izradu terena i ucrtavanje tangenti nivelete pomoću naredbe profile. Niveleta se postavlja tako da se zadovolje geometrijski i sigurnosni elementi te odvodnja. Vertikalnu geometriju čini jedna konkavna krivina i jednostavno se iscrtava sa zadanim radijusom i tipom krivine.

Slijedi definiranje poprečnog presjeka ceste koristeći se naredbom assembly. Poprečni presjek je definiran oblikom traka ceste i rigola, zatim širinom bankine te nagibom pokosa usjeka i nasipa. Pomoću definiranog poprečnog presjeka, vertikalnog i horizontalnog toka trase izrađuje se 3D model ceste odnosno koridor.

Nakon što je koridor definiran, omogućena je brza izrada svih karakterističnih poprečnih presjeka postavljenih u pet karakterističnih točaka horizontalne krivine te svako 20 m od početka do kraja trase služeći se naredbom sample lines.

Računalni ispisi glavnih točaka osi ceste, detaljnih točaka osi ceste, kota kolnika te vertikalnog toka trase izrađuju se pomoću naredbe report manager.

Kartica naredbi analyze i naredba volumes dashboard omogućava proračun količina zemljanih radova za troškovnik (računa se ukupna količina radova za cijelu trasu na temelju definiranih površina). Također na kartici naredbi analyze nalazi se i naredba compute materials pomoću koje se izradi proračun količina radova za dokaznicu mjera (računaju se količine radova po presjecima i kumulativno).

6. IZLAZNI PODACI IZ PROGRAMA

6.1 Koordinatni račun glavnih točaka

Tablica 2. Koordinatni račun glavnih točaka

Tangent Data

Description	PT Station	Northing	Easting
Start:	0+00.000	92.202	868.111
End:	0+56.757	139.489	899.500

Tangent Data

Parameter	Value	Parameter	Value
Length:	56.757	Course:	N 33° 34' 34.2655" E

Spiral Point Data

Description	Station	Northing	Easting
TS:	0+56.757	139.489	899.500
SPI:		156.207	910.598
SC:	0+86.757	162.951	918.062

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length:	30.000	L Tan:	20.066
Radius:	60.000	S Tan:	10.060
Theta:	14° 19' 26.2016"	P:	0.624
X:	29.813	K:	14.969
Y:	2.489	A:	42.426
Chord:	29.917	Course:	N 38° 20' 53.8910" E

Curve Point Data

Description	Station	Northing	Easting
SC:	0+86.757	162.951	918.062
RP:		118.433	958.287
CS:	1+21.103	177.644	948.588

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	32° 47' 50.6821"	Type:	RIGHT
Radius:	60.000		
Length:	34.345	Tangent:	17.657
Mid-Ord:	2.441	External:	2.544
Chord:	33.878	Course:	N 64° 17' 55.8081" E

Spiral Point Data

Description	Station	Northing	Easting
CS:	1+21.103	177.644	948.588
SPI:		179.270	958.516
ST:	1+51.103	177.513	978.505

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length:	30.000	L Tan:	20.066
Radius:	60.000	S Tan:	10.060
Theta:	14° 19' 26.2016"	P:	0.624
X:	29.813	K:	14.969
Y:	2.489	A:	42.426
Chord:	29.917	Course:	S 89° 45' 02.2747" E

Tangent Data

Description	PT Station	Northing	Easting
Start:	1+51.103	177.513	978.505
End:	1+66.553	176.161	993.896

Tangent Data

Parameter	Value	Parameter	Value
Length:	15.450	Course:	S 84° 58' 42.6493" E

Spiral Point Data

Description	Station	Northing	Easting
TS:	1+66.553	176.161	993.896
SPI:		173.821	1020.529
SC:	2+06.553	175.618	1033.805

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length:	40.000	L Tan:	26.736
Radius:	90.000	S Tan:	13.396
Theta:	12° 43' 56.6236"	P:	0.739
X:	39.803	K:	19.967
Y:	2.953	A:	60.000
Chord:	39.912	Course:	S 89° 13' 15.1287" E

Curve Point Data

Description	Station	Northing	Easting
SC:	2+06.553	175.618	1033.805
RP:		264.804	1021.729
CS:	2+17.677	177.787	1044.708

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	07° 04' 54.9758"	Type:	LEFT
Radius:	90.000		
Length:	11.124	Tangent:	5.569
Mid-Ord:	0.172	External:	0.172

Chord:	11.117	Course:	N 78° 44' 53.2392" E

Spiral Point Data

Description	Station	Northing	Easting
CS:	2+17.677	177.787	1044.708
SPI:		181.208	1057.660
ST:	2+57.677	193.564	1081.370

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length:	40.000	L Tan:	26.736
Radius:	90.000	S Tan:	13.396
Theta:	12° 43' 56.6236"	P:	0.739
X:	39.803	K:	19.967
Y:	2.953	A:	60.000
Chord:	39.912	Course:	N 66° 43' 01.6071" E

Tangent Data

Description	PT Station	Northing	Easting
Start:	2+57.677	193.564	1081.370
End:	3+21.730	223.165	1138.172

Tangent Data

Parameter	Value	Parameter	Value
Length:	64.052	Course:	N 62° 28' 29.1277" E

Alignment: os 1-Left-2.950
Description:

Tangent Data

Description	PT Station	Northing	Easting
Start:	0+00.000	93.833	865.653
End:	0+56.757	141.120	897.042

Tangent Data

Parameter	Value	Parameter	Value
Length:	56.757	Course:	N 33° 34' 34.2655" E

Spiral Point Data

Description	Station	Northing	Easting
TS:	0+56.757	141.120	897.042
SPI:		158.147	908.345
SC:	0+87.495	165.140	916.084

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value

Length:	30.738	L Tan:	20.556
Radius:	62.950	S Tan:	10.304
Theta:	13° 59' 17.9387"	P:	0.624
X:	30.555	K:	15.338
Y:	2.491	A:	43.988
Chord:	30.652	Course:	N 38° 24' 20.2977" E

Curve Point Data

Description	Station	Northing	Easting
SC:	0+87.495	165.140	916.084
RP:		118.433	958.287
CS:	1+23.529	180.555	948.112

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	32° 47' 50.6821"	Type:	RIGHT
Radius:	62.950		
Length:	36.034	Tangent:	18.526
Mid-Ord:	2.561	External:	2.669
Chord:	35.544	Course:	N 64° 17' 55.8081" E

Spiral Point Data

Description	Station	Northing	Easting
CS:	1+23.529	180.555	948.112
SPI:		182.241	958.405
ST:	1+54.266	180.452	978.763

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length:	30.738	L Tan:	20.556
Radius:	62.950	S Tan:	10.304
Theta:	13° 59' 17.9387"	P:	0.624
X:	30.555	K:	15.338
Y:	2.491	A:	43.988
Chord:	30.652	Course:	S 89° 48' 28.6815" E

Tangent Data

Description	PT Station	Northing	Easting
Start:	1+54.266	180.452	978.763
End:	1+69.717	179.100	994.154

Tangent Data

Parameter	Value	Parameter	Value
Length:	15.450	Course:	S 84° 58' 42.6493" E

Curve Point Data

Description	Station	Northing	Easting
PC:	1+69.717	179.100	994.154
RP:		187.069	994.854
PT:	1+70.489	179.069	994.925

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	05° 31' 49.3559"	Type:	LEFT
Radius:	8.000		
Length:	0.772	Tangent:	0.386
Mid-Ord:	0.009	External:	0.009
Chord:	0.772	Course:	S 87° 44' 37.3272" E

Tangent Data

Description	PT Station	Northing	Easting
Start:	1+70.489	179.069	994.925
End:	2+07.845	179.401	1032.280

Tangent Data

Parameter	Value	Parameter	Value
Length:	37.356	Course:	N 89° 29' 27.9948" E

Curve Point Data

Description	Station	Northing	Easting
PC:	2+07.845	179.401	1032.280
RP:		187.401	1032.209
PCC:	2+08.851	179.473	1033.283

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	07° 12' 07.2677"	Type:	LEFT
Radius:	8.000		
Length:	1.006	Tangent:	0.503
Mid-Ord:	0.016	External:	0.016
Chord:	1.005	Course:	N 85° 53' 24.3610" E

Curve Point Data

Description	Station	Northing	Easting
PCC:	2+08.851	179.473	1033.283
RP:		264.804	1021.729
PCC:	2+19.494	181.549	1043.715

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	07° 04' 54.9758"	Type:	LEFT

Radius:	86.110		
Length:	10.643	Tangent:	5.329
Mid-Ord:	0.164	External:	0.165
Chord:	10.637	Course:	N 78° 44' 53.2392" E

Curve Point Data

Description	Station	Northing	Easting
PCC:	2+19.494	181.549	1043.715
RP:		189.283	1041.672
PT:	2+20.500	181.866	1044.668

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	07° 12' 07.2677"	Type:	LEFT
Radius:	8.000		
Length:	1.006	Tangent:	0.503
Mid-Ord:	0.016	External:	0.016
Chord:	1.005	Course:	N 71° 36' 22.1174" E

Tangent Data

Description	PT Station	Northing	Easting
Start:	2+20.500	181.866	1044.668
End:	2+57.856	195.856	1079.306

Tangent Data

Parameter	Value	Parameter	Value
Length:	37.356	Course:	N 68° 00' 18.4836" E

Curve Point Data

Description	Station	Northing	Easting
PC:	2+57.856	195.856	1079.306
RP:		203.274	1076.310
PT:	2+58.628	196.180	1080.007

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	05° 31' 49.3559"	Type:	LEFT
Radius:	8.000		
Length:	0.772	Tangent:	0.386
Mid-Ord:	0.009	External:	0.009
Chord:	0.772	Course:	N 65° 14' 23.8056" E

Tangent Data

Description	PT Station	Northing	Easting
Start:	2+58.628	196.180	1080.007

End:	3+22.681	225.781	1136.809

Tangent Data

Parameter	Value	Parameter	Value
Length:	64.052	Course:	N 62° 28' 29.1277" E

Alignment: os 1-Right-2.950
Description:

Tangent Data

Description	PT Station	Northing	Easting
Start:	0+00.000	90.570	870.569
End:	0+56.757	137.857	901.958

Tangent Data

Parameter	Value	Parameter	Value
Length:	56.757	Course:	N 33° 34' 34.2655" E

Curve Point Data

Description	Station	Northing	Easting
PC:	0+56.757	137.857	901.958
RP:		133.433	908.623
PT:	0+57.799	138.686	902.589

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	07° 27' 45.2989"	Type:	RIGHT
Radius:	8.000		
Length:	1.042	Tangent:	0.522
Mid-Ord:	0.017	External:	0.017
Chord:	1.041	Course:	N 37° 18' 26.9149" E

Tangent Data

Description	PT Station	Northing	Easting
Start:	0+57.799	138.686	902.589
End:	0+84.786	159.040	920.307

Tangent Data

Parameter	Value	Parameter	Value
Length:	26.986	Course:	N 41° 02' 19.5643" E

Curve Point Data

Description	Station	Northing	Easting
PC:	0+84.786	159.040	920.307
RP:		153.788	926.342
PCC:	0+85.744	159.724	920.978

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	06° 51' 40.9027"	Type:	RIGHT
Radius:	8.000		
Length:	0.958	Tangent:	0.480
Mid-Ord:	0.014	External:	0.014
Chord:	0.957	Course:	N 44° 28' 10.0157" E

Curve Point Data

Description	Station	Northing	Easting
PCC:	0+85.744	159.724	920.978
RP:		118.433	958.287
PCC:	1+17.599	173.351	949.292

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	32° 47' 50.6821"	Type:	RIGHT
Radius:	55.650		
Length:	31.855	Tangent:	16.377
Mid-Ord:	2.264	External:	2.360
Chord:	31.422	Course:	N 64° 17' 55.8081" E

Curve Point Data

Description	Station	Northing	Easting
PCC:	1+17.599	173.351	949.292
RP:		165.456	950.585
PT:	1+18.557	173.449	950.244

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	06° 51' 40.9027"	Type:	RIGHT
Radius:	8.000		
Length:	0.958	Tangent:	0.480
Mid-Ord:	0.014	External:	0.014
Chord:	0.957	Course:	N 84° 07' 41.6005" E

Tangent Data

Description	PT Station	Northing	Easting
Start:	1+18.557	173.449	950.244
End:	1+45.543	174.598	977.206

Tangent Data

Parameter	Value	Parameter	Value
Length:	26.986	Course:	N 87° 33' 32.0519" E

Curve Point Data

Description	Station	Northing	Easting
PC:	1+45.543	174.598	977.206
RP:		166.605	977.547
PT:	1+46.585	174.575	978.247

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	07° 27' 45.2989"	Type:	RIGHT
Radius:	8.000		
Length:	1.042	Tangent:	0.522
Mid-Ord:	0.017	External:	0.017
Chord:	1.041	Course:	S 88° 42' 35.2987" E

Tangent Data

Description	PT Station	Northing	Easting
Start:	1+46.585	174.575	978.247
End:	1+62.035	173.222	993.638

Tangent Data

Parameter	Value	Parameter	Value
Length:	15.450	Course:	S 84° 58' 42.6493" E

Spiral Point Data

Description	Station	Northing	Easting
TS:	1+62.035	173.222	993.638
SPI:		170.853	1020.599
SC:	2+02.691	172.695	1034.200

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length:	40.656	L Tan:	27.172
Radius:	92.950	S Tan:	13.614
Theta:	12° 31' 49.2538"	P:	0.740
X:	40.462	K:	20.295
Y:	2.954	A:	61.473
Chord:	40.566	Course:	S 89° 15' 18.4046" E

Curve Point Data

Description	Station	Northing	Easting
SC:	2+02.691	172.695	1034.200
RP:		264.804	1021.729
CS:	2+14.180	174.935	1045.461

Circular Curve Data

Parameter	Value	Parameter	Value

Delta:	07° 04' 54.9758"	Type:	LEFT
Radius:	92.950		
Length:	11.489	Tangent:	5.752
Mid-Ord:	0.177	External:	0.178
Chord:	11.482	Course:	N 78° 44' 53.2392" E

Spiral Point Data

Description	Station	Northing	Easting
CS:	2+14.180	174.935	1045.461
SPI:		178.440	1058.732
ST:	2+54.835	190.948	1082.733

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length:	40.656	L Tan:	27.172
Radius:	92.950	S Tan:	13.614
Theta:	12° 31' 49.2538"	P:	0.740
X:	40.462	K:	20.295
Y:	2.954	A:	61.473
Chord:	40.566	Course:	N 66° 45' 04.8831" E

Tangent Data

Description	PT Station	Northing	Easting
Start:	2+54.835	190.948	1082.733
End:	3+18.888	220.549	1139.536

Tangent Data

Parameter	Value	Parameter	Value
Length:	64.052	Course:	N 62° 28' 29.1277" E

6.2 Koordinatni račun detaljnih točaka osi

Tablica 3. Koordinatni račun detaljnih točaka osi

Station	Northing	Easting	Tangential Direction
0+000.00	92.2015m	868.1108m	N33° 34' 34"E
0+020.00	108.8645m	879.1717m	N33° 34' 34"E
0+040.00	125.5276m	890.2326m	N33° 34' 34"E
0+060.00	142.1888m	901.2962m	N33° 44' 37"E
0+080.00	158.1681m	913.2926m	N42° 10' 27"E
0+100.00	170.6776m	928.7837m	N60° 32' 45"E
0+120.00	177.4553m	947.5020m	N79° 38' 40"E
0+140.00	178.3588m	967.4351m	S86° 56' 26"E
0+160.00	176.7346m	987.3681m	S84° 58' 43"E
0+180.00	175.0962m	1,007.3003m	S86° 25' 03"E
0+200.00	174.9631m	1,027.2856m	N86° 07' 09"E
0+220.00	178.4089m	1,046.9460m	N73° 46' 17"E
0+240.00	185.6226m	1,065.5785m	N64° 57' 41"E
0+260.00	194.6371m	1,083.4299m	N62° 28' 29"E
0+280.00	203.8799m	1,101.1660m	N62° 28' 29"E
0+300.00	213.1226m	1,118.9021m	N62° 28' 29"E
0+320.00	222.3654m	1,136.6383m	N62° 28' 29"E

6.3 Račun kota kolnika

Tablica 4. Račun kota kolnika

CHAINAGE 0+000.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	857.9116	98.9717	162.5818	-12.242m	Daylight
2	864.2852	94.7409	170.2318	-4.592m	Hinge
3	864.2861	94.7404	170.0317	-4.591m	EPS_Sub
4	865.1184	94.1879	170.2718	-3.592m	Back_Curb
5	865.2434	94.1049	170.2718	-3.442m	Top_Curb
6	865.2781	94.0819	170.0468	-3.400m	Flowline_Gutter
7	865.6530	93.8330	169.8738	-2.950m	ETW_SubBase
8	865.6530	93.8330	170.0738	-2.950m	Flange
9	870.5686	90.5700	169.9263	2.950m	Flange
10	870.5686	90.5700	169.7263	2.950m	ETW_SubBase
11	870.9435	90.3212	169.8993	3.400m	Flowline_Gutter
12	870.9783	90.2981	170.1243	3.442m	Top_Curb
13	871.1032	90.2151	170.1243	3.592m	Back_Curb
14	871.9356	89.6626	169.8843	4.591m	EPS_Sub
15	871.9364	89.6621	170.0843	4.592m	EPS

CHAINAGE 0+020.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	869.7058	115.1480	162.2119	-11.362m	Daylight
2	875.3461	111.4039	168.9817	-4.592m	Hinge
3	875.3470	111.4034	168.7817	-4.591m	EPS_Sub
4	876.1793	110.8509	169.0217	-3.592m	Back_Curb
5	876.3043	110.7679	169.0217	-3.442m	Top_Curb
6	876.3390	110.7449	168.7967	-3.400m	Flowline_Gutter
7	876.7139	110.4960	168.8237	-2.950m	ETW
8	876.7139	110.4960	168.6237	-2.950m	ETW_SubBase
9	881.6295	107.2330	168.6762	2.950m	Flange
10	881.6295	107.2330	168.4762	2.950m	ETW_SubBase
11	882.0044	106.9842	168.6492	3.400m	Flowline_Gutter
12	882.0392	106.9611	168.8742	3.442m	Top_Curb
13	882.1642	106.8782	168.8742	3.592m	Back_Curb
14	882.9965	106.3257	168.6342	4.591m	EPS_Sub
15	882.9973	106.3251	168.8342	4.592m	Hinge_Cut
16	884.8847	105.0723	173.3649	6.857m	Daylight

CHAINAGE 0+040.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	880.6074	131.9167	160.7707	-11.553m	Daylight
2	886.4071	128.0670	167.7317	-4.592m	Hinge

3	886.4079	128.0664	167.5317	-4.591m	EPS_Sub
4	887.2402	127.5139	167.7717	-3.592m	Back_Curb
5	887.3652	127.4310	167.7717	-3.442m	Top_Curb
6	887.3999	127.4079	167.5467	-3.400m	Flowline_Gutter
7	887.7748	127.1590	167.5737	-2.950m	ETW
8	887.7748	127.1590	167.3737	-2.950m	ETW_SubBase
9	892.6904	123.8961	167.4262	2.950m	Flange
10	892.6904	123.8961	167.2262	2.950m	ETW_SubBase
11	893.0653	123.6472	167.3992	3.400m	Flowline_Gutter
12	893.1001	123.6241	167.6242	3.442m	Top_Curb
13	893.2251	123.5412	167.6242	3.592m	Back_Curb
14	894.0574	122.9887	167.3842	4.591m	EPS_Sub
15	894.0582	122.9881	167.5842	4.592m	Hinge_Cut
16	894.9816	122.3752	169.8008	5.700m	Daylight

CHAINAGE 0+060.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	897.4790	144.7387	166.4817	-4.590m	EPS
2	897.4799	144.7382	166.2817	-4.589m	EPS_Sub
3	898.3106	144.1833	166.5217	-3.590m	Back_Curb
4	898.4353	144.0999	166.5217	-3.440m	Top_Curb
5	898.4700	144.0768	166.2967	-3.399m	Flowline_Gutter
6	898.8442	143.8268	166.3237	-2.949m	ETW
7	898.8442	143.8268	166.1237	-2.949m	ETW_SubBase
8	904.0419	140.3546	166.1674	3.302m	Flange
9	904.0419	140.3546	165.9674	3.302m	ETW_SubBase
10	904.4161	140.1047	166.1404	3.752m	Flowline_Gutter
11	904.4508	140.0815	166.3654	3.794m	Top_Curb
12	904.5755	139.9982	166.3654	3.944m	Back_Curb
13	905.4062	139.4433	166.1254	4.943m	EPS_Sub
14	905.4070	139.4427	166.3254	4.944m	EPS
15	906.3058	138.8423	168.4871	6.025m	Daylight

CHAINAGE 0+080.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	909.8896	161.2510	165.2318	-4.592m	EPS
2	909.8903	161.2503	165.0318	-4.591m	EPS_Sub
3	910.6307	160.5796	165.2718	-3.592m	Back_Curb
4	910.7418	160.4789	165.2718	-3.442m	Top_Curb
5	910.7728	160.4509	165.0468	-3.400m	Flowline_Gutter
6	911.1063	160.1488	165.0738	-2.950m	ETW
7	911.1063	160.1488	164.8738	-2.950m	ETW_SubBase

8	916.7900	154.9997	164.8820	4.719m	Flange
9	916.7900	154.9997	164.6820	4.719m	ETW_SubBase
10	917.1235	154.6976	164.8550	5.169m	Flowline_Gutter
11	917.1544	154.6696	165.0800	5.211m	Top_Curb
12	917.2656	154.5689	165.0800	5.361m	Back_Curb
13	918.0060	153.8982	164.8400	6.360m	EPS_Sub
14	918.0067	153.8975	165.0400	6.361m	EPS
15	919.9800	152.1099	170.3651	9.023m	Daylight

CHAINAGE 0+100.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	926.4453	174.8184	164.3092	-4.755m	Daylight
2	926.5259	174.6759	163.9817	-4.592m	EPS
3	926.5264	174.6750	163.7817	-4.591m	EPS_Sub
4	927.0176	173.8051	164.0217	-3.592m	Back_Curb
5	927.0913	173.6745	164.0217	-3.442m	Top_Curb
6	927.1118	173.6382	163.7967	-3.400m	Flowline_Gutter
7	927.3331	173.2464	163.8237	-2.950m	ETW
8	927.3331	173.2464	163.6237	-2.950m	ETW_SubBase
9	930.9227	166.8899	163.4412	4.350m	ETW_SubBase
10	930.9227	166.8899	163.6412	4.350m	ETW
11	931.1440	166.4980	163.6142	4.800m	Flowline_Gutter
12	931.1645	166.4617	163.8392	4.842m	Top_Curb
13	931.2383	166.3311	163.8392	4.992m	Back_Curb
14	931.7295	165.4612	163.5992	5.991m	EPS_Sub
15	931.7300	165.4604	163.7992	5.992m	Hinge_Cut
16	933.4900	162.3437	170.9579	9.571m	Daylight

CHAINAGE 0+120.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	946.6576	182.0759	162.9426	-4.697m	Daylight
2	946.6766	181.9722	162.7317	-4.592m	EPS
3	946.6768	181.9713	162.5317	-4.591m	EPS_Sub
4	946.8563	180.9885	162.7717	-3.592m	Back_Curb
5	946.8833	180.8410	162.7717	-3.442m	Top_Curb
6	946.8908	180.7999	162.5467	-3.400m	Flowline_Gutter
7	946.9717	180.3573	162.5737	-2.950m	ETW
8	946.9717	180.3573	162.3737	-2.950m	ETW_SubBase
9	948.2839	173.1762	162.1912	4.350m	ETW_SubBase
10	948.2839	173.1762	162.3912	4.350m	ETW
11	948.3648	172.7335	162.3642	4.800m	Flowline_Gutter
12	948.3723	172.6925	162.5892	4.842m	Top_Curb

13	948.3993	172.5449	162.5892	4.992m	Back_Curb
14	948.5788	171.5622	162.3492	5.991m	EPS_Sub
15	948.5790	171.5612	162.5492	5.992m	Hinge_Cut
16	948.9093	169.7537	166.2241	7.829m	Daylight

CHAINAGE 0+140.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	967.9044	187.1406	157.2935	-8.794m	Daylight
2	967.6801	182.9441	161.4960	-4.592m	Hinge
3	967.6801	182.9431	161.2960	-4.591m	EPS_Sub
4	967.6268	181.9455	161.5360	-3.592m	Back_Curb
5	967.6188	181.7957	161.5360	-3.442m	Top_Curb
6	967.6165	181.7541	161.3110	-3.400m	Flowline_Gutter
7	967.5925	181.3047	161.3380	-2.950m	ETW
8	967.5925	181.3047	161.1380	-2.950m	ETW_SubBase
9	967.2113	174.1721	161.1594	4.193m	Flange
10	967.2113	174.1721	160.9594	4.193m	ETW_SubBase
11	967.1873	173.7227	161.1324	4.643m	Flowline_Gutter
12	967.1850	173.6811	161.3574	4.684m	Top_Curb
13	967.1770	173.5313	161.3574	4.834m	Back_Curb
14	967.1237	172.5337	161.1174	5.833m	EPS_Sub
15	967.1236	172.5327	161.3174	5.834m	Hinge_Cut
16	967.0848	171.8069	162.7711	6.561m	Daylight

CHAINAGE 0+160.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	988.5042	189.6648	151.9470	-12.980m	Daylight
2	987.7700	181.3087	160.3353	-4.592m	Hinge
3	987.7699	181.3077	160.1353	-4.591m	EPS_Sub
4	987.6825	180.3125	160.3753	-3.592m	Back_Curb
5	987.6693	180.1631	160.3753	-3.442m	Top_Curb
6	987.6657	180.1215	160.1503	-3.400m	Flowline_Gutter
7	987.6263	179.6733	159.9773	-2.950m	ETW_SubBase
8	987.6263	179.6733	160.1773	-2.950m	Flange
9	987.1099	173.7959	160.0298	2.950m	Flange
10	987.1099	173.7959	159.8298	2.950m	ETW_SubBase
11	987.0705	173.3476	160.0028	3.400m	Flowline_Gutter
12	987.0668	173.3061	160.2278	3.442m	Top_Curb
13	987.0537	173.1567	160.2278	3.592m	Back_Curb
14	986.9663	172.1615	159.9878	4.591m	EPS_Sub
15	986.9662	172.1605	160.1878	4.592m	EPS
16	986.9647	172.1437	160.1710	4.609m	Daylight

CHAINAGE 0+180.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	1,008.1768	189.0953	150.9937	-14.027m	Daylight
2	1,007.6587	180.8200	159.2853	-5.735m	Hinge
3	1,007.6586	180.8190	159.0853	-5.734m	EPS_Sub
4	1,007.5962	179.8219	159.3253	-4.735m	Back_Curb
5	1,007.5868	179.6722	159.3253	-4.585m	Top_Curb
6	1,007.5842	179.6306	159.1003	-4.543m	Flowline_Gutter
7	1,007.5561	179.1815	159.1273	-4.093m	ETW
8	1,007.5561	179.1815	158.9273	-4.093m	ETW_SubBase
9	1,007.1160	172.1518	158.9512	2.950m	Flange
10	1,007.1160	172.1518	158.7512	2.950m	ETW_SubBase
11	1,007.0879	171.7027	158.9242	3.400m	Flowline_Gutter
12	1,007.0853	171.6611	159.1492	3.442m	Top_Curb
13	1,007.0759	171.5114	159.1492	3.592m	Back_Curb
14	1,007.0135	170.5143	158.9092	4.591m	EPS_Sub
15	1,007.0134	170.5134	159.1092	4.592m	Hinge_Cut
16	1,007.0037	170.3578	159.4210	4.748m	Daylight

CHAINAGE 0+200.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	1,026.5927	185.1767	154.0951	-10.237m	Daylight
2	1,026.8766	180.9920	158.2894	-6.043m	Hinge
3	1,026.8767	180.9910	158.0894	-6.042m	EPS_Sub
4	1,026.9443	179.9943	158.3294	-5.043m	Back_Curb
5	1,026.9544	179.8446	158.3294	-4.893m	Top_Curb
6	1,026.9573	179.8030	158.1044	-4.851m	Flowline_Gutter
7	1,026.9877	179.3541	158.1314	-4.401m	ETW
8	1,026.9877	179.3541	157.9314	-4.401m	ETW_SubBase
9	1,027.4852	172.0202	157.9476	2.950m	Flange
10	1,027.4852	172.0202	157.7476	2.950m	ETW_SubBase
11	1,027.5157	171.5712	157.9206	3.400m	Flowline_Gutter
12	1,027.5185	171.5296	158.1456	3.441m	Top_Curb
13	1,027.5287	171.3799	158.1456	3.591m	Back_Curb
14	1,027.5963	170.3832	157.9056	4.590m	EPS_Sub
15	1,027.5963	170.3822	158.1056	4.591m	Hinge_Cut
16	1,027.7260	168.4713	161.9364	6.507m	Daylight

CHAINAGE 0+220.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	1,044.5707	186.5698	154.5130	-8.500m	Daylight

2	1,045.3473	183.9015	157.2921	-5.721m	Hinge
3	1,045.3476	183.9005	157.0921	-5.720m	EPS_Sub
4	1,045.6268	182.9413	157.3321	-4.721m	Back_Curb
5	1,045.6687	182.7973	157.3321	-4.571m	Top_Curb
6	1,045.6804	182.7573	157.1071	-4.529m	Flowline_Gutter
7	1,045.8061	182.3252	157.1341	-4.079m	ETW
8	1,045.8061	182.3252	156.9341	-4.079m	ETW_SubBase
9	1,047.7706	175.5761	156.9583	2.950m	Flange
10	1,047.7706	175.5761	156.7583	2.950m	ETW_SubBase
11	1,047.8963	175.1440	156.9313	3.400m	Flowline_Gutter
12	1,047.9080	175.1040	157.1563	3.442m	Top_Curb
13	1,047.9499	174.9600	157.1563	3.592m	Back_Curb
14	1,048.2291	174.0008	156.9163	4.591m	EPS_Sub
15	1,048.2294	173.9998	157.1163	4.592m	Hinge_Cut
16	1,048.9789	171.4246	162.4804	7.274m	Daylight

CHAINAGE 0+240.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	1,060.1441	197.2562	149.4650	-12.840m	Daylight
2	1,063.0410	191.0548	156.3096	-5.996m	Hinge
3	1,063.0414	191.0539	156.1096	-5.995m	EPS_Sub
4	1,063.4642	190.1488	156.3496	-4.996m	Back_Curb
5	1,063.5277	190.0129	156.3496	-4.846m	Top_Curb
6	1,063.5453	189.9751	156.1246	-4.804m	Flowline_Gutter
7	1,063.7358	189.5674	156.1516	-4.354m	ETW
8	1,063.7358	189.5674	155.9516	-4.354m	ETW_SubBase
9	1,066.8269	182.9501	155.9690	2.950m	Flange
10	1,066.8269	182.9501	155.7690	2.950m	ETW_SubBase
11	1,067.0173	182.5424	155.9420	3.400m	Flowline_Gutter
12	1,067.0350	182.5046	156.1670	3.441m	Top_Curb
13	1,067.0984	182.3687	156.1670	3.591m	Back_Curb
14	1,067.5212	181.4636	155.9270	4.590m	EPS_Sub
15	1,067.5217	181.4627	156.1270	4.591m	Hinge_Cut
16	1,068.0997	180.2253	158.8585	5.957m	Daylight

CHAINAGE 0+260.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	1,077.6716	205.6867	147.4169	-12.460m	Daylight
2	1,081.3078	198.7090	155.2852	-4.592m	Hinge
3	1,081.3083	198.7081	155.0852	-4.591m	EPS_Sub
4	1,081.7700	197.8222	155.3252	-3.592m	Back_Curb
5	1,081.8393	197.6892	155.3252	-3.442m	Top_Curb

6	1,081.8586	197.6522	155.1002	-3.400m	Flowline_Gutter
7	1,082.0665	197.2531	155.1272	-2.950m	ETW
8	1,082.0665	197.2531	154.9272	-2.950m	ETW_SubBase
9	1,084.7932	192.0210	154.9797	2.950m	Flange
10	1,084.7932	192.0210	154.7797	2.950m	ETW_SubBase
11	1,085.0011	191.6219	154.9527	3.400m	Flowline_Gutter
12	1,085.0204	191.5849	155.1777	3.442m	Top_Curb
13	1,085.0897	191.4519	155.1777	3.592m	Back_Curb
14	1,085.5514	190.5660	154.9377	4.591m	EPS_Sub
15	1,085.5519	190.5651	155.1377	4.592m	Hinge_Cut
16	1,086.6859	188.3890	160.0454	7.046m	Daylight

CHAINAGE 0+280.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	1,096.2333	213.3453	148.2140	-10.674m	Daylight
2	1,099.0440	207.9518	154.2959	-4.592m	Hinge
3	1,099.0445	207.9509	154.0959	-4.591m	EPS_Sub
4	1,099.5061	207.0650	154.3359	-3.592m	Back_Curb
5	1,099.5755	206.9320	154.3359	-3.442m	Top_Curb
6	1,099.5947	206.8950	154.1109	-3.400m	Flowline_Gutter
7	1,099.8027	206.4959	154.1379	-2.950m	ETW
8	1,099.8027	206.4959	153.9379	-2.950m	ETW_SubBase
9	1,102.5293	201.2638	153.9904	2.950m	Flange
10	1,102.5293	201.2638	153.7904	2.950m	ETW_SubBase
11	1,102.7373	200.8647	153.9634	3.400m	Flowline_Gutter
12	1,102.7565	200.8277	154.1884	3.442m	Top_Curb
13	1,102.8259	200.6947	154.1884	3.592m	Back_Curb
14	1,103.2875	199.8088	153.9484	4.591m	EPS_Sub
15	1,103.2880	199.8079	154.1484	4.592m	Hinge_Cut
16	1,104.2443	197.9727	158.2872	6.661m	Daylight

CHAINAGE 0+300.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	1,114.2575	222.0354	147.8479	-10.050m	Daylight
2	1,116.7801	217.1946	153.3066	-4.592m	Hinge
3	1,116.7806	217.1937	153.1066	-4.591m	EPS_Sub
4	1,117.2423	216.3078	153.3466	-3.592m	Back_Curb
5	1,117.3116	216.1748	153.3466	-3.442m	Top_Curb
6	1,117.3309	216.1378	153.1216	-3.400m	Flowline_Gutter
7	1,117.5388	215.7387	153.1486	-2.950m	ETW
8	1,117.5388	215.7387	152.9486	-2.950m	ETW_SubBase
9	1,120.2655	210.5066	153.0011	2.950m	Flange

10	1,120.2655	210.5066	152.8011	2.950m	ETW_SubBase
11	1,120.4734	210.1075	152.9741	3.400m	Flowline_Gutter
12	1,120.4927	210.0705	153.1991	3.442m	Top_Curb
13	1,120.5620	209.9375	153.1991	3.592m	Back_Curb
14	1,121.0237	209.0516	152.9591	4.591m	EPS_Sub
15	1,121.0241	209.0507	153.1591	4.592m	Hinge_Cut
16	1,121.6317	207.8848	155.7886	5.906m	Daylight

CHAINAGE 0+320.00

POINT	X	Y	Z	OFFSET	STRING CUT
1	1,131.1347	232.9264	145.0000	-11.909m	Daylight
2	1,134.5163	226.4374	152.3173	-4.592m	Hinge
3	1,134.5167	226.4365	152.1173	-4.591m	EPS_Sub
4	1,134.9784	225.5506	152.3573	-3.592m	Back_Curb
5	1,135.0477	225.4175	152.3573	-3.442m	Top_Curb
6	1,135.0670	225.3806	152.1323	-3.400m	Flowline_Gutter
7	1,135.2750	224.9815	152.1593	-2.950m	ETW
8	1,135.2750	224.9815	151.9593	-2.950m	ETW_SubBase
9	1,138.0016	219.7493	152.0118	2.950m	Flange
10	1,138.0016	219.7493	151.8118	2.950m	ETW_SubBase
11	1,138.2096	219.3503	151.9848	3.400m	Flowline_Gutter
12	1,138.2288	219.3133	152.2098	3.442m	Top_Curb
13	1,138.2982	219.1803	152.2098	3.592m	Back_Curb
14	1,138.7598	218.2944	151.9698	4.591m	EPS_Sub
15	1,138.7603	218.2935	152.1698	4.592m	Hinge_Cut
16	1,139.8240	216.2523	156.7731	6.893m	Daylight

6.4 Vertikalni tok trase

Tablica 5. Vertikalni tok trase

PVI	**Station**	**Grade Out**	**Curve Length**
0.00	0+000.00	-6.25%	
1.00	0+160.00	-4.95%	63.570m
	Vertical Curve Information:(sag curve) PVC Station: 0+128.23 Elevation: 161.986m PVI Station: 0+160.00 Elevation: 160.000m PVT Station: 0+191.80 Elevation: 158.427m Low Point: 0+191.80 Elevation: 158.427m Grade in: -6.25% Grade out: -4.95% Change: 1.30% K: Curve Length: 63.570m Headlight Distance:		
2.00	0+321.73		

7. Literatura

1. Prof. dr. sc. Željko Korlaet, “Uvod u projektiranje i građenje cesta“ , Građevinski Fakultet Sveučilišta u Zagrebu, Zagreb, 1995.
2. Ministarstvo pomorstva, prometa i veza, “Pravilnik o osnovnim uvjetima kojima javne ceste izvan naselja i njihovi elementi moraju udovoljavati sa stajališta sigurnosti prometa“, Narodne novine, Zagreb, 30. studenoga 2001.