



Republic of Macedonia  
Municipality Sveti Nikole

## PROJECT APPRAISAL DOCUMENT

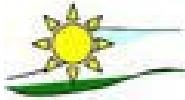
**“Reconstruction of streets, water supply and sewerage system and construction of sidewalks and storm water system in the Municipality Sveti Nikole”**

World Bank

Municipal Services Improvement Project

Skopje, March 2015

The Project's Appraisal Document was prepared by the Center for Promotion of Sustainable Agricultural Practices and Rural Development – CeProSARD, with the exception of Environmental Impact section prepared by the MSIP consultant Slavjanka Pejcinovska-Andonova



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# 1.

## INTRODUCTION

The project assumes reconstruction of two local roads with construction of sidewalks and storm water system and reconstruction of water supply and sewerage system. The total length of the streets, which are the subject of this evaluation, is 1,605.88m, or "Mladinska" has a length of 578.64 and "Krste Misirkov" length of 1,027.24m. The project cost is lower than the credit capacity of the municipality, which provides the loan repayment. The relevance of the project comes from the fact that the biggest part of the municipality residents is directly influenced by negative implications of the inadequate surface of streets and sidewalks, in addition to storm water due to lack of storm water system. However, it should be also emphasized that these streets are the main traffic arteries in the municipality that connect the city and represent shortcut road from one side to the other side in order to avoid the center of the city, whereby it can be inferred that the implementation of the project will have a wider indirect benefit on the community living in the municipality Sveti Nikole. The main purpose of the proposed technical solution is to provide a long range improvement of the streets by maximizing the technical life of the surface, thus meeting the needs of the community in the municipality Sveti Nikole. At the same time, the purpose of the technical design is to provide convenience and safety for pedestrians and traffic by controlling storm water flows, within prescribed limits and to retain within each catchment as much storm water and run-off as possible given the planned use of the terrain and its civil engineering characteristics. Also, the technical design will satisfy the needs of the residents who live on the streets that are subject to this appraisal in respect to the water supply and sewerage system. The proposed technical solution is in-line with the existing standards and positive regulation for this kind of projects, which implies that the implementation of the project is technically feasible.

The project is in accordance to the Program for Development of the municipality Sveti Nikole for 2014 and it will contribute towards achieving the vision of the municipal administration for providing full coverage of transport and communal (utility) infrastructure throughout the municipal territory. The Mayor and the municipal administration strive to achieve full coverage of a transport, storm water, water supply and sewerage system and other communal (utility) infrastructure throughout the municipal territory. It can be inferred that the implementation of the project will undoubtedly contribute towards improvement of the quality of life and well-being of the residents of the municipality Sveti Nikole. Municipality has implemented various similar projects in the past, some of which in collaboration with international institutions, which implies that, is able to implement large construction projects such as this one.

The project is relevant to the development objective of the MSIP because it is considered both cost-efficient and cost-effective, over a long run and also useful for the health of the residents and the environmental protection. No adverse social or environmental impacts were identified.

The cost-benefit analysis showed the project is acceptable and desirable for implementation according to the methods used. In addition, the project will cause significant unquantifiable benefits such as increasing the traffic safety and comfort, increasing the traffic capacity and communications, ensuring a feeling of security by pedestrians, enhancing the commercial activities, as well as extending the outdoor social and recreational activities for the residents living on the streets. The present condition of the streets causes frequent interruption of traffic and forces the residents to search for alternative routes, which ultimately results in fall of productivity. Additionally, the implementation of the project is expected to lead towards reduction of the municipal costs for constant repairs of the streets. Once the project is implemented, the municipality will spend less money for repairs and reallocate them to other municipal services. Flood control will not only reduce the municipal spending, but also private spending on repairs, thus enabling reallocation of the funds to other more beneficial, i.e. productive use. The implementation of the project is also expected to increase the property value for houses and other residential or commercial objects on the streets, thus increasing the growth of revenues.

Furthermore, it is very difficult to relate the benefits of projects of this kind with the economic development and poverty levels in a certain municipality in a short-term. However, taking into account that increasing the quality of the transport infrastructure and increasing the productivity are linked with decreasing poverty, the project will definitely have a wide positive impact on the economic growth and the poverty level, not only in a short term but also in the longer term perspective.



# 2.

## PROJECT DESCRIPTION

## 2.1 General Information on the municipality Sveti Nikole

Sveti Nikole is a relatively large urban municipality located in the middle of the Republic of Macedonia. According to its absolute altitude, it is included in relatively low municipalities in the country. The local communities' areas are spreading in the lowest part of Ovce Pole valley, as well as in the medium high eastern parts of Gradisanska Mountain.

The extension line of the municipality's territory is from north-west to south-east. It borders with the municipalities: Probistip, Kratovo, Orasec, Kumanovo, Petrovec, Veles, Lozovo, Stip and Karbinci. The municipality has quite good geographical position and traffic connection, because of its location in the middle of the country. The highway passes near Sveti Nikole, which through Veles, Lozovo, Stip and Delcevo continues to Bulgaria. The second important arterial road connects this municipality with Kumanovo and the northern parts of the country.

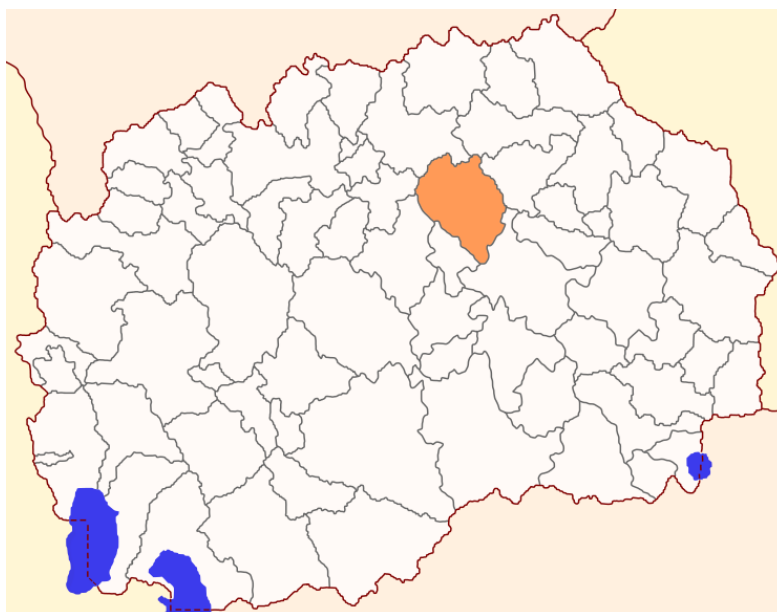


Figure 1: Location of the Municipality Sveti Nikole  
Source: State Statistical Office

Ovce Pole valley is specific in its occurrence and morphological structure. Its entire surface is not completely flat, because its altitude is mostly between 200 and 400 meters and the biggest altitude does not exceed 900 meters. The highest places are: Gjuriste - 856m, the hill Gradiski Rid above the local community Pavleshenci – 789m, Bogoslovec - 756m, Mangovica - 741m, Golem Osoj – 734m and more.

Considering the relief structure of the municipality, most of the local communities (17) are flat, 14 are hilly and there is no mountain settlement at all. Municipality Sveti Nikole due to its configuration and geographic location is at continental and Mediterranean climatic influences.

Municipality covers an area of 477km<sup>2</sup> and it is one of the largest municipalities in the country, but the density of the population is very low, 39 inhabitants per km<sup>2</sup>, therefore it is included in rarely populated municipalities. The municipality consists of 33 local communities: Alakince, Amzabegovo, Arbasanci, Bogoslovec, Burilovci, Gorno Gjugjence, Dolno Gjugjence, Gorno Crniliste, Gorobinci, Delisinci, Dolno Crniliste, Erdzelija, Kadrifakovo, Knezje, Krushica, Makresh, Malino, Gorna Mezdra, Dolna Mezdra, Mechkuevci, Mustafino, Nemanjica, Orel, Pavleshenci, Patetino, Pesirovo, Preod, Rancinci, Sopot, Stanulovci, Stanjevci, Stroimanci, Sveti Nikole and Trstenik.





Figure 2 Local communities within the Municipality Sveti Nikole  
Source: State Statistical Office

According to the last revised Census of population and households (2005) in 2002 the total number of population in the municipality was 18,497 and most of inhabitants are Macedonian nationality. The most interesting part is the difference between the number of population according to the last two censuses of population and households hold in 1994 and 2002 increased only by 10 inhabitants.

Municipality Sveti Nikole has 32 rural communities – local communities and only one urban community – city of Sveti Nikole. According to the State Statistical Office, last revised Census data (2005) in 2002 most of the population lives in the city 74.3%, while the reminding 25.7% is rural population. Comparing to the population structure in the Republic of Macedonia, there is 57.8% urban population. Comparing to the previous Census in 1994 in municipality Sveti Nikole 71.8% is urban population, while the remaining 28.2% of the population lives in the rural areas. This indicated gradual abandonment of local communities and increased concentration of the population in the urban areas.

The most prevalent in the agrarian structure is the cultivated agrarian soil with 24,355ha, pastures with 13,804ha and forests with 5,984ha. The region of Ovce Pole is extraordinary suitable for sheep breeding and production of the best quality sheep dairy products and recently has been developed farm cattle breeding, too. Apart from that, the area is suitable for vine production, cereals, tobacco and watermelon.

Table 1 Local communities in municipality Sveti Nikole

#	Local communities	Absolute attitude	Area (km <sup>2</sup> )	Inhabitants (in 000)		Agrarian structure (ha)			
				1994	2002	Agricultural land	Pastures	Forests	Total
Municipality Sveti Nikole		400	477	18,487	18,497	24,355	13,804	5,984	44,143
1	Alkince	410	10.1	13	5	343	304	298	945
2	Amzabegovo	225	13.9	554	543	907	301	16	1,224
3	Arbasanci	490	6.4	4	1	185	442	9	636
4	Bogoslovec	440	23.0	2	4	183	909	641	1,733
5	Burilovci	360	8.9	13	14	724	138	7	869
6	Gorno Gjugejce	420	8.6	11	3	263	426	132	821
7	Gorno Crniliste	290	21.0	356	345	1,531	461	44	2,036
8	Gorobinci	440	21.8	885	820	1,201	268	468	1,937
9	Delisinci	250	7.7	1	9	516	216	0	732
10	Dolno Gjugejce	420	19.6	218	174	1,036	562	277	1,875
11	Dolno Crniliste	290	-	119	114	-	-	-	-
12	Erdzelija	255	24.2	1,040	1,012	1,938	248	67	2,253
13	Kadrifakovo	260	8.4	179	163	356	411	3	770
14	Knezje	390	9.5	72	86	338	168	5	511
15	Krusica	520	9.2	29	22	309	173	402	884
16	Makres	570	3.7	2	0	68	248	50	366
17	Malino	470	18.2	68	45	938	370	460	1,768
18	Mezdra	-	-	-	-	-	-	-	-
19	Meckuevci	480	22.2	18	15	934	1,120	97	2,151
20	Mustafino	290	20.5	560	517	1,638	338	4	1,980
21	Nemanjica	440	41.3	281	201	1,938	1,742	283	3,963
22	Orel	480	18.1	63	45	1,052	598	59	1,709
23	Pavlesenci	420	24.0	121	77	1,052	594	647	2,293
24	Patetino	620	9.6	6	6	181	737	17	935
25	Pesirovo	260	7.7	243	247	662	29	37	728
26	Preod	520	10.2	41	44	548	289	127	964
27	Rancinci	460	11.9	67	38	140	443	180	763
28	Sveti Nikole	275	37.3	13,280	13,746	2,868	439	209	3,516
29	Sopot	480	12.0	101	89	816	275	49	1,140
30	Stanulovci	450	7.2	4	2	340	352	7	699
31	Stanjevci	400	23.0	82	61	885	500	869	2,254
32	Stroimanci	480	10.4	2	8	251	601	138	990
33	Trstenik	650	7.4	52	41	214	102	382	698

Source: Popovski, V., Selmani, A. and Panov, N. (2006). Municipalities in the Republic of Macedonia, Local Government of the Republic of Macedonia and its Territory Division

Some industrial cultures are grown here as well, particularly sunrise and cotton, which nowadays covers small surfaces. The most familiar industries are: MIK – meat industry, Ego-farm for egg production, BIM – for production of meat and delicatessen, 14 September – for agricultural production, Sveti Nikole diary, Konagra for alimentary industry, Becon – Ovce Pole for pig breeding, Laktis – for milk production, as well as Jugotutun – for processing and fermentation of tobacco and Moda – for textile production.

## 2.2 Demographic and economic profile

### 2.2.1 Demographic profile

According to the last revised Census of population and households (2005) for 2002 the number of inhabitants in municipality Sveti Nikole is 18,497 and 5,698 resident households, with an average of 3.2 members per household. In 2013, the total number of population has decreased to 17,968 inhabitants. The decreasing of population is due to the decreasing of live births and rate of natural increase per 1000 inhabitants. A statistical data on the population and migration in municipality Sveti Nikole, Vardar Region and the Republic of Macedonia are shown in the table below.

Table 2 Main demographic indicators

Demography indicators	Municipality Sveti Nikole	Vardar Region	Republic of Macedonia
Demography - according to the last revised census data for 2002			
Total population	18,497	154,535	2,022,547
Natural increase per 1000 inhabitants	1.2	1.7	3.1
Live births per 1000 inhabitants	10.5	10.9	11.9
Total households	5,698	47,473	564,296
Average households members	3.2	3.2	3.6
Total dwellings	7,157	61,367	698,143
Total immigrated residents	73	653	11,861
Total emigrated residents	82	827	11,219
Demography - State Statistical Office estimates for 2013			
Total population	17,968	153,422	2,065,769
Natural increase per 1000 inhabitants	-0.7	-0.5	1.9
Live births per 1000 inhabitants	9.3	10.4	11.2
Total immigrated residents	130	753	8,405
Total emigrated residents	112	811	8,860

Source: State Statistical Office, MAKStat database, 2013; revised Census of population and households, 2005

The rates of population movement considering natural growth, births and migrations per year (from 2001 to 2013) of municipality Sveti Nikole are shown in the table below. Hence, the analysis shows negative average rates for all three indicators of population growth and movement through the years. In addition, an average natural growth rate is -0.1, average birth rate is -0.1 and average migration rate is 0.2. The average values of population movement in the municipality are quite similar with the overall trend of natural movement of population in the rural areas in the country.

Table 3 Decreasing of population in municipality Sveti Nikole

Year	Natural growth rate	Birth rate	Migration rate
2001	-0.3	-0.4	-0.5
2002	0.8	0.7	1.0
2003	-1.0	-0.6	1.7
2004	-2.9	-1.9	-1.1
2005	2.7	1.1	-1.2
2006	-3.2	-0.4	0.5
2007	2.9	1.2	-3.7
2008	-2.0	-1.4	2.9
2009	1.3	1.2	1.3
2010	-1.9	-0.2	-1.5
2011	1.0	-1.2	1.9
2012	-0.7	0.5	-0.4
2013	1.8	0.6	1.0
<b>Average</b>	<b>-0.1</b>	<b>-0.1</b>	<b>0.2</b>

Source: State Statistical Office, MAKStat database

Live births data for municipality Sveti Nikole, Vardar region and the Republic of Macedonia are shown in the table below.

Table 4 Live births according to gender

Year	Municipality Sveti Nikole			Vardar Region			Republic of Macedonia		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
2009	92	85	177	873	820	1,693	12,340	11,344	23,684
2010	89	83	172	899	822	1,721	12,631	11,665	24,296
2011	77	72	149	808	742	1,550	11,752	11,018	22,770
2012	81	76	157	898	841	1,739	12,243	11,325	23,568
2013	86	81	167	862	740	1,602	12,093	11,045	23,138
<b>Average</b>	<b>85</b>	<b>79</b>	<b>164</b>	<b>868</b>	<b>793</b>	<b>1,661</b>	<b>12,212</b>	<b>11,279</b>	<b>23,491</b>

Source: State Statistical Office, MAKStat database

The analysis of live births through years in municipality Sveti Nikole shows bigger number of male babies than females which is similar to the live births in the Vardar region and the overall country. In addition, according to the State Statistical data, there is a decreasing of live births through years which is the same in Vardar region and the Republic of Macedonia. This indicates on aging of the population in the country, especially in the smaller local communities.

The next table gives an overview of a gender structure in municipality Sveti Nikole compared to the Vardar Region and the Republic of Macedonia. The data shows bigger number of male population in municipality Sveti Nikole, while Vardar region and the country have the same share of gender, representing an increased share of male population over the female population.

Table 5 Population according to the gender in 2013

Gender	Municipality Sveti Nikole		Vardar Region		Republic of Macedonia	
	Number	Share	Number	Share	Number	Share
Male	9,286	51.7	77,993	50.8	1,034,841	50.1
Female	8,682	48.3	75,429	49.2	1,030,928	49.9
<b>Total</b>	<b>17,968</b>	<b>100</b>	<b>153,422</b>	<b>100</b>	<b>2,065,769</b>	<b>100</b>

Source: State Statistical Office, MAKStat database 2013

The age distribution and its share in the total population in municipality Sveti Nikole, Vardar Region and the Republic of Macedonia in 2013 are shown in the following table.

Table 6 Population according to the age structure in 2013

Repartition	Municipality Sveti Nikole		Vardar Region		Republic of Macedonia	
	Number	Share	Number	Share	Number	Share
0	160	0.9	1,577	1.0	22,913	1.1
1-4	653	3.6	6,633	4.3	93,301	4.5
5-9	816	4.5	7,953	5.2	112,351	5.4
10-14	913	5.1	8,119	5.3	119,851	5.8
15-19	1,018	5.7	9,104	5.9	137,385	6.7
20-24	1,282	7.1	10,589	6.9	155,698	7.5
25-29	1,465	8.2	11,920	7.8	164,394	8.0
30-34	1,295	7.2	11,752	7.7	162,384	7.9
35-39	1,224	6.8	10,823	7.1	153,564	7.4
40-44	1,206	6.7	10,612	6.9	146,353	7.1
45-49	1,374	7.6	11,234	7.3	147,433	7.1
50-54	1,455	8.1	11,429	7.4	141,756	6.9
55-59	1,392	7.7	11,091	7.2	134,995	6.5
60-64	1,166	6.5	9,777	6.4	117,663	5.7
65-69	849	4.7	7,029	4.6	87,896	4.3
70-74	680	3.8	5,948	3.9	70,067	3.4
75-79	565	3.1	4,423	2.9	53,549	2.6
80 and more	449	2.5	3,401	2.2	43,857	2.1
unknown	6	0.0	8	0.0	359	0.0
<b>Total</b>	<b>17,968</b>	<b>100</b>	<b>153,422</b>	<b>100</b>	<b>2,065,769</b>	<b>100</b>

Source: State Statistical Office, MAKStat database 2013

Most of the population in municipality Sveti Nikole is Macedonian (97.3%). From the other minorities there are: Vlachs, Turks, Serb and Roma. The minority repartition is shown in the table below. Macedonian population prevails in the Vardar region as well, while the Albanian population takes the second place.

Table 7 Population according to ethnic affiliation in 2002

Repartition	Municipality Sveti Nikole		Vardar Region		Republic of Macedonia	
	Number	Share	Number	Share	Number	Share
Macedonians	18,005	97.3	137,520	89.0	1,297,981	64.2
Albanians	-	-	5,217	3.4	509,083	25.2
Turks	81	0.4	3,178	2.1	77,959	3.9
Roma	72	0.4	2,153	1.4	53,879	2.7
Vlachos	238	1.3	745	0.5	9,695	0.5
Serb	71	0.4	2,102	1.4	35,939	1.8
Bosnians	1	-	2,979	1.9	17,018	0.8
Others	29	0.2	641	0.4	20,993	1.0
<b>Total</b>	<b>18,497</b>	<b>100</b>	<b>154,535</b>	<b>100</b>	<b>2,022,547</b>	<b>100</b>

Source: State Statistical Office, revised Census of population and households, 2005

## 2.2.2 Economic profile

Considering the State Statistical Office data for 2013, the following table presents infrastructure, education and economic data for municipality Sveti Nikole, Vardar Region and the Republic of Macedonia. In municipality Sveti Nikole there are 23 health and social institutions, 40 transport and storage institutions and 4 water supply and sewage management institutions. The transport in the municipality is organized through 104km local roads.

There are 13 educational institutions, from which 11 primary, 1 special primary (83 in the Vardar region) and 1 secondary school (9 in the Vardar region). In 2013/2014 study year there were 1,422 children in the primary and 590 children in the secondary school. In the municipality operate 885 business subjects, while the GDP per capita is calculated on a regional level, since there are no available data on the municipality contribution.

Table 8 Main macroeconomic indicators

Macroeconomic indicators	Unit	Year	Municipality Sveti Nikole	Vardar Region	Republic of Macedonia
<b>Infrastructure</b>					
Local roads	km	2013	104	1,005	9,471
Health and social institutions	Number	2013	23	253	3,315
Transport and storage institutions	Number	2013	40	655	6,095
Water supply, sewage disposal and waste management institutions	Number	2013	4	33	306
<b>Education</b>					
Educational institutions	Number	2013	13	77	1,025
Children that attend primary school	Number	2013/2014	1,422	13,421	191,051
Children that attend secondary school	Number	2012/2014	590	5,782	86,418
Population literacy at age 10 and more	Number	2002	15,830	131,787	1,693,044
Women literacy at age 10 and more	Number	2002	7,432	63,705	829,755
<b>Economy</b>					
Active business subjects	Number	2013	885	5,526	71,290
GDP per capita	MKD	2012	-	236,025	226,440

Source: State Statistical Office, MAKStat database, 2013; revised Census of population and households, 2005

According to the last revised Census data for 2002 the total number of population in age of 15 and over (working age population) in municipality Sveti Nikole is 15,121; economically active people are 7,868, of whom 59.4% are employed, while 40.6% are still looking for a job. The municipality has 7,253 economically inactive persons. Considering gender, there are 16.5% women less employed than men.

Table 9 Activity of the population between 15 years and more in 2002

Population activity		Municipality Sveti Nikole		Vardar Region		Republic of Macedonia	
		Number	Share	Number	Share	Number	Share
Economically active	All	7,868	52.0	65,250	52.2	824,824	52.6
	Employed	4,670	59.4	36,849	56.5	561,341	68.1
	Unemployed	3,198	40.6	28,401	43.5	263,483	31.9
Economically inactive		7,253	48.0	59,817	47.8	742,129	47.4
Activity rate		52.0		52.2		52.6	
Employment rate		30.9		29.5		35.8	
Unemployment rate		40.6		43.5		31.9	

Source: State Statistical Office, revised Census of population and households, 2005

The activity rate is a little less than in Vardar Region and in the country, and the employment rate in municipality Sveti Nikole in 2002 was bigger than in the Vardar region and lower than in Macedonia.

In the following table is given a distribution of the economic activities in the municipality considering the number of active business subjects by sectors in 2013.

Table 10 Active business subjects by sectors in 2013

Sector	Municipality Sveti Nikole		Vardar Region		Republic of Macedonia	
	Number	Share	Number	Share	Number	Share
Agriculture, forestry and fishing	396	44.7	745	13.5	2,866	4.0
Mining and quarrying	-	-	13	0.2	164	0.2
Manufacturing	74	8.4	604	10.9	7,918	11.1
Electricity, gas, steam and air conditioning supply	-	-	5	0.1	132	0.2
Water supply, sewerage, waste management and remediation activities	4	0.5	33	0.6	306	0.4
Construction	22	2.5	176	3.2	4,322	6.1
Wholesale and retail trade; repair of motor vehicles and motorcycles	195	22.0	1,941	35.1	25,429	35.7
Transportation and storage	40	4.5	655	11.9	6,095	8.5
Accommodation and food service activities	29	3.3	289	5.2	4,482	6.3
Information and communication	9	1.0	57	1.0	1,446	2.0
Financial and insurance activities	-	-	7	0.1	390	0.5
Real estate activities	1	0.1	13	0.2	485	0.7
Professional, scientific and technical activities	41	4.6	325	5.9	5,817	8.2
Administrative and support service activities	2	0.2	46	0.8	1,514	2.1
Public administration and defense; compulsory social security	3	0.3	17	0.3	258	0.4
Education	13	1.5	77	1.4	1,025	1.4
Human health and social work activities	23	2.6	253	4.6	3,315	4.7
Arts, entertainment and recreation	6	0.7	59	1.1	1,179	1.7
Other service activities	27	3.1	211	3.8	4,147	5.8
<b>Total</b>	<b>885</b>	<b>100</b>	<b>5,526</b>	<b>100</b>	<b>71,290</b>	<b>100</b>

Source: State Statistical Office, MAKStat database 2013

According to State Statistical Office there are 885 active business subjects in municipality Sveti Nikole in 2013. The most important and dominant sectors are Agriculture, forestry and fishing with 44.7%, Wholesale and retail trade; repair of motor vehicles and motorcycles with 22.0%, manufacturing industry with 8.4% and professional, scientific and technical activities with 4.6%. From the other sectors, very important are Transportation and storage together with Human health and social work activities.

## 2.3 General description of the Project

### 2.3.1. Current situation

The project assumes reconstruction of two existing streets in the municipality Sveti Nikole: Krste Misirkov and Mladinska. The streets are located in the central part of the municipality Sveti Nikole. The street Krste Misirkov starts right after the crossroad with trees streets and finished right before the crossroad with the street Karposheva. The street Mladinska continuous from the street Krste Misirkov, i.e. starts at the crossroad with the street Karposheva and finish right before the crossroad with the street Veljko Vlahovic. The project will include street reconstruction and construction of storm water system on the street Krste Misirkov and reconstruction of the street, water supply and sewerage system and construction of storm water system and sidewalks on the street Mladinska. The current situation of the street Madinska and Krste Misirkov is shown in the following pictures.



Figure 3 Current situation of the street Mladinska  
Source: Archive of CeProSARD<sup>1</sup>



Figure 4 Current situation of the street Krste Misirkov  
Source: Archive of CeProSARD

In accordance with the data obtained from the municipality, approximately 40% of the total population in the municipality lives on the streets that are subject to this appraisal.

<sup>1</sup>The team of CeProSARD during 13.01.2015 made an insight of the current state of the subjects location planned for reconstruction

Both streets, in accordance with the regulations in the country, are classified as local residential streets. It is important to note that these are the main streets of the city that connect locations of existing facilities and locations provided for construction of residential, commercial and public sector. The streets connect one side of the municipality with the other side, without crossing the city center, and allow the fastest crossing through the city. At the same time, the streets connect the city with other local communities within the municipality and the other regions and cities, such as the city of Kumanovo.

The infrastructure on the streets have fallen into such disrepair that an expansive reconstruction is required to extend their useful life. The lack of adequate storm water, water supply and sewerage systems caused a number of health and environmental hazardous impacts, as well as traffic inconvenience for the residents on these streets, and as a result they have been constantly complaining to the Mayor and the municipal administration about the situation. Therefore, the main purpose of the proposed technical solution is to provide a long range improvement of the streets by maximizing the technical life of the surface, thus meeting the needs of the community in the municipality Sveti Nikole.

### 2.3.2. Future situation

The alignment of local streets is made in accordance with the General Urban Plan (GUP) and follows the terrain configuration and spatial limitation of the field, and the available data on existing and planned infrastructure facilities. The drafted technical documentation is in accordance with the laws and regulations in the areas of design, urban planning and the applicable standards for reconstruction of streets, water supply and sewerage systems and construction of sidewalks and storm water system.

The objectives of the technical solution of the project are:

- To provide traffic comfort, convenience and safety for the pedestrians and traffic by improving the surface and sidewalks, as well as their carrying characteristics;
- To ensure that storm water system of residential and commercial facilities located on the floodprone area occurs only on very rare occasions and that the velocity/depth conditions during these events are below prescribed limits;
- To ensure regular and quality supply of water to the residential and commercial buildings which are located on the streets;
- To ensure that the sewerage system is working appropriately with enough capacity for all residential and commercial buildings located on the streets and will lead the sewerage water safety towards the existing waste water treatment plant;
- To ease traffic on the street, thus improving safety and reliability for pedestrians and goods movement;
- To satisfy various social, recreational and residential needs of the residents in the all area in the municipality.

The benefits expected from the project implementation (elaborated in detail in Chapter 6 below) are related to increasing the traffic safety and comfort, increasing the traffic capacity and communications, ensuring a feeling of security by pedestrians, enhancing the commercial activities, as well as extending the outdoor social and recreational activities for the residents living on the street. The present condition of the street causes frequent interruption of traffic and forces the residents to search for alternative routes, which ultimately results in fall of productivity. Additionally, the implementation of the project is expected to lead towards reduction of the municipal costs for constant repairs of the streets. Once the project is implemented, the municipality will spend less money for repairs and reallocate them to other municipal services. The implementation of the project is also expected to increase the property value of houses and other residential or commercial buildings on the streets, thus increasing the growth of revenues from property taxes.

The implementation of the project is expected to have environmental impact as well as positive impact on the health of the population, thus influencing higher productivity. It will also retain within each catchment as much storm water and run-off as possible given the planned use of the terrain and its civil engineering characteristics



which will not only reduce the municipal spending, but also private spending on repairs, thus enabling reallocation of the funds to other more beneficial, that is productive use.



Figure 5 Location of the streets which is subject of the project\*

\*Note: The Streets that are subject of this appraisal are marked in red "Mladinska" and green "Krste Misirkov"

### 2.3.3. Strategic goals

If implemented, the project will contribute towards accomplishment of the strategic goals in the area of infrastructure of the municipality Sveti Nikole. As elaborated in the Annual Program for Communal Utilities of the municipality Sveti Nikole adopted by the Municipal Council in 2014, Strategic planning for Local Economic Development for the period 2010-2015, as well as Local Action Employment Plan from 2009, the municipal administration strives to see the municipality Sveti Nikole with a full coverage of transport and communal (utility) infrastructure throughout its territory.

It is important to note that no storm water system has been previously constructed on these streets. This project will add to the accomplishment of the strategic goal of the municipality in a manner that will lead towards increasing the coverage of storm water system.

This will undoubtedly contribute towards improvement of the quality of life and well-being of all residents of the municipality Sveti Nikole. In addition, the project is considered strategically important since the streets that are subject to the reconstruction are considered one of the main residential/traffic arteries in the municipality. This in turn will increase the quality of life and well-being of the residents. It is also important to state that the municipality has the intention to improve the transportation network in all districts and to invest in storm water system wherever deemed necessary. It solves the problems that were persistent for many years. Those, who will be not covered by this project, can expect that will be provided with such public good subsequently. With the implementation of this strategically important project, the municipality is sending a strong signal that plans to solve this issue on the whole municipal area.

### 2.3.4. Knowledge and experience of the municipality Sveti Nikole

The following table illustrates the municipal experience in implementation of different types of projects.

Table 11 Implemented infrastructure projects in the period of 2009-2014

#	Project name	Year	Financing source	Budget (Denar)
1	Construction and arrangement of public – green areas for relaxation and recreation	2014	Ministry of agriculture, forestry and water economy, Program for rural development 2013	7,391,800
2	Extension of the sewerage system in the local community Gorobinici	2014	Ministry of agriculture, forestry and water economy, Program for rural development 2013	5,706,642
3	Construction of local road towards the artificial lake Mavrovica	2014	Ministry of agriculture, forestry and water economy, Program for rural development 2013	3,700,275
4	Construction of local road towards the archeological location Bila Zora	2014	Ministry of agriculture, forestry and water economy, Program for rural development 2013	7,872,140
5	Community service 2 phase: art for the youngest in the kindergarten and local tourist guides	2014	USAID	250,000
6	Preparation of the main technical project for construction of storm water system in the central city area	2014	Regional Development Bureau	184,500
7	Business accelerator for start-up firms with content: office area, administrative support and trainings for business sector	2014	Secretariat of the Government of the Republic of Macedonia	589,500
8	Equipping and modernization of factories for processing and production of clean drinking water for the city of Sveti Nikole	2013	Project for maintenance of the Bregalnica river basin	2,559,488
9	Community service – art for the youngest in the kindergartens and rural areas	2013	USAID	291,040
10	Preparation of the main technical documentation for connecting the local communities Erdzelija, Kadrifakovo, Peshirovo, Amzabegovo and Crnilishte at the existing water supply system in the city and the existing factory for processing of drinking water	2013	GIZ	1,230,000
11	Preparation of urban plans for light industry for the local communities Kadrifakovo and Amzabegovo	2012	Regional Development Bureau	500,000
12	Palliative Service - care and support of people with incurable disease	2012	UNDP	120,000
13	Infrastructure arrangement of the artificial lake Mavrovica	2010	Ministry of transport and communications	6,889,812
14	Construction of the traffic polygon at the primary school Kiril and Methodius and equipment of the classroom for student with special needs	2010	Swiss agency for development and cooperation	2,700,000
15	Construction of Center for Care of Victims of home violence	2010	Swiss agency for development and cooperation	3,900,000
16	Reconstruction of the public building – Home of culture K.P.Misirkov	2010	EU IPA 2007	30,750,000
17	Extension of the water supply system in the local community Mustafino	2009	Regional Development Bureau	1,149,759
18	Increasing the capacity of youths with academic education for giving services in the rural tourism	2009	GTZ	300,000
<b>Total</b>				<b>76,084,956</b>

Source: Municipality Sveti Nikole

The knowledge and experience needed for successful implementation of the project are related to project management, technical knowledge and execution of procurement practices. The municipality Sveti Nikole has participated in a wide variety of large constructions or other type of projects with different investors, where the municipality allocated the land and provided the investors with technical services, and gained in return new

businesses on its territory or improved housing facilities, schooling facilities, water supply system, etc. The municipality has implemented several projects on improving municipal services supported by the local institutions, such as: Ministry of agriculture, forestry and water economy, Regional Development Bureau, Ministry of transport and communications, etc., as well as international donors: USAID, EU IPA, GIZ, UNDP, Swiss agency, etc. It can be inferred that the municipality is able to contribute with the necessary experience to large construction projects such as the construction of storm water system, construction of water supply system, reconstruction of the Home of culture, Construction of several streets, etc.

## **2.4 Conclusions**

The project is in line with the strategic priorities of the municipality Sveti Nikole and will contribute to achieving the vision of the municipal administration to ensure full coverage of transportation network and water supply, sewerage and storm water systems in the municipality.

The relevance of the project results from the fact that most of the population is affected by the negative implications of inadequate local surface roads. The proposed technical solution is in accordance with existing standards and regulations for this kind of projects. For successful implementation of projects, knowledge and experience is required, especially on project management and technical knowledge. Municipality Sveti Nikole has implemented a variety of similar projects in the past, some in cooperation with international institutions, which means that the municipality is able to carry out large construction projects such as the reconstruction and expansion of local roads and construction of storm water, water supply and sewerage systems which are connected through the center of Sveti Nikole and the wider region.

3.



## SOCIAL IMPACT

## 3.1 Sociological study

### Social analysis

This study is based upon the methodological concept of World Bank summarized as Five Entry Points, One Result. This concept requires exploration of five components: social diversity and gender, institutions, rules and behavior, stakeholders, participation and social risk. The assessment anticipated field research to get available information on interest and attitudes of stakeholders.

The research was based on meeting with a focus group and face to face interviews with the municipality representatives in order to give a social assessment about the project on reconstruction of two municipal streets with construction of sidewalks and storm water system.

The interviews were organized with 6 officials from the municipality: mayor of the municipality Sveti Nikole and 5 advisors from different political sides (3 from the political party in position and 2 from the political parties in opposition). Between the interviewees there were two women. They all presented their opinions about the role and influence of various stakeholders in the process of decision making relevant to the project, as well as the level of information, capacities and readiness of the residents to support the project.

Taking their delegation and duties into account, the above mentioned officials proved to be useful interpreters of the opinions of the residents since being their representatives and having frequent meetings with them, they are very familiar with the needs, attitudes and opinions of the local population and the project. The answers from the interviews are very indicative a very good insight in the local processes to the project.

The focus group consisted of municipal residents both direct and indirect users of the project. Most of the participants were from the city of Sveti Nikole. There were 10 participants in the focus group from whom 6 women.

#### 3.1.1 Social diversity and gender

In the municipality Sveti Nikole, in the streets which are a subject of this appraisal there are residents from different social groups (minorities, gender, language, young couples, etc.) By age groups are mainly young but also old people, some of them are people with a special needs.

The prevailing nationality in the municipality Sveti Nikole is the Macedonians with 93.7%. From the other nationalities that live on the streets there are Roma population and Vlachos with approximately 60 people. Some of the young people are leaving the municipality, moving into the bigger cities or to other country, but most of them stay in the municipality creating their own families. There are a lot of young people who settle in the area at the streets which are subject to this appraisal. Approximately, 40% of the municipality population lives on the streets which are subject to the appraisal. In addition, new 40 construction plots were sold recently for houses and building in which additional 1,000 inhabitants will live. Residents who live at the streets subject to this project are nearly equal considering male and female population.

The main municipal priority is to improve the quality of life firstly through economic development and employment of the local population, but also to improve the infrastructure, through reconstruction of water supply system and sewerage, reconstruction of the streets and roads, construction of storm water system and improving the efficiency of communal services. According to the female population, the most important issues are construction of storm water system and reconstruction of streets with construction of sidewalks contributing to the safety of pedestrians. At the same time, the advisors of the community added the reconstruction of the streets subject to this appraisal as a priority which was already emphasized by the overall population that lives nearby the streets.

Asked about the number of beneficiaries of the project, the interviewees expressed their opinion that all of the residents in the municipality will be beneficiaries of the project because these are main streets that connect the city from one to another side and also connect the entrance to the regional road to the city of Kumanovo. They allow drivers to pass the city faster avoiding the center. Both streets connect each other and make one long

street with two names. Moreover, the streets are connected to other local streets and represent the main street where the water supplies system and sewerage system connects from the local residential buildings. A lot of people are crossing them every day to their work. This is because the street subjected to this project is one of the most important communication local streets. At the same time, the streets lead to the employment agency, the city hospital which is 100m away from the streets, one kindergarten which is 50m away from the streets, and a city stadium which is also 50m away from the streets. In the kindergarten attend 386 children from who 240 live in the area where the streets are located. Also, the primary school is near this area and the students must cross the streets which are subject to the appraisal in order to get to school. There are 500 students who attend in the primary school, from whom approximately 350 students live in the streets subject to this appraisal.

The residents who live in the other rural communities within the municipality will also benefit from reconstruction of the streets, considering the fact that the streets lead to the local community Gorobinci which is one of the biggest local communities in the municipality. Also, the streets lead to the tourist place Gurishte where a monastery and meteorological station are located, and to the area with big industries, such as the factory for production of sweets "Lion" which is export oriented and the mill "Ivana".

Therefore, through the streets crosses heavy mechanization for agricultural production and heavy trucks that bring crop and confectionary products. This additionally makes difficult walking on the streets without sidewalks and crossing of cars that should drive on the left side of the streets due to the very bad condition of the right side of both streets. According to the population who live and use the location which is subject to this appraisal, the streets are in very bad condition where most of the roads are fulfilled with paving bricks, there are no sidewalks or the existing ones need immediate reconstruction, there is no storm water system and there are often breaks in the existing sewerage which leaks down the streets. The need for improvement of the sewerage makes the local population to fulfill one manhole with concrete by themselves. This is due to the sewerage system is very old and not appropriate for the needs of the increased population who live at the location.

Very important is the fact that the factory Lion has 150 employees from which more than 100 are with special needs. All of them need to cross the streets in order to get to their working place. Because the factory works for export, often there are representatives from the foreign countries (including buyers and investors), especially from Israel and Hungary, who also crosses the streets which are subject to this appraisal.

The reconstruction of this street will be beneficial for the safety of women with children, school children, elderly people and residents with special needs, but also in making favorable conditions for the foreign investors to come and work in the municipality which additionally will improve the economic situation of the municipality.

### **3.1.2 Institutions, rules and behavior**

According to the interviewees' opinions the selected contractor must provide guarantees for the realization of the project. The municipal Council might request information from the mayor in reference to the project's realization at any time. In addition, based on experience with other projects and the overall existing streets and storm water system in the municipality Sveti Nikole, the municipal administration has the capacity to maintain the streets after the implementation of the project. In addition, the municipality has an administration which has experience to monitor the progress of the project.

The municipality will be responsible for maintenance of the streets, and the Public Communal Enterprise "Komunalec" Sveti Nikole will continue with maintaining the streets in summer cleaning the sand and grass from the street and in the winter cleaning the street from snow. The Public Communal Enterprise also fulfills the holes in the streets with paving bricks if there is a need. The local communities are not directly included in the maintenance, but they can contribute by request of the residents and municipality.

According to the interviews the private companies will have great benefits from the reconstruction of the street. There are not many buildings from the business sector, except few small companies, but the streets leads to the industrial area with big factories. The construction will provide easy access to all consumers, which will increase the earnings and trade. This information was confirmed by the focus group participants, especially in the interest for opening new businesses from foreign investments.

### 3.1.3 Stakeholders

There are several important stakeholders of the project. The interviewees fully agree that the most influential participant in the process of decisions making at the municipal level are the mayor and the municipal council. Residents, as an organized group of stakeholders, articulate their opinions directly to the council and the mayor, through the local communities present in the municipality, direct contact with the municipal advisors and forums organized by the mayor. The residents can express their opinion every Wednesday as it is an open day for all residents to discuss their needs or requests with the mayor. The residents can influence the decisions making process, as their opinions are always taken into consideration by the mayor and the council.

The interviewees stated that the project is supported by all councilors representing different political parties in the municipal council, which means that a political consensus is achieved on this issue and that the councilors are considering the project as one of the top priorities of the municipality Sveti Nikole. In respect of the residents, the opinion of most interviewees is that all of them support or will support the project, because it is in the general interest at the municipal level. The project was already discussed at the council meetings and it was voted as priority at the meeting held on 16.12.2014. The focus group participants confirm the need of the reconstruction of the street and construction of storm water system. The storm water system was discussed as very important issue in order to prevent car crashing and flooding of the private houses of the residents who live at the streets.

One very important question that was discussed is related to the potential *"feeling of inequality among the residents and possibility they could endanger the realization of the project in order to get some personal or group benefits?"* The interviewees and focus group participants stated that there is no risk or problems that can appear during the implementation of this project because, like they stated it is for everyone's benefit and good and the project will contribute to improve the living of all the residents in the municipality.

### 3.1.4 Participation

The residents have submitted their complaints about the current situation in the streets that are subject of this appraisal, which again implies that the residents are fully in favor of the project. In order to express the needs of the residents who live in the municipality, local NGOs provided a questionnaire regarding the residents' requests and needs. The results of the questionnaires show that one of the biggest priorities is to reconstruct the streets which are subject to this appraisal. The residents are well informed about this project by constant posting on the website of the municipality and local communities, as well as by direct interview and discussions with the mayor in each local community. They can influence the necessary changes if there is a need. The information about the project was also discussed on the local television "Svet" where the mayor is guest on 6 to 7 emissions per year. Moreover, each council meeting is public and shown on the local television in order to provide constant information of the population that live in the municipality.

### 3.1.5 Social risks

High social risk for carrying out the project cannot be perceived. In the municipality Sveti Nikole, the municipal council consists of 15 representatives from different political parties. Out of the total number of councilors 10 support the mayor, while 4 are in opposition and 1 is independent participant. There are 5 female representatives in the municipal council. In spite of their political orientation, the councilors cannot endanger the realization of the project. As elaborated earlier, the councilors have already expressed their support for the project.

Interviewees presented a wide range of priorities in many fields that are within the local government competencies. They identified the infrastructure and increasing the employment rate as crucial for local economic development. Without exceptions, all of the interviewees said that the one of the highest priority is full coverage of storm water system and reconstruction of the water supply and sewerage system at the streets that are subject to this appraisal, since there is often lack of water at many houses, especially those that are located on the right part of the streets.

Additionally, it was discussed in detail whether the residents are fully informed of the intended reconstruction of the streets that are subject to this appraisal. In that way, there is no risk for resident not to be informed about the project activities.

It is very important to state that the municipality has the intention to improve the transportation network in all local communities and to invest in storm water, sewerage and water supply system wherever deemed necessary. It solves the problems that were persistent for many years. With the implementation of this strategically important project, the municipality is sending a strong signal that plans to solve this issue on the whole municipality area.

Since the streets are the subject of this appraisal, it is set on municipal (state) property; no expropriation is expected to be raised.

### **3.2 Other fields of considerations**

The reconstruction of the streets in the municipality Sveti Nikole which are subject to this appraisal is expected to improve the overall population living conditions in the municipality. The implementation of the project is expected to create savings in the item of the municipal budget for the streets maintenances on the long term basis. The implementation of the project is also expected to improve local public finances in a sense that once the streets are reconstructed, the municipality will spend less money for repair and reallocate them to other municipal services. Moreover, increased property value as a result of the improved infrastructure will result in growth of revenues from property taxes.

For safe walking of children to school, there is an emergency need of sidewalks construction. For prevention of flooding of residential houses there is also a need for construction of storm water system. These project activities will bring welfare of the local population, but will also lower the costs for taking children to and from the school by car and repairs of the gardens due to the frequent flooding's.

### **3.3 Resettlement issues**

The project is not a subject to resettlement issues because it involves reconstruction of already existing streets in the municipality territory. The reconstruction of the streets will improve the transport and will allow development of new small businesses. Constructed infrastructure network will bring investments, especially from the migrated population in the foreign countries. The increased number of businesses will open new jobs for the local population and contribute to the employment of young people. In that way, decreasing the emigration is expected.

### **3.4 Conclusion on the project potential success and recommendation**

The project is expected to be socially successful for the following reason:

- The project is relevant because it is considered both cost-efficient and cost effective over a long run and also useful for the improvement of the community living in the municipality Sveti Nikole;
- The project is of a highest municipal priority for the public administration and for residents;
- The stakeholders are very motivated by the realization of the project;
- The project is not a subject to a resettlement issues;
- No expropriation issue is expected to be raised during the implementation of the project.

The main drivers of the change that will bring about prosperity are the municipal authorities (mayors, councilors, public enterprise managers) who have initiated and made the decision for seeking funding from the World Bank funded MSIP. Since the problem of bad infrastructure exists for many years it has been publicly declared and discussed on many occasions. Direct beneficiaries of the project are the residents in Sveti Nikole who live on the selected streets (approximately 40% of the population).

A part of the vulnerable and poor groups identified by the municipality (people with special needs, single mothers and elderly people), as well as kids and school children have special needs considering sidewalks, water supply, sewerage and storm water system that will ease their movement. Gender balance needs to be incorporated in the strategic approach of the municipality and public communal enterprise towards all development efforts.

High social risks for carrying out this project cannot be perceived. There are no issues connected with ethnic



distribution of population or inter-local community rivalry: the action will allow benefits for all nationalities, it will cover the majority of residents in the municipality and there are no land ownership (expropriations and resettlements) concerns that need to be resolved.

# 4.



## ENVIRONMENTAL IMPACT

This project contains several sub-projects within the city Sveti Nikole (Municipality Sveti Nikole):

- Reconstruction of street “Krstе Misirkov” and construction of storm water system; and
- Reconstruction of the street “Mladinska”, reconstruction of water supply system (daily water consumption of City of Sveti Nikole is 250-500 liters per capita) and sewerage system and construction of storm water system and sidewalks on the street.

Both of the streets are local residential streets, located in the city Sveti Nikole. The current condition of the both streets is unsatisfactory for the needs of the local population who lives near these streets, causes frequent traffic disruption and usually residents are re-routing to other alternative streets. The lack of storm water system, water supply and sewerage system causes potential risks to the human health and poses environmental risks.

The Project will lead to the improvement of traffic flow along the city Sveti Nikole providing good and safe connection with the other settlements within the municipality and wider, as well as improvement of human health ensuring drinking water with a high quality and appropriate system for collection and discharging of urban waters.

#### 4.1. Location of sub project activities

Streets “Mladinska” (with total length of 578.6m) and “Krstе Misirkov” (with total length of 1,027.2m) are located in central urban area in the city Sveti Nikole. The regional road R1204 passes across the city. Street “Krstе Misirkov” begins from crossroad with St. Septemvriska. Near the street “Krstе Misirkov” passes Svetinikolska River. Along the street “Krstе Misirkov” there are individual and residential facilities for housing, urban green areas for sport and recreation (two city parks and sport center “Car Samoil”) and educational facilities (primary school Ss.“Cyril and Methodius” and kindergarten “Rahilka Goneva”). This street ends with crossroad with St.“Karposeva”. From this point begins St. “Mladinska”. Along this street there are individual facilities for housing, health care facility (about 200m south form the street) and building of the CSE “Komunalec” Sveti Nikole. The location of project activities and some of the sensitive receptors that will be affected by it are presented in Figure 6.

#### 4.2. Main sub-project activities with environmental impact

The project activities will run in 3 phases: preparatory work, constructive phase and operational phase.

The preparatory phase includes organization, clearing, marking and securing the construction site (setting alert signs), transportation of construction materials and equipment and ensuring the implementation of OH&S standards (e.g. mobile toilets for the workers and adequate containers for waste collection).

The reconstruction phase contains cutting and removing of existing layer of asphalt, digging a ditch for setting the storm water pipes (PP with  $\text{Ø}315\text{-}\text{Ø}800\text{mm}$  and  $\text{Ø}400\text{mm}$ ), water supply (PE 100-RC) and sewerage pipes (two-layer PP drainage pipes), filling the ditches with layer of sand and excavation soil, embedding of crushed stone material with a thickness of 30cm with leveling and compaction, placement of curbstones and concrete tiles and applying two asphalt layers.

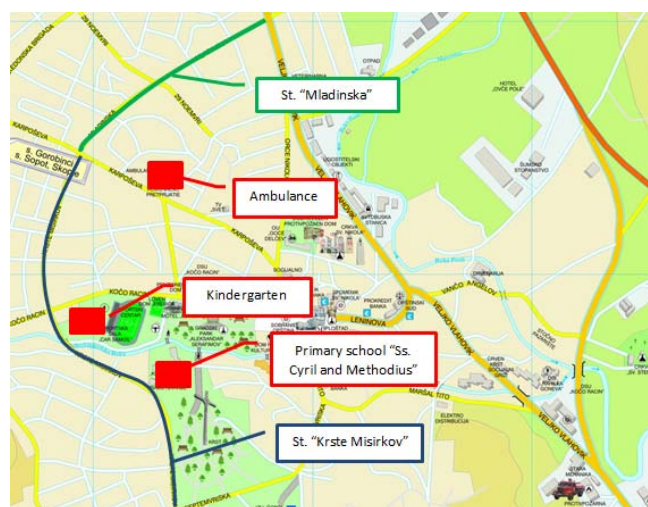


Figure 6 Location of project activities with some of sensitive receptors

Operation phase will include daily use of two local streets and daily use of the drinking water supply and sewage systems.

### 4.3. Main environmental impacts and sensitive receptors

All sub-project activities are located in urban area in the city Sveti Nikole, the area is very frequent and used by drivers, passengers, and students. In order to minimize the negative impacts on the safety of workers and the population living and passing/driving along or passing near the construction site, the contractor should provide appropriate marking of reconstruction area, lighting for night periods, fencing and the attention signs should be posted on notice boards. The special attention should be paid when the works are performed near the kindergarten and primary school "St. Cyril and Methodius". The close communication between the Contractor and the school/kindergarten officials need to be established in order to inform in time the professors, students and kids about the ongoing reconstruction works and importance of following the attention signs posted along the street section. Also, the most hazardous operations need to be scheduled when school and kindergarten are not occupied. The attention signs should be also in graphical form in intensive color for better visibility and easy understanding by small children. The open trenches, falling tools, bottle gases and other hazards need to be fenced and labeled with attention signs.

The proper horizontal and vertical signalization should be placed along the streets for informing the drivers to decrease the speed (especially near the ambulance/health care facility, school and kindergarten) or to show the temporary driving directions. The Contractor should provide standard road signs to warn, guide and instruct drivers passing near the reconstruction areas. The signs must be kept clean and well maintained in order to be effective. Traffic Management Plan needs to be developed prior start up of project activities with all prevention measures listed (e.g. re-routing the traffic during the construction activities, announcement of the duration of reconstruction activities and alternative traffic directions to avoid the traffic disruptions, etc.). Local radio releases could be used to warn drivers what to expect at a site, the importance of safety measures and necessity of re-routing, etc.

The environmental impacts are expected on short-term basis during the project activities and the impacts will be with minor local significance. The major impact is expected as a result of traffic disturbance during the reconstruction activities, improper waste management with different waste streams, noise from the outdoor equipment (especially near educational and health care facilities, family houses and public institutions) and pollution of ambient air.

Different waste streams (soil, asphalt, concrete, plastic, paper, etc.) could be generated on the site. The contractor needs to communicate with the municipal staff at the beginning of the project to get instructions on disposal of the waste streams. The adequate containers for waste collection should be placed on the reconstruction site. The surrounding area (school and kindergarten yards near the sites) should be kept clean, without waste disposed there. Keeping records of temporary and final disposal of waste is also important. The waste should be transported and disposed on municipal landfill "Ljubin Dol" that is located 9km from Sveti Nikole. The estimated values for waste from excavated soil and construction waste (estimation made within the Project Main Design) are:

- St. "Krste Misirkov"- waste from excavated soil is 3,297m<sup>3</sup> (during reconstruction), and 1,165.07m<sup>3</sup> (during construction of storm water system) and construction waste is 22m<sup>3</sup> (during construction of storm water system);
- St. "Mladinska" - waste from excavated soil is 788.41m<sup>3</sup> and construction waste is 962.7m<sup>3</sup>.

The CSE "Komunalec" is responsible for municipal waste collection and disposal of waste on the municipal landfill.

Sources of air pollution that may occur during the implementation of project activities are construction machinery (trucks and excavators), which will be used for supply of raw material (pipes, excavation of soil, crushed stone material etc.) and their operation. In operational phase of streets air emissions will be generated from mobile sources of pollution – vehicles.

The sensitive receptors of the planned project activities are kids and young girls and boys (they are visiting educational facilities and green urban areas for recreation and sport) residents living near the project locations.

According to the Law on noise sensitive protection (Official Gazette No. 79/07, 124/10, 47/11 и 163/13) all project locations have been identified to the area with II degree of noise protection and the maximum allowed noise level should be 45dBA for night and 55dBA for evening and day.

In the vicinity of St. "Krste Misirkov" the Svetinikolska river is passing. According to the Regulation of classification of water streams, lakes, water accumulations and underground water (Official Gazette No. 18/99) the categorization of this river is III class (there are V classes, the I class is the best quality and the V class is the worst quality). The waste disposal on the river bank is forbidden.

In or near the project location there are no registered endemic, protected and endangered animal or plant species or protected areas and habitats that will be negatively affected by the reconstruction/ construction activities. Referring to the Municipality staff statement, there is no cultural heritage protected structures near or under the reconstruction area.

In operational phase, the storm water after passing the oil/water separators will be discharged into Gorobinska river (right tributary of Svetinikolska river) – from local street "Krste Misirkov" and the storm waters from local street "Mladinska" after separation of oil will be discharged into river Perish. The urban waste waters from the sewerage system will entered into existing waste water treatment plant. Very important issue is the quality of drinking water coming from the water purification plant, so regular sampling and testing of drinking water are essential for minimization of human health risks.

The oil/water separators should be installed at the end of storm water systems and during operational phase, based on the manufacturer's recommendations and instructions, the trained operator needs to inspect the integrity of all mechanical parts of the separator, replace some of them if necessary, and assess the quantity of accumulated oil and silt. The accumulated waste from the oil separator should be treated as hazardous waste (waste code 13 05 02\* according the national legislation: Law on Waste and List of Waste codes – Official Gazette of RM no. 100/2005). The waste stream should be collected only in special hazardous waste canisters/tanks by the authorized waste collectors (the list with authorized hazardous waste collectors in Macedonia has been published on the Ministry of Environment and Physical Planning website: **Error! Hyperlink reference not valid.** The proper labeling on the waste canister/tank should be done informing that it contains the hazardous waste. The operator should register and keep records for submission of collected oil-waste stream.

According to the national legislation, the EIA Reports for all sub-project activities were prepared in 2014 by citizens association "Zetvanaznaenje" from Prilep. The EIA Reports were adopted by the Mayor, Mr. Zoran Tasev issuing the decision on approval. These reports contain the main project goals, project activities, photos of the locations where the reconstruction activities will be performed and proposed general environmental mitigation measures.

The detailed relevant Environmental Mitigation Plan and Monitoring Plan for all sub-projects are presented in the following Tables. The main responsibility for implementation of the purposed preventive and mitigation measures lies on the contractor. The supervisor and municipal staff need to monitor how the environmental measures are implemented and how the purposed important parameters are monitored. The all included in the project need to coordinate the working plan and proposed measures with the school/kindergarten officials in order to ensure smoothly project implementation and minimization of environmental, health and safety risks.

## A. MITIGATION PLAN

Project activity	Potential impact	Impact scale	Proposed mitigation measures	Responsibility
<b>Construction phase</b>				
Set the protective signalization for achieving safe transport of the route and the connecting streets - under construction	<p><b>OH&amp;S and community safety</b></p> <p>Possible negative social and health impact on the population, drivers and workers because:</p> <ul style="list-style-type: none"> <li>- Lack of signs placed on security measures at the beginning of reconstruction work</li> <li>- Injuries occur because of passage near the construction site along the route</li> <li>- No established standards and procedures that comply with health and safety at work</li> </ul>	Short-term/ local within the city/ minor significance during the reconstruction and construction phases	<ul style="list-style-type: none"> <li>-Preparation of Traffic Management Plan in close communication with the municipal staff, traffic police department and officials from kindergarten and school near the reconstruction sites;</li> <li>-Information through local radio for activities related to reconstruction activities – beginning and finishing with work every day and certain location of the activities, working time frame and traffic access to other streets;</li> <li>- Providing adequate marking of the construction site and construction material or temporary disposed waste streams along the two streets;</li> <li>- Provide standard road signs to warn, guide and instruct drivers on site; Signs must be kept clean and well maintained in order to be effective;</li> <li>- The falling tools, open trenches and bottle gases need to be protected and attention signs need to be posted;</li> <li>- Ensuring warning tapes and signs; Special graphical form signs in colour should be posted for better understanding of danger by the kids and students;</li> <li>- Not allowed entrance for unemployment in the site where the construction activities are provided;</li> <li>- Measures undertaken to protect the safety and health of workers (first aid, protective clothing for workers, appropriate machinery and tools);</li> <li>-Ensure lighting along the construction site during nights.</li> </ul>	<p>Contractor-Bidder Supervisor</p> <p>Municipal staff (communal inspector/ environmental inspector/ traffic engineer)</p>
Reconstruction of street and storm water	<b>Air emissions</b> Rehabilitation activities will	Short-term/ local within the city/	-Use of standardized fuels for the mechanization and switching off engines of the mechanization when not in work for reducing gas	Contractor - Bidder

Project activity	Potential impact	Impact scale	Proposed mitigation measures	Responsibility
<b>Construction phase</b>				
system on "Krste Misirkov" and reconstruction street and sidewalks, sewage system and water supply system on "Mladinska" street in the city Sveti Nikole	<p>initiate creation of gases and dust particles suspended:</p> <ul style="list-style-type: none"> <li>-fugitive dust emission during cutting of existing asphalt on both streets, as well as emission of scratching the existing asphalt layer</li> <li>-fugitive emission of dust for load and transport of dig material and disposal of asphalt</li> <li>-Traffic congestion will be caused as well as changes in existing traffic circulation</li> </ul>	minor significance during the reconstruction and construction phases	<p>emissions;</p> <ul style="list-style-type: none"> <li>-Use of sprayers that do not contain chemicals and are on a water base – for reduction of the dust;</li> <li>-Planning the transport and the factor of loading and unloading are of great importance to reducing fuel consumption and emissions and fugitive dust emissions;</li> <li>- Stopping work or reducing the amount of construction work if register intense dust emission in order to determine the cause of the issue and to take measures for its elimination;</li> <li>- The speed of movement of the vehicles for transporting dig soil to a particular location should be low 30(40)km/h;</li> <li>- Vehicles that perform transport of gravel, grit, soil and ephemera should be covered or closed;</li> <li>-Construction materials should be kept on appropriate places so to eliminate dust.</li> </ul>	<p>Supervisor</p> <p>Municipal staff (communal inspector/ environmental inspector/ traffic engineer)</p>
	<p><b>Emissions in water and soil</b></p> <ul style="list-style-type: none"> <li>- Contamination of surface and underground waters due to inappropriate ensuring portable toilets and garbage bins where it is possible uncontrolled spill/ disposal of the liquid and solid waste</li> </ul>	Short-term/ local within the city/ minor significance during the reconstruction and construction phases	<ul style="list-style-type: none"> <li>-The portable toilets that will be cleaned and maintained on regular basis need to be placed along the streets;</li> <li>-Repair and maintenance of vehicles should be made in mechanical services not on the construction site;</li> <li>-For leakage of oil derivate it is necessary fast intervention with digging the soil and transport it as a hazardous waste;</li> <li>- The temporary/final disposal of various waste steams on the Svetinikolska river banks is forbidden;</li> <li>- Set up of oil/water separators at the end of storm water systems in order to protect the pollution of Gorobinska river.</li> </ul>	<p>Contractor - Bidder</p> <p>Supervisor</p> <p>Municipal staff (communal inspector/ environmental inspector/ traffic engineer)</p>
	<p><b>Waste management</b></p>	Short-term/ local	-Identification of the different waste types at the reconstruction site	Contractor - Bidder

Project activity	Potential impact	Impact scale	Proposed mitigation measures	Responsibility
<b>Construction phase</b>				
	<ul style="list-style-type: none"> <li>- Generation of construction waste and other non-hazardous waste, paper and plastic packaging waste, soil and stones (clean); Asphalt mixtures</li> <li>-Possible generation of hazardous waste from liquid fuels (oil, fuel, etc.), contaminated soil from eventually spilled oil from construction mechanization</li> </ul>	within the city/ minor significance during the reconstruction and construction phases	<ul style="list-style-type: none"> <li>(soil, sand, asphalt, bottles, food, etc.);</li> <li>-Classification of waste according the national List of Waste (Official Gazette no.100/05);</li> <li>-Transportation and final disposal of the inert and communal waste by CSE "Komunalec";</li> <li>-Fulfilment of the Annual Report for non-hazardous waste management by the Mayor and reporting to the Ministry of Environment and Physical Planning;</li> <li>- The construction waste should be promptly removed from the sites, should be re-used if possible;</li> <li>- The surrounding area (school and kindergarten yards near the sites ) should be kept clean, without waste disposed there;</li> <li>-Possible hazardous waste (motor oils, vehicle fuels) should be collected separately and authorized collector and transporter should be sub-contracted to transport and finally dispose the hazardous waste.</li> </ul>	<ul style="list-style-type: none"> <li>Supervisor</li> <li>Municipal staff (communal inspector/ environmental inspector/ traffic engineer)</li> <li>CSE "Komunalec"</li> <li>MoEPP</li> </ul>
	<p><b>Emission of noise and vibrations</b></p> <ul style="list-style-type: none"> <li>-Noise of construction activities and use of heavy construction mechanization, vibrations from demolition, breaking asphalt, construction machinery work</li> </ul>	Short-term/ local within the city/ minor significance during the reconstruction and construction phases	<ul style="list-style-type: none"> <li>-Use of appropriate and technically functional equipment and mechanization;</li> <li>-Construction activities have to be made during the day and with certain time frame;</li> <li>- Switching off vehicle and construction mechanization engines when there is no need for their working.</li> </ul>	<ul style="list-style-type: none"> <li>Contractor - Bidder</li> <li>Supervisor</li> <li>Municipal staff (environmental inspector)</li> </ul>



Project activity	Potential impact	Impact scale	Proposed mitigation measures	Responsibility
<b>Construction phase</b>				
<p data-bbox="188 304 405 331"><b>Operational phase</b></p> <p data-bbox="188 352 931 379">No environmental impacts are expected during the operational phase;</p> <p data-bbox="188 400 2103 464">Proper maintenance of the reconstructed streets, regular preventive maintenance of the drinking water supply system, storm water system and sewage pipelines regular checks for leakage for all mechanical connections and fittings, pumps and in time supply of spare parts;</p> <p data-bbox="188 485 1585 512">Regular inspection of the integrity of all mechanical parts of the oil/water separators, assess the quantity of accumulated oil and silt;</p> <p data-bbox="188 533 2103 596">Collection of accumulated waste from the oil/water separator as a hazardous waste (waste code 13 05 02* according the national legislation (Law on Waste and List of Waste codes – Official Gazette of RM no. 100/2005) and proper hazardous waste management;</p> <p data-bbox="188 617 607 644">Regular drinking water testing analysis;</p> <p data-bbox="188 665 1402 692">Keeping records of all technical documentation for the sub-projects and keeping logs on all maintenance activities.</p>				

## B. MONITORING PLAN

What parameter to be monitored?	Where is the parameter to be monitored?	How is the parameter monitored?	When is the parameter monitored (frequency of measurement)?	Why is the parameter monitored?	Cost		Responsibility	
					Const.	Oper.	Construction of local roads	Operations of the local roads
Project stage: Preparation activities/ Start-up of the reconstruction and construction work (site cleanup, and marking out the route and reconstruction sites within the urban area of the city Sveti Nikole)								
The safety protection measures applied for the workers and the community (especially safety for passengers, drivers, students and kids and their parents)	On the reconstruction sites	Visual checks	During the clean-up activities At the beginning of each working day during the project activities	To prevent health and safety risks – mechanical injuries To be in compliance with national communal health regulation and OH&S and community and health and safety standards			Contractor - Bidder Supervisor Communal Inspector at the municipality Sveti Nikole	
Project stage: Reconstruction of streets and construction of storm water system, reconstruction of sewage and drinking water supply systems								
Safety traffic flow along two streets under reconstruction in City of Sveti Nikole and implementation of Traffic Management Plan	On the site	Visual monitoring	During the working day	To ensure the coordinated traffic flow in the urban area of the city			Contractor - Bidder Supervisor Communal Inspector at the municipality Sveti Nikole	
Disposal of the waste streams (solid and liquid) near the Svetinikolska river as potential pollution of good ecological status of water course	Near the project areas at the bank of Svetinikolska river	Visual check if the waste is disposed near the Svetinikolska river	During the construction period (once per week)	To ensure good status of water quality at the river			Contractor - Bidder Supervisor	
Primary selection of the waste streams as they are generated at the reconstruction/	On the site	Review the documentation	At the beginning of work with new material/s	To separate hazardous from the non-hazardous waste as well as inert from biodegradable waste			Contractor – Bidder Supervisor	

What parameter to be monitored?	Where is the parameter to be monitored?	How is the parameter monitored?	When is the parameter monitored (frequency of measurement)?	Why is the parameter monitored?	Cost		Responsibility	
					Const.	Oper.	Construction of local roads	Operations of the local roads
construction site								
Collection and transport as well storage of hazardous waste (if any occurs)	On safety temporary storage	Review the transportation list and conditions at the storage facility	Before the transportation of the hazardous waste (if there is any)	To improve the waste management practice on municipality and national level/ Not to dispose the hazardous waste on the waste disposal spots			Contractor and sub-contractor (Authorized Company for collection and transportation of hazardous waste (if any appears))	
Collection transportation and final disposal of the solid waste	On the sites and around the sites in all three districts	Visual monitoring and reviewing the transportation and disposal lists from the sub-contractor	After the collection and transportation of the solid waste on regular base each day	Not to leave the waste on the spot to avoid the environmental and health impact on residents To have records of generated waste streams and to improve the waste management			Contractor – Bidder Supervisor CSE “Komunalec”	
Fulfilled Annual Report for collection, transportation and disposal of waste	Local self-government administration	Review of documentation – Identification of waste list	After the accomplishment the waste management activities	To improve the waste management on local and national level To be in compliance with national legal requirements			Mayor of the municipality Sveti Nikole Ministry of Environment and Physical Planning	
Noise measurements	Along the streets	Noise measurements	During the work peaks	To ensure noise level limits according regulation			Contractor - Bidder	
<b>Operational phase</b>								
Clean up of the oil/water separators at the end of storm water system along the streets	At the storm water separation tanks location	Visual check	On regular basis and especially after hard rain	To ensure that the separators are clean from disposed solid materials coming from storm waters washing on the streets				Technical staff in the CSE “Komunalec”



# 5.

## TECHNICAL SOLUTION

## 5.1 Description

The project assumes technical solution for reconstruction of two local streets in the Municipality Sv.Nikole ("Krstе Misirkov" and "Mladinska" streets). The reconstruction of these streets would improve the traffic communication of the whole town because both of them are considered as one of the main sections in Sveti Nikole, which contributes to better connectivity of all parts of the town, both locally and regionally.

According to the existing positive regulations, the streets are classified as local residential streets. The plan for the project is made in accordance with the General Urban Plan (GUP), follows the terrain configuration, spatial limitation of the field, and the available data on existing and planned infrastructure facilities. The technical documentation is in accordance with the laws and regulations in the field of design, urban planning and the applicable standards for street reconstruction and construction of storm water system.

## 5.2 Analysis, evaluation and potential amendments

According to a European standards and world adopted definition, the street reconstruction is a project whereby many or all meaningful elements of an existing street are being removed and replaced. This would include sidewalks, bituminous or concrete pavement, sub-base and other structures.

The total length of the streets that will be reconstructed is 1,605.9m; whereas the width of both of the streets is 6m (see Table 12 below).

Table 12 Technical characteristics of the local streets

Street	Length (m)	Width of the street (m)
Mladinska	578.64	6.0
Krstе Misirkov	1,027.24	6.0
<b>Total</b>	<b>1,605.88</b>	<b>/</b>

Source: Project's technical documentation

Due to the fact that the subject of the project is already existing streets, geotechnical investigations and additional design has not been carried out. The structure, sizes and layers of the proposed technical design for the streets are based on the positive regulation and standards applicable for this kind of traffic on these streets.

### 5.2.1 Local Street "Mladinska"

"Mladinska" street is in the town area in Sveti Nikole and is considered a street with significant amount of traffic. It begins at the intersection with the street, "Karposheva" until the intersection with the street „Veljko Vlahovic". The reconstruction of this street would improve the traffic communication and service of the whole town because it is considered one of the main sections in Sveti Nikole. The construction activities involve reconstruction of the street, replacement of the existing kerbstones (including sidewalks), construction of storm water system as well as reconstruction of the sewerage and water supply system. The exploitation period of the street and the underground installations is over 30 years, which has caused damages to the installation and visible deflections and damages of the street structure additionally due to the possible leakages. The design envisages renewal of the water supply and sewerage system and blocking of existing underground utilities without removal of underground pipelines. Along the street there are no additional underground installations (electrical, telecommunications or gas) and there is no information about any old installations. The municipality will take the necessary measures for relocation or protection of any installations that may occur during the construction work. The sewerage system will be connected to the existing sewer collector that is discharged through the existing waste water treatment plant. The storm water system will be connected to the existing storm water manhole, which is connected to the pipe that discharges into the recipient River Perish. The street has fallen into such disrepair that extensive reconstruction is considered as necessary so as to classify the street as modern and thus, satisfactory for the needs of the residents in the town of Sveti Nikole. The goal of the technical solution is to provide traffic comfort, convenience and safety for the pedestrians and the traffic communication by improving the surface on the street and sidewalks as well as its load bearing characteristics. In order to achieve this goal, four major construction activities have been foreseen for this street such as: reconstruction of the upper structure of the street and sidewalks, construction of storm water system, replacement of the water supply system as well

as the sewerage system.

**Reconstruction of the upper layer of the street and sidewalks** - The technical solution for the street involves the following:

- Removing of existing upper layer;
- Applying of new pavement with two asphalt layers with the following characteristics:
  - Wearing Course AB11 (asphalt concrete layer) with a thickness of 5cm,
  - Bearing Course BNS22 with a thickness of 7cm,
  - Road base crushed stone layer with a thickness of 30cm.
- Kerbstones and sidewalks on both sides of the street with the following characteristics of the layers:
  - 6cm thick interlock concrete tiles,
  - 3-5cm thick fine sand layer,
  - 20 cm thick crushed stone base layer.

The sidewalk has a width of 1-2m depending on the location as shown below.

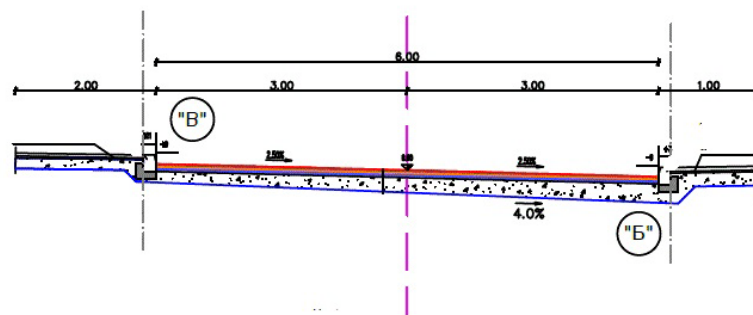


Figure 7 Planned technical solution of the street Mladinska  
Source: Main project

Horizontal solution is projected at a speed of 40km/h and is defined in one direction and one horizontal curvature. The vertical solution is achieved with a total of 7 vertical curvatures and thus applied the maximum slope is 9.8%, and the minimum longitudinal slope is 1.9%. Due to the large radius of curvature the adopted cross slope of the road is 2.5%.

**Construction of a storm water system** - The goal of the technical solution is to provide convenience and safety for pedestrians and traffic by controlling storm water flows within prescribed limits and to retain within each catchment as much as storm water and run-off as possible given the planned use of terrain and civil engineering characteristics. It is important to note that the technical documentation is complete and there is no need for elaboration of additional documents. The technical documentation has been designed according to the existing standards, norms and regulations.

The construction of the main collector of the storm water system on the street of "Mladinska" envisages storm water pipes of PP HM class SN8 with diameter of  $\Phi 400\text{mm}$  with a total length of 543.10m. The connection of the gullies with the manholes will be performed with PP HM pipes, class SN8,  $\Phi 160\text{mm}$  from that with a total length of 210.0m. The main collector will be installed on one side of the street at about 1.2m from the sidewalk.

The technical solution also envisages installation of 17 manholes at different locations, which will not exceed distance of 51.3m and installation of 23 street gullies constructed with PE corrugated pipes; class SN8, OD 500mm at a distance of 35-40m in order to collect the rain water from the street. Their location is determined by

taking into account the street longitudinal and cross slopes. The foreseen storm water system on "Mladinska" is envisaged to be connected with the existing system on the "Veljko Vlahovic" street.

**Sewerage system** - The technical solution also includes construction of sewerage system. The terrain upon which the sewerage system will be reconstructed is with a slope 2-10%. It is envisaged that the route of sewerage will be taken on the sidewalks by the buildings. By using hydraulic calculations determined is the amount of waste water at specified population growth of 1% and a population density of 79 inhabitants per ha.<sup>2</sup> The technical documentation envisages that the sewerage system is performed by two-layer polypropylene drainage pipes (PP-HM) SN8 according to the standard prEN 13476-3. The length of the pipe is L=501.39m with a diameter of ID 250mm SN-8; and length of the pipe is L=96.00m with a diameter of ID 200mm SN-8. The total length of 597,39m of the sewerage system includes the main collector and additional short arms of the existing sewerage systems that are placed on both sides of the street Mladinska.

In order to control the functionality of the sewerage system the technical documentation envisages 20 inspection manholes. The inspection manholes should be made of polyethylene (PE) using "Rotomoulding" technology in compliance with the standard prEN 13598-2 with an average high of 1.8m and internal diameter ID 1000mm. The manholes are with a metal cover with a capacity of 40MPa, and RC ring on top of the manhole, including the prior expansion of excavated trench and setting 10cm sand layer over the bottom trench. The connection of the buildings to the sewerage should be performed inside the manholes. The manholes of the existing sewerage system will be properly blocked after installation of the new sewerage system along Mladinska Street.

The sewerage water will be discharged through the existing waste water treatment plant into the final recipient.

**Water supply system** - The goal of the technical solution for the water supply works on the street of "Mladinska" is to replace the current water pipes in order to improve the water supply services and due to the reconstruction of the street and the fact that the existing water supply system is very old made of asbestos pipes with sings of leakages. The technical solution envisages replacement of the existing pipe and placement of a new PE 100-RC (EN 12201-2, PAS 1075 standard) pipe with two different diameters, OD 110mm and OD140mm. The total length of the pipeline is L= 579.1m, from that 563.65m will be performed with OD140mm PN10 and 11.44m will be performed with OD110mm PN10. The old pipeline will be blocked and the consumers will be connected to the new pipeline network.

Eight inspection manholes are foreseen to be placed on the street as well as six fire hydrants in line with the positive regulation in the country. Manholes will be covered with square covers the "nodular" iron with capacity of 400 KN. The foreseen system is envisaged to be connected to the existing water supply system on the "Karposheva" street.

### 5.2.2 Local Street "Krste Misirkov"

"Krste Misirkov" street begins at the intersection with the street "Karposheva" until the intersection with the street "Septemvriska" at the end of the city park in Sveti Nikole. The reconstruction of this street is also expected to improve the traffic communication and service of the whole town because, as in the case of "Mladinska", it is considered one of the main traffic sections in Sveti Nikole. The construction activities-include reconstruction of the street, replacement of the curbs), and construction of storm water system along the street. The goal of the technical solution for this street is to provide traffic comfort, convenience and safety for the pedestrians and traffic by improving the load bearing characteristics. The water and the sewer system in this part of the town are newly constructed in the last 20 years and there is no need for their renovation. The storm water system that will be constructed will be discharged in the recipient river Gorobinska that has a regulated river bed.

**Reconstruction the upper layer of the street** - The technical solution for the street involves the following:

- Removing of existing upper layer;

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<sup>2</sup> Main project for reconstruction of sewerage system / Hydraulic calculations

- Applying of new pavement with two asphalt layers with the following characteristics:
  - Wearing Course AB11 (asphalt concrete layer) with a thickness of 5cm,
  - Bearing Course BNS22 with a thickness of 7cm,
  - Road base crushed stone layer with a thickness of 30cm.

The sidewalks at this street are in good condition, and reconstruction of the sidewalks is not part of the design. In the picture below is shown the characteristic profile for street Krste Misirkov.

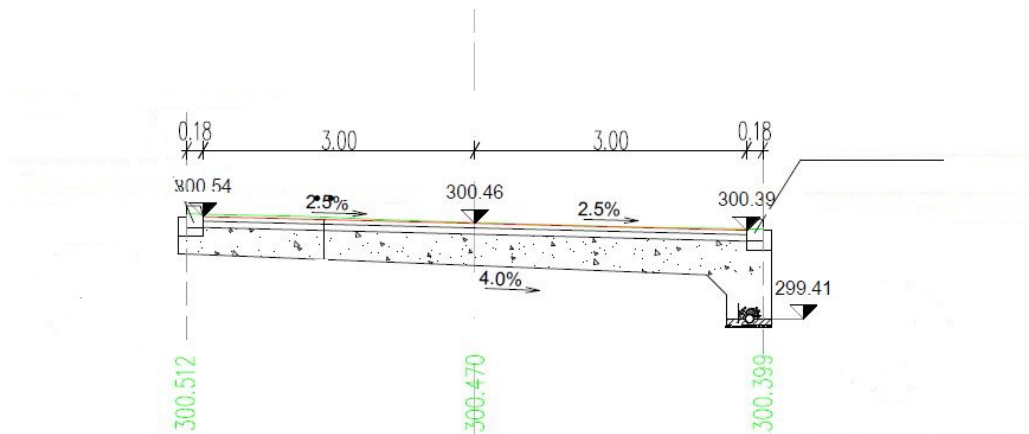


Figure 8 Planned technical solution of the street Krste Misirkov  
Source: Main project

Horizontal solution is designed with speed of 40 (30) km/h and are preserved the existing overall dimensions of the existing street. The vertical solution is achieved with a total of 10 vertical circular curvatures and thus maximal longitudinal applied slope is 8.12% and the minimum longitudinal slope is 0.1%. Cross slope of the road of 2.5% is applied.

**Construction of a storm water system** - The technical solution also involves construction of storm water system along the street. The goal of the technical solution is to provide convenience and safety for pedestrians and traffic by controlling storm water flows within prescribed limits and to retain within each catchment as much as storm water and run-off as possible given the planned use of terrain and civil engineering characteristics. It is important to note that the technical documentation is complete and there is no need for elaboration of additional documents. The technical documentation has been designed according to the existing standards, norms and regulations.

Due to the hilly terrain configuration the storm water system along the part of the street Krste Misirkov that will be reconstructed is organized with two arms of the main collector that pass along the street and run into the collecting manhole no.13 approximately in the middle of the main collector from where the storm water discharges through the third arm of the collector and runs into the recipient Gorobinska river. The first arm of the collector is with a length of 425m, the second arm is with a length of 632m and the third arm that collects the water from the other two arms is constructed with a length of 37m with corrugated PP HN pipe with dimension of ID 693(OD800). The street Krste Misirkov is the main artery for the relatively newly developed settlement without a drainage system, and by collecting the surface water from additional thirteen street arms that flow towards the main artery Krste Misirkov street significant water catchment area is created.

The construction of a storm water system on the street "Krste Misirkov" envisages storm water pipes of PP HM with a different diameter of  $\Phi 315$ - $\Phi 800$ mm with class SN8 according to the standard EN 13476 -3. The total length of the pipeline is  $L = 1,310.54$ m, from that:

- 216.00m will be performed by ID 138 (OD160) SN8,



- 405.61m will be performed by ID 348 (OD400) SN8,
- 260.28m will be performed by ID 432 (OD500) SN8,
- 391.65m will be performed by ID 550(OD630) SN8,
- 37.00m will be performed by ID 693 (OD800) SN8.

Longitudinal slopes are defined in accordance with the field conditions. The trace is drawn providing minimum number of horizontal violations that result with smaller number of manholes.

For the control of the operations of the system 30 revision manholes are included as part of the storm water system. Revision manholes are designed to be prefabricated polyethylene PE, made according to "Rotomoulding" technology in compliance with the standard prEN 13598-2. They should be with an average height of 1.8m, with a metal cover with capacity of 40MPa fixed in a RC ring cast in situ including the prior expansion of excavated trench and setting 10cm sand layer with compunction at the pit bottom.

The storm water system of the street Krste Misirkov will be discharged in the river Gorobinska through the pipe covered with metal grating at the end. All the surface dirt and the possible liquid pollutants will be collected in the gullies' separators.

### **5.3 Conclusions and recommendations**

The project is in line with the existing positive regulation and standards in the country. The project is part of the General Urban Plan (GUP). In the preparation of the documentation were used surveying situations in scale R 1:2500 for the municipality Sveti Nikole. With further detail recording and computer data processing basic layers have been made for which were used as a base for elaboration of the technical documentation of the project.

For determination of catchment areas and intensity of precipitation of storm water system are been used calculations and technical documents valid in Macedonia.

The technical design is in line with the positive regulation, i.e. all applicable laws, secondary legislation and civil engineering and urban-planning standards in the area of streets and storm water systems. It is worth mentioning that the municipality Sveti Nikole has proposed the reconstruction of these streets as of its utmost priority based on public hearings and various complaints received by the residents. The various benefits of the implementation of the project are elaborated in the subsequent chapters of the PAD.