Tacis

Project Name : Technical Assistance to the Southern Republics of the CIS and Georgia – TRACECA : Road Maintenance

Project No TNREG 9601

Annexes

Volume I

Annexes 1 - 21

ANNEX 1

PROCUREMENT PROCEDURE SUMMARY

ANNEX 1

PROCUREMENT PROCEDURE SUMMARY
(Direct Agreement and Informal Consultation)

1 Identify supplier(s) and obtain provisional cost estimate.

2 Prepare costed Schedule of Lots together with Specifications for Informal Consultation items.

3 Send Schedule and Specifications to Task Manager for approval.

4 Send Schedule to (British) Department of Trade and Industry and seek approval to export items listed to the beneficiary countries.

5 Request formal quotations from suppliers (three in the case of Informal Consultation items) in accordance with seven page TACIS General Conditions of Supply attached to invitation letter. Ensure letter amends and clarified General Conditions as appropriate.

6 Receive and evaluate quotations. Check, and if necessary, confirm delivery dates.

7 Send quotations for Informal Consultation items to Task Manager with recommendations for acceptance.

8 Place order for each scheduled lot and attached to each order three copies of three page TACIS Contract Form appropriately completed.

9 Receive and retain for future processing two copies of each Contract Form signed by the supplier.

10 Take delivery of and check individual lots. Store and assemble into country sets.

11 Pack equipment sets having regard to package size and weight regulations applicable to individual country destinations.

12 Fax Schedule of Lots to TACIS office in country of destination requesting appropriate documentation to import free of customs duties and taxes.

13 Arrange for collection of packed equipment by DHL and prepare associated documentation.

14 In recipient country visit TACIS office to collect necessary documentation for customs, and/or advice on what other documentation may be necessary and from where it may be obtained. Visit other offices as necessary.

15 Visit highway department and ascertain equipment delivery location. Arrange for hire of appropriate transport.

16 Take documentation to customs and arrange for clearance of equipment.

17 Transport equipment to highway department, unpack and check it with departmental representative and obtain signature for delivery.

ANNEX 2

BRIDGE TESTING EQUIPMENT

ANNEX 2

BRIDGE TESTING EQUIPMENT

REF	ITEM	SPECIFICATION	SUPPLIER
1	Aluminium Ladder	Sectional, Spigot and Socket Connection, 6m Overall Length	SGB
2	Step Down Transformer	240V to 110V for Portable Site Generator (1)	Greenhams
3	Tape Measure	5m Stanley Powerlock	Greenhams
4	Tape Measure	30m Fibron on Open Reel	Greenhams
5	Paint Inspection Mirror	50mm dia Swivel Head on Telescopic Handle	Elcometer
6	Spotlamp	110V, c/w 20m Cable & Plugs for Generator	Parker
7	Hand Held Data Collection Device	Husky FS/GS & Charger	Husky
8	Water Spray	Hand Held 1 Pint Capacity	Greenhams
9	Spirit Level	1 Metre Long Horiz/Vert Bubble	Greenhams
10	CP9 Concrete Breaker	Makita 100V with Steels	Wide Range
11	Plumb Line	Nylon, with Bob	Greenhams
12	Masonry Drill and Bits	110V with 20m Extension Lead and Plugs	Parker
13	Binoculars	10 x 50 c/w Case and Straps	Estimate
14	Torches	Taking Road Lamp Batteries	Greenhams
15	Electro Potential Meter	Scribe Half Cell	Hammond
16	Thickness Gauge	Audit 105 Steel Thickness Gauge	Hammond
17	Headroom Pole	Sokkisha 6m Telescopic Polypropylene	Sokkisha
18	Schmidt Hammer	"N" Type	Hammond
19	Hammer	Engineers Ball Pein, 3/4 lb	Greenhams
20	Covermeter	Protovale CM 52 Standard Head	Protovale
21	Camera	35mm with Databack, Zoom Lens and Macro	Greenhams
22	Road Signs	Set of 4 Lightweight Grp or Equivalent, Folding	Greenhams
23	Traffic Cones	Set of 12, 750mm Height	Greenhams
24	Fluorescent Vests	Class A Visibility Appendix G, Set of 6	Parker

Note (1) : Generators assumed available in-country.

ANNEX 3

VISUAL AND MECHANICAL PAVEMENT SURVEY EQUIPMENT

ANNEX 3

VISUAL AND MECHANICAL PAVEMENT SURVEY EQUIPMENT

Ref	Item	Specification	Supplier	Quantity (no)
1	Bump Integrator	c/w installation kit, counter and spare wires		1
2	Merlin road roughness machine	Transport Research Laboratory design	CNS Farnell	1
3	Trip meter	c/w universal speedometer probe and Husky cable	D Mollineux	1
4	Measuring Wheel	Pedestrian operated		2
5	Hand held data device	Husky FS/GS 2.0 Mbyte Ram c/w charger and battery	Husky Computers	1
6	Road signs	Set of 4, lightweight grp or equivalent		1 set
7	Double amber flashing beacon	Magnetic type c/w cable and spare bulbs		1
8	Fluorescent vests	Class A visibility, set of 6		1 set
	TOTAL			

ANNEX 4

DETAILED SPECIFICATION
FALLING WEIGHT DEFLECTOMETER -FWD

DETAILED SPECIFICATION
FALLING WEIGHT DEFLECTOMETER – FWD

Ref.	ITEM	SPECIFICATION
1	FWD	Kuab 120SP, FWD Falling Weight Deflectometer including spares and standard tools
	Tools	Tool kit in 1 plastic box specified below:
1		Socket wrench set, 10-32 mm
1		Set allen keys, 1.5-10 mm
1		Set jointed wrenches, 8-19 mm
1		Set wrenches, 8-19
1		Motor plier
1		Screwdriver with 6 bits, 2 phillips, 2 pozidriv, 2 flat
1		Tool kit in 1 metal box specified below:
1		Torch light
1		Caliper
1		Allen key 12 mm
1		Large wire cutter
1		Small wire cutter
1		Plastic hammer
6		Knife
1		Wrenches, 6, 7, 22, 24, 27, 36 mm
3		Folding rule
3		Adjustable wrenches, 6", 8", 10"
3		Files, round, flat and half-round
		Flat pliers
1		Snap ring pliers
Set		Air pressure meter
1		Phillips screwdriver
3		Flat screwdrivers
6		Potentiometer screwdriver
1		
		Remaining tools specified below:
1		Multimeter with current measurement plier
1		Four-way rim wrench
1		Cable shoe plier with cable shoes
1		Jumper cables

DETAILED SPECIFICATION
FALLING WEIGHT DEFLECTOMETER – FWD

Ref.	ITEM	SPECIFICATION
	Spare parts	Specified below:
1		Trailer wheel
9		Power relays
1		Subcaster
16		Weight plate screws, 4 of each type
1		Hitch damper
3		Tripods, one of each type
2		Distance meter sensors
1		Fanbelt
2		Oil filter
1 Set		O-rings for tripods
1 Set		Fuses, 10 of each type
8		Springs for geophones
1		Spring for magnet cable
2		Spark plugs
1Set		Rubber plates with screws for small load plate
1 Set		Rubber plates with screws for big load plate
1Set		Screws for small load plate
1 Set		Screws for big load plate
5		End switches, 1 or 2 of each type
1		Solenoid
1		Car-relay
2		Air temperature sensor
1Set		O-rings for load cell
1 Set		Bulbs, 2 of each type
1	Electronic Unit	Data Collection Unit including stand with rubber suspension to be placed in towing vehicle
1	DMI	Distance Meter Instrument (Display)
1	Computer	Toshiba Satellite 2520 CDT
1	Computer accessories	Power supply, 2 English language manuals, 50 floppy disks etc.
1	Printer	Hewlett Packard 420 C
1	Printer accessories	Power supply, 1 color cartridge, 2 black cartridges, printer cable, English language software, 2 English language manuals, 500 papers
1	Calibration Stand	Stand for comparison between geophones
1	Thermometer	Digital temperature meter for air and liquid
1	Load plate	Big rigid load plate 450 mm
1	Remaining parts	Cable intake, cable intake cover, 2 english analyse manuals, load plate rubber for lowest load mode, 1 manual for Hondamotor, inverter 24-220V, serial cable

ANNEX 5

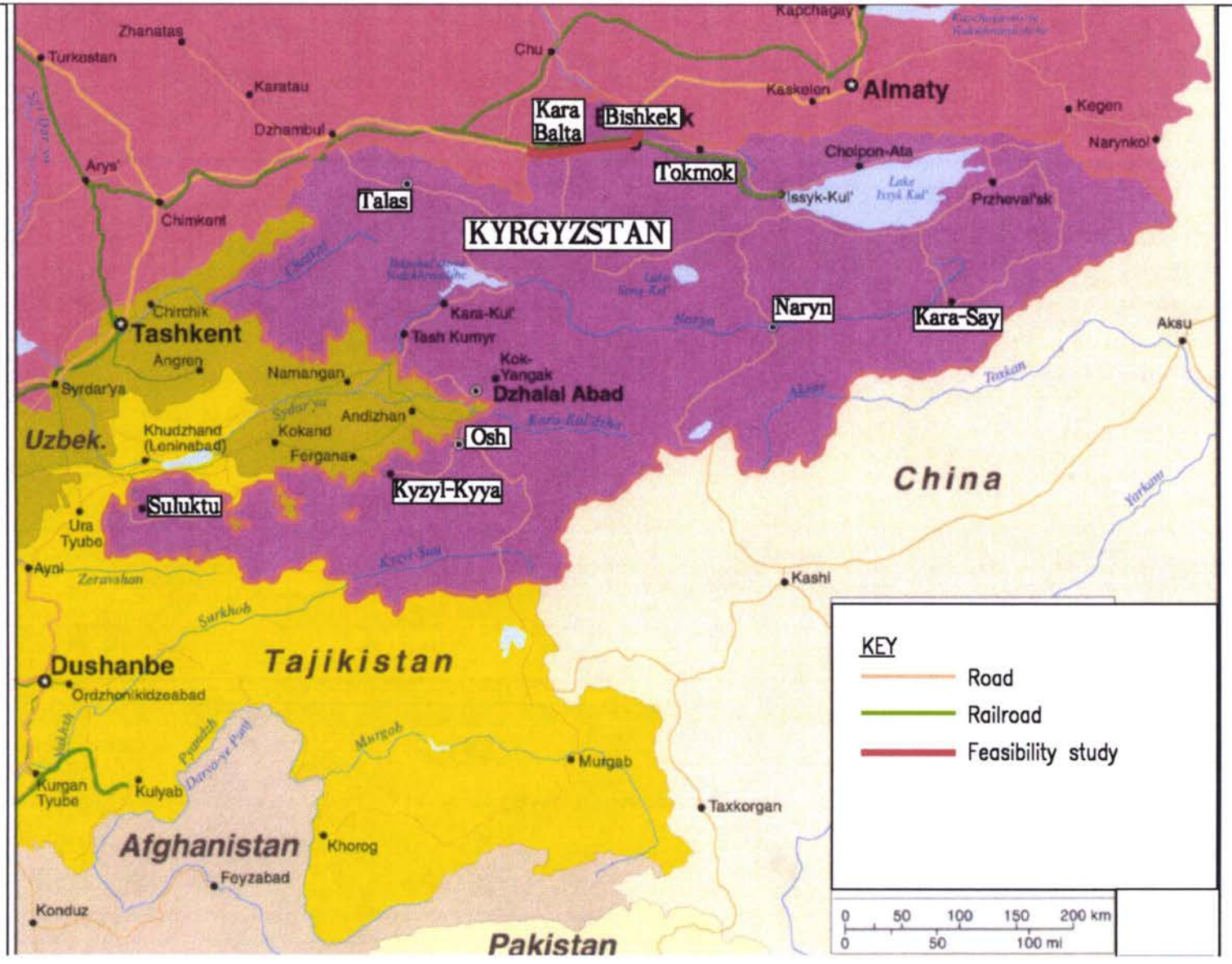
MAP OF PAVEMENT SURVEY AND FEASIBILITY STUDY SECTIONS - ARMENIA

ANNEX 6

MAP OF PAVEMENT SURVEY AND FEASIBILITY STUDY SECTIONS - KAZAKHSTAN

ANNEX 7

MAP OF PAVEMENT SURVEY AND FEASIBILITY STUDY SECTIONS - KYRGYZSTAN



ANNEX 8

MAP OF PAVEMENT SURVEY AND FEASIBILITY STUDY SECTIONS - UZBEKISTAN

ANNEX 9

SAMPLE RECORD OF DRIVE-OVER RECONNAISSANCE SURVEY FOR ARMENIA, KAZAKHSTAN, KYRGYZSTAN AND UZBEKISTAN

ANNEX 9 : TRACECA ROADS MAINTENANCE PROJECT (TN REG 9601): MODULE D

SAMPLE RECORD OF DRIVE-OVER RECONNAISSANCE SURVEY FOR: ARMENIA

Road No	Link Ref	Link Start		Link End		Link Length Km	Condn Rating (Note 1)	Traffic Survey Station	
		Location	Km	Location	Km			Location	Km
M3	M304	Ashtarak boundary	40	Kuchak underpass	65	25	1-2		
	M305	Kuchak underpass	65	Alagziz boundry	85	20	1-2		
	M307	Alagziz boundry	86	Spitak boundary	111	25	1-2		
	M309	Spitak boundary	116	Vanadzor Junc.	127	11	1-2		
	M310	**Vanadzor Junc.**	**127**	**Stepanaven boundary**	**153**	**26**	**1-2**		
	M312	**Stepanaven boundary**	**159**	**Tashir, Ashotsk junc**	**173**	**14**	**1-2**		
	M313	**Tashir, Ashotsk junc**	**127**	**Georgia border**	**184**	**11**	**1-2**	**Near Tashir**	**176**
								Near Ararat	**70**
								Near Abovian	**26**
Total length surveyed: 132 km							Total length for detailed study: 51 km		

Notes:
1) Assessed Condition Category
   1 : Good (IRI 3)
   2 : Fair (IRI 4 - 6)
   3 : Moderate to Poor (IRI 7 - 9)
   4 : Bad to Very Bad (IRI 10)
2) All links single carriageway
3) Priority sections for detailed study shown **BOLD.**
4) All chainages and lengths approximate.

RECORD OF DRIVE-OVER RECONNAISSANCE SURVEY FOR KAZAKHSTAN

Road No	Link Ref	Link Start		Link End		Link Length Km	Condn Category (Note 1)	Traffic Survey Station	
		Location	Km	Location	Km			Location	Km
A351	**A35102**	**Almaty ring road**	**12**	**Evgenevka**	**65**	**53**	**2**	**Police station**	**15**
	A35103	**Evgenevka**	**65**	**Chelik**	**108**	**43**	**2**	**Police station**	**70**
	A35104	**Chelik**	**108**	**Kokpek**	**155**	**47**	**2-3**	**Km post 110**	**110**
	A35105	Kokpek	155	Chundza	218	63	2-3		
	A35106	Chundza	218	River bridge	268	50	2-3		
	A35107	River bridge	268	Koktal	294	26	2-3		
A353	A35301	Koktal	294	Panvilov	312	18	2-3		
	A35302	Panvilov	312	Chargoz	349	37	2-3		
						337			
M39	M3905	Kyrgz border	328	Merke boundary	349	21	2		
	M3907	**Merke boundary**	**354**	**Logveo**	**393**	**39**	**2**	**Near Police Check**	**65**
	M3908	**Logveo**	**393**	**Petrol station**	**448**	**55**	**2-3**	**Km post 394**	**394**
	M3909	**Petrol station**	**448**	**Km post 486**	**486**	**38**	**2**	**Km post 450**	**450**
	M3910*	Km post 486	486	Km post 489	489	3	2		
	M3911	Km post 489	489	Djambul boundary	513	24	2		
	M3913	Djambul boundary	520	Junction local road	569	49	2		
	M3914	Junction local road	569	Vanovka	619	50	2		
	M3915	Vanovka	619	Km post 638	638	19	2		
	M3916*	Km post 638	638	Km post 645	645	7	2		
	M3917	Km post 645	645	Belae	668	23	2		
	M3918	**Belae**	**668**	**Cimkent boundary**	**686**	**18**	**2**	**Near roundabout**	**660**
						346			

Notes:
1) Assessed Condition Category
   1 : Good (IRI ≤ 3)
   2 : Fair (IRI 4 - 6)
   3 : Moderate to Poor (IRI 7 - 9)
   4 : Bad to Very Bad (IRI ≥ 10)
2) All links single carriageway except indicated by *.
3) Priority links for detailed study shown in **BOLD.**
4) All chainages and lengths approximate.

Road No	Link Ref	Link Start		Link End		Link Length Km	Condn Category (Note 1)	Traffic Survey Station	
		Location	Km	Location	Km			Location	Km
M32	M3202	Cimkent boundary	4	Timortanovka	40	36	2		
	M3203	**Timortanovka**	**40**	**Tortkul**	**95**	**55**	**2-3**	**After Market**	**44**
	M3204	**Tortkul**	**95**	**Strarkan**	**140**	**45**	**2-3**		
	M3205	Strarkan	140	Turkistan boundary	162	22	2-3		
	M3207	**Turkistan boundary**	**166**	**Km post**	**216**	**50**	**2-3**		
	M3208	**Km post**	**216**	**Km post**	**266**	**50**	**2-3**		
	M3209	**Km post**	**266**	**Km post**	**316**	**50**	**2-3**		
	M3210	**Km post**	**316**	**Km post**	**366**	**50**	**2-3**		
	M3211	Km post	366	Km post	416	50	2-3		
	M3212	Km post	416	Kyzl Orda boundary (River bridge)	444	28	2-3		
	M3214	**K.orda boundary**	**454**	**Chagan**	**504**	**50**	**2-3**	**After Bridge**	**454**
	M3215	Chagan	504	Km post	554	50	2-3		
	M3216	Km post	554	Km post	604	50	2-3		
	M3217	Km post	604	Km post	654	50	2-3		
	M3218	Km post	654	Km post	704	50	2-3		
	M3219	Km post	704	Km post	754	50	2-3		
	M3220	Km post	754	Km post	804	50	2-3		
	M3221	Km post	804	Km post	854	50	2-3		
	M3222	Km post	854	Km post (Aralsk)	918	64	2-3		
						900			
Total length surveyed: 1583km						Total length for detailed study: 643km			

Notes:
1) Assessed Condition Category
   1 : Good (IRI ≤ 3)
   2 : Fair (IRI 4 - 6)
   3 : Moderate to Poor (IRI 7 - 9)
   4 : Bad to Very Bad (IRI ≥ 10)
2) All links single carriageway except indicated by *.
3) Priority links for detailed study shown in **BOLD.**
4) All chainages and lengths approximate.

RECORD OF DRIVE-OVER RECONNAISSANCE SURVEY FOR : KYRGYZSTAN

Road No	Link Ref	Link Start Location	Km	Link End Location	Km	Link Length Km	Condn Rating (Note 1)	Traffic Survey Station Location	Km
M41	M4101	Osh-oblast Hospital	0	Bash	50	50	2		
	M4102	Bash	50	Culcha round about	81	31	2		
	M4103	Gulcha round about	81	Km post 131	131	50	3		
	M4104	Km post 131	131	Sari Tash Police check	183	52	3		
M39	**M3901**	**Kazakhstan border (east)**	**222**	**End of Bishkek bypass**	**256 (16)**	**34**	**3**	**Police check**	**16**
	M3902*	**End of Bishkek bypass**	**16**	**End of Dual Carriage way**	**21**	**5**	**3**		
	M3903	**End of Dual Carriage way**	**21**	**Kazakhstan border (west)**	**92**	**70**	**3**	**Round about**	**60**
						109			
Total length surveyed: 292 km				Total length for detailed study: 114 km					

Notes:

1) Assessed Condition Category
   - 1 : Good (IRI ≤ 3)
   - 2 : Fair (IRI 4 - 6)
   - 3 : Moderate to Poor (IRI 7 - 9)
   - 4 : Bad to Very Bad (IRI ≥ 10)
2) All links single carriageway except indicated by *.
3) Priority sections for detailed study shown **BOLD.**
4) All chainages and lengths approximate.
5) M39 chainage measured from Almaty to end of bypass, thence from centre of Bishkek.

RECORD OF DRIVE-OVER RECONNAISSANCE SURVEY FOR: UZBEKISTAN

Road No	Link Ref	Link Start		Link End		Link Length	Condn Rating	Traffic Survey Station	
		Location	Km	Location	Km	Km	(Note 1)	Location	Km
A373	**A37301**	**Tashkent ringroad**	**11**	**Toitepa**	**28**	**17**	**2**	**Km post 20**	**20**
	A37302	**Toitepa**	**28**	**Okangaran**	**57**	**29**	**2-3**		
	A37303	**Okangaran**	**57**	**Angreen junc 4R2**	**106**	**49**	**2-3**		
	A37304	Angren junction	106	Start of reconstruction work	115	9	3		
	A37305	Start of reconstruction work	115	Finish of reconstruction work	196	81			
	A37306	Finish of reconstruction work	196	Kokand boundary	245	49	3		
	A37308	**Kokand boundry**	**250**	**Yengikurgan**	**262**	**12**	**3**	**Km post 261**	**261**
	A37309	**Yengikurgan**	**262**	**Kanabad**	**311**	**49**	**3**		
	A37310	**Kanabad**	**311**	**Shakrikan**	**339**	**28**	**2-3**		
	A37311	**Shakrikan**	**339**	**Andijan boundry**	**358**	**19**	**2-3**		
						342			

Notes:
1) Assessed Condition Category
   1 : Good (IRI ≤ 3)
   2 : Fair (IRI 4 - 6)
   3 : Moderate to Poor (IRI 7 - 9)
   4 : Bad to Very Bad (IRI ≥ 10)
2) All links single carriageway .
3) Priority sections for detailed study shown **BOLD.**
4) All chainages and lengths approximate.

Road No	Link Ref	Link Start		Link End		Link Length	Condn Rating	Traffic Survey Station	
		Location	Km	Location	Km	Km	(Note 1)	Location	Km
M37	M3701	River Bridge	0	Samarkand boundary (roundabout)	4	4	2		
	M3702	Samarkand boundary (roundabout)	4	Km post 59	59	55	3		
	M3703	**Km post 59**	**59**	**Katakurgan Km post 84**	**84**	**25**	**2-3**	**Km post 76**	**76**
	M3704	**Katakurgan**	**84**	**Km post 136**	**136**	**52**	**2-3**		
	M3705	**Km post 136**	**136**	**Navoi junc /A379**	**159**	**23**	**2-3**	**Km post 159**	**159**
	M3706	**Navoi junc /A379**	**159**	**Qiziltepa**	**211**	**52**	**2-3**		
	M3707	**Qiziltepa**	**211**	**Gishdovan**	**237**	**26**	**2-3**		
	M3708	**Gishdovan**	**237**	**Buchara (roundabout)**	**266**	**29**	**2-3**		
	M3709	**Buchara (roundabout)**	**266**	**Karakul**	**327**	**61**	**2-3**		
	M3711	**Karakul**	**327**	**Turkmenistan boarder**	**353**	**26**	**3**	**Km post 341**	**341**
						353			
Total length surveyed: 695 km						Total length for detailed study: 497 km			

Notes:
1) Assessed Condition Category
   1 : Good (IRI ≤ 3)
   2 : Fair (IRI 4 - 6)
   3 : Moderate to Poor (IRI 7 - 9)
   4 : Bad to Very Bad (IRI ≥ 10)
2) All links single carriageway .
3) Priority sections for detailed study shown **BOLD.**
4) All chainages and lengths approximate.

ANNEX 10

RECORD OF NETWORK REFERENCING OF PRIORITY LINKS FOR: ARMENIA, KAZAKHSTAN, KYRGYZSTAN, UZBEKISTAN

ANNEX 10 : TRACECA ROADS MAINTENANCE PROJECT (TN REG 9601) : MODULE D

RECORD OF NETWORK REFERENCING OF PRIORITY LINKS FOR : ARMENIA

Road No	Link Ref.	Section Ref.	Section Start		Section End		Section Length Km	Link Length Km
			Location	Km	Location	Km		
M3	M310	010	Vanadzor Junction	127	Km post 142- Near police check	142	15	
		020	Km post 142- Near police check	142	Stepanaven boundary	152.8	10.8	25.8
	M312	010						15.1
			Stepanaven boundary	158.5	Tashir, Ashotsk junc.	173.6	15.1	
	M313	010						10.4
			Tashir, Ashotsk junc.	173.6	Georgian border, Custom office	184	10.4	
								51.3

Note: All link/section node points marked in white paint For locations see sketches.

RECORD OF NETWORK REFERENCING OF PRIORITY LINKS FOR KAZAKHSTAN

Road Reference	Link Ref	Section Ref	Section Start		Section End		Section Length	Link Length
			Location	Km	Location	Km	Km	Km
A351	A35102	010	Almaty ring road	12.9	Road junc. to v.Dmitrievka	27.8	14.9	
		020	Road junc. to v.Dmitrievka	27.8	River Issyk bridge	43.3	15.5	
		030	River Issyk bridge	43.3	Road junc. to Ornek	53.7	10.4	
		040	Road junc. to Ornek	53.7	Evgenevka, Kairat junc	65.2	11.5	52.3
	A35103	010	Evgenevka, Kairat junc	65.2	River Turmys bridge	79.2	13.9	
		020	River Turmys bridge	79.2	Road junc to Koldy	90	10.8	
		030	Road junc to Koldy	90	Chelik, river Lavar bridge	106.9	16.8	41.6
	A35104	010	Chelik, river Lavar bridge	106.9	River Chilik bridge	125.3	18.4	
		020	River Chilik bridge	125.3	River Nura bridge	140.2	14.9	
		030	River Nura bridge	140.2	River bridge	152	11.8	
		040	River bridge	152	Kokpek, Km post 167	167	15	60.1
M39	M3907	010	Merke boundary/Jun. A359	352	Km post 366	366	14	
		020	Km post 366	366	Km post 383	383	17	
		030	Km post 383	383	Logveo, Km post 394	394	11	42
	M3908	010	Logveo, Km post 394	394	Km post 412	412	18	
		020	Km post 412	412	Km post 430	430	18	
		030	Km post 430	430	Km post 439	439	9	
		040	Km post 439	439	Petrol Station	448	9	54
	M3909	010	Petrol Station	448	Km post 460	460	12	
		020	Km post 460	460	Km post 475	475	15	
		030	Km post 475	475	Km post 486	486	11	38
	M3918	010	Belae, Km post 668	668	Km post 678	678	10	
		020	Km post 678	678	Cimkent boundary	686	8	18
M32	M3203	010	Timortanovka, Km post 40	40	Km post 55	55	15	
		020	Km post 55	55	Km post 70	70	15	
		030	Km post 70	70	Km post 83	83	13	
		040	Km post 83	83	Tortkul, Km post 95	95	12	55
	M3204	010	Tortkul, Km post 95	95	Km post 110	110	15	
		020	Km post 110	110	Km post 125	125	15	
		030	Km post 125	125	Strarkan	140	15	45
	M3207	010	Turkistan boundary, Km post 166	166	Km post 179	179	13	
		020	Km post 179	179	Km p. 192	192	13	
		030	Km p. 192	192	Km post 205	205	13	
		040	Km post 205	205	Km post 217	217	12	51

Road Reference	Link Ref	Section Ref	Section Start		Section End		Section Length Km	Link Length Km
			Location	Km	Location	Km		
	M3208	010	Km post 217	217	Km post 228	228	11	
		020	Km post 228	228	Km post 240	240	12	
		030	Km post 240	240	Km post 254	254	14	
		040	Km post 254	254	Km post 266	266	12	49
	M3209	010	Km post 266	266	Km post 280	280	14	
		020	Km post 280	280	Km post 295	295	15	
		030	Km post 295	295	Km post 305	305	10	
		040	Km post305	305	Km post 316	316	11	50
	M3210	010	Km post316	316	Km post 331	331	15	
		020	Km post 331	331	Km post 343	343	12	
		030	Km post 343	343	Km post 354	354	11	
		040	Km post 354	354	Km post 366	366	12	50
	M3214	010	K.Orda boundary , Km post 454	454	Km post 470	470	16	
		020	Km post 470	470	Km post 480	480	10	
		030	Km post 480	480	Km pos 489(bridge)	489	9	
		040	Km post 489	489	Chagan	504	15	50
								350

Note: All link/section node points marked in white paint. For locations see sketches.

RECORD OF NETWORK REFERENCING OF PRIORITY LINKS FOR KYRGYZSTAN

Road No	Link Ref.	Section Ref.	Section Start		Section End		Section Length Km	Link Length Km
			Location	Km	Location	Km		
M39	M3901	010	Border Check point	222	Start of Bishkek bypass	232	10	
		020	Bishkek bypass	232	Junction to Airport (Cleaver leaf Junc.)	244	12.5	
		030	Junction to Airport (Cleaver leaf Jun.)	244	End of Bishkek bypass	255		34.1
							11.60	
	M3902*	010	End of Bishkek bypass	16	End of Dual Carriage way	21		
		020	End of Dual Carriage way	21	Start of Dual Carriage way	16		9.6
							4.8	
	M3903	010	Start of Single Carriage way	21	Km post 36	36		
		020	Km post 36	36	Km post 51	51	4.80	
		030	Km post 51	51	Round about- Junct. with M41	60		
		040	Round about-Junct. with M41	60	Km post 76	76	14.9	
		050	Km post 76	76	Border Check Point	92	14.8	70.6
							9.5	
							15.5	
							15.9	
							Total	114.3

*010 right side of Dual Carriageway
*020 left side of Dual Carriageway

RECORD OF NETWORK REFERENCING OF PRIORITY LINKS FOR UZBEKISTAN

Road No	Link Ref	Section Ref	Section Start		Section End		Section Length Km	Link Length Km
			Location	Km	Location	Km		
A373	A37301	010	Tashkent ringroad, Km post 11	11.0	Road junc to oblast centre	17.8	6.8	
		020	Road junc to oblast centre	17.8	Toitepa, junc 4P20	28.7	10.9	17.7
	A37302	010	Toitepa, junc 4P20	28.7	Road junc to ind complex	35.0	6.3	
		020	Road junc to ind complex	35.0	Km post 48	48.0	13.0	
		030	Km post 48	48.0	Okangaran, junc 4R2	57.0	9.0	28.3
	A37303	010	Okangaran, junc 4R2	57.0	Km post 64	64.0	7.0	
		020	Km post 64	64.0	Km post 76	76.0	12.0	
		030	Km post 76	76.0	Km post 86	86.0	10.0	
		040	Km post 86	86.0	Km post 99	99.0	13.0	
		050	Km post 99	99.0	Angreen junc/4R184	106.0	7.0	49.0
	A37308	010	Kokand Km post 250	250.0	Buvida junc (roundabout)	255.5	5.5	
		020	Buvida junc (roundabout)	255.5	Yengikurgan Km post 262	262.0	6.5	12.0
	A37309	010	Yengikurgan Km post 262	262.0	Km post 270	270.0	8.0	
		020	Km post 270	270.0	Road junction/4R148	278.3	8.3	
		030	Road junction/4R148	278.3	Road junction/4K910	290.0	11.7	
		040	Road junction/4K910	290.0	Namangan junction	302.9	12.9	
		050	Namangan junction	302.9	Kanabad, junc 4K841	310.7	7.8	48.7
	A37310	010	Kanabad, junc 4K841	310.7	Km post 318	318.0	7.3	
		020	Km post 318	318.0	Road junc/4R128/4N108	329.1	11.1	
		030	Road junc/4R128/4N108	329.1	Shakrikan junction	333.0	3.9	
		040	Shakrikan junction	333.0	Shakrikan junction/4R112E	339.4	6.4	28.7
	A37311	010	Shakrikan junction/4R112E	339.4	Km post 351	351.0	11.6	
		020	Km post 351	351.0	Andijan Km post 358	358.0	7.0	18.6
								203.0

Road No	Link Ref	Section Ref	Section Start		Section End		Section Length	Link Length
			Location	Km	Location	Km	Km	Km
M37	M3703	010	Km post 59	59.0	Km post 73	73.0	14.0	
		020	Km post 73	73.0	Katakurgan roundabout	78.0	5.0	
		030	Katakurgan roundabout	78.0	Katakurgan, Km post 54	84.0	6.0	25.0
	M3704	010	Katakurgan, Km post 84	84.0	Km post 98	98.0	14.0	
		020	Km post 98	98.0	Atrash junction	105.5	7.5	
		030	Atrash junction	105.5	Km post 120	120.0	14.5	
		040	Km post 120	120.0	River bridge	126.3	6.3	
		050	River bridge	126.3	Km post 136	136.0	9.7	52.0
	M3705	010	Km post 136	136.0	Road junc (Police check)	146.8	10.8	
		020	Road junc (Police check)	146.8	Navoi junc/A379	159.1	12.3	23.1
	M3706	010	Navoi junc/A379	159.1	Km post 174	174.0	14.9	
		020	Km post 174	174.0	Km post 189	189.0	15.0	
		030	Km post 189	189.0	Tashrabad road bridge	202.8	13.8	
		040	Tashrabad road bridge	202.8	Qiziltepa Km post 211	211.0	8.2	51.9
	M3707	010	Qiziltepa Km post 211	211.0	Road junc to oblast centre	218.0	7.0	
		020	Road junc to oblast centre	218.0	Aggrashtan junc	225.0	7.0	
		030	Aggrashtan junc	225.0	Gishdovan Km post 237	237.0	12.0	26.0
	M3708	010	Gishdovan Km post 237	237.0	Km post 251	251.0	14.0	
		020	Km post 251	251.0	Nukos junc/4R68	258.3	7.3	
		030	Nukos junc/4R68	258.3	Buchara (roundabout)	266.0	7.7	29.0
M37	M3709	010	Buchara (roundabout)	266.0	Buchara, south gate	279.8	13.8	
		020	Buchara, south gate	279.8	Jandor junction	288.3	8.5	
		030	Jandor junction	288.3	Km post 303	303.0	14.7	
		040	Km post 303	303.0	Km post 318	318.0	15.0	
		050	Km post 318	318.0	Karakul Km post 327	327.0	9.0	61.0
	M2710	010	Karakul Km post 327	327.0	Karakul main junction	331.5	4.5	
		020	Karakul main junction	331.5	Alat junction	340.2	8.7	
		030	Alat junction	340.2	Turkmenistan border	353.0	12.8	26.0
								294.0

Note: 1) All link/section node points marked in white paint . For locations see sketches.

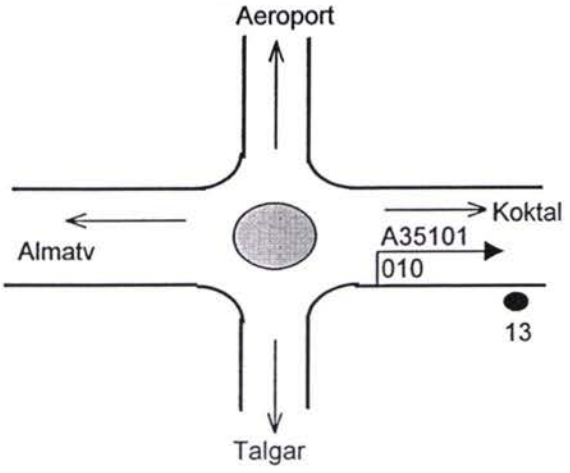
ANNEX 11

SAMPLE SKETCHES

- LOCATION OF LINK / SECTION NODE POINTS

A351

A35101010



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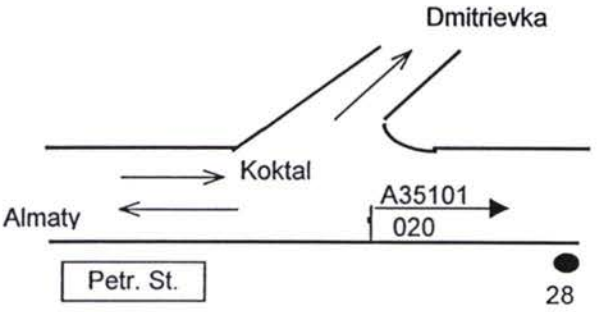

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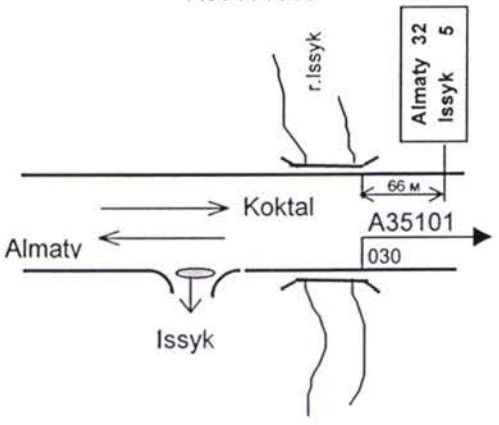

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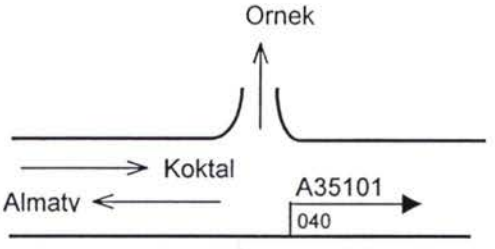
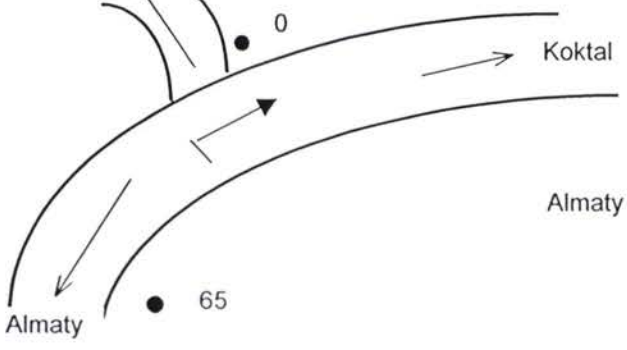


Kairat **A35102010**



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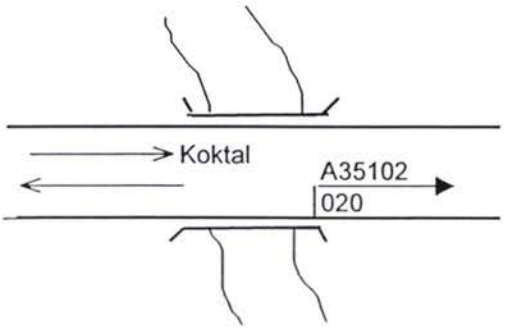

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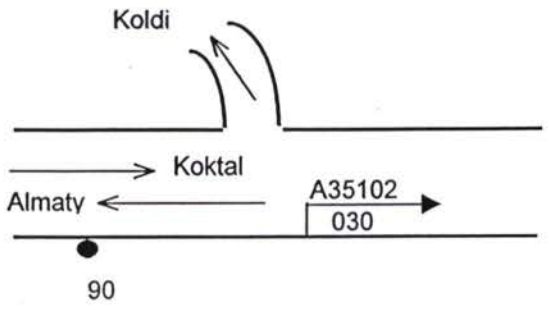

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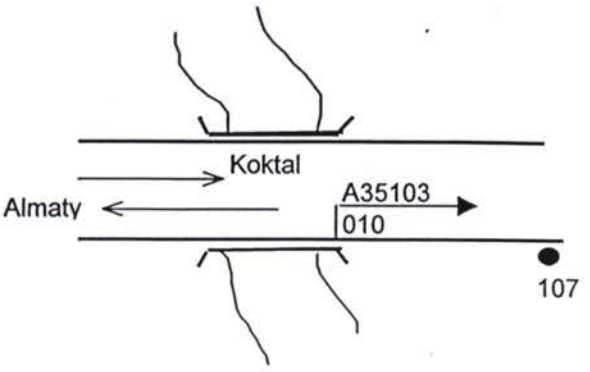

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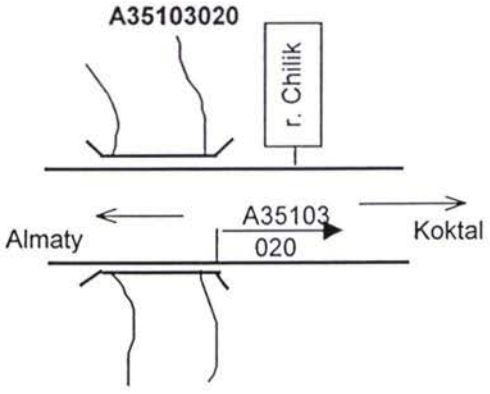

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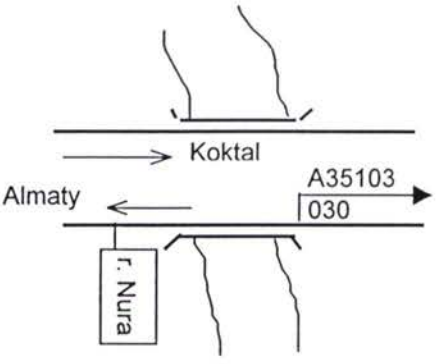

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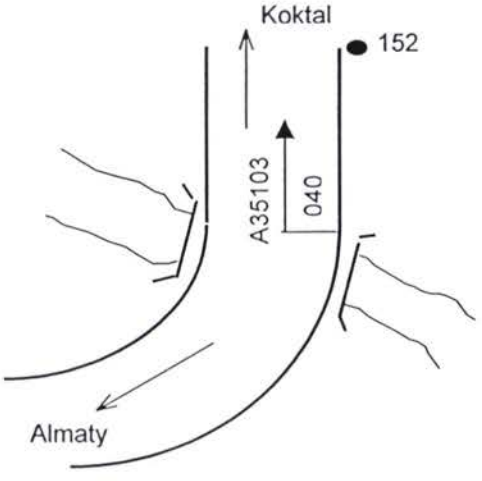

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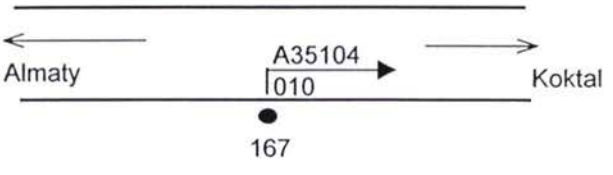

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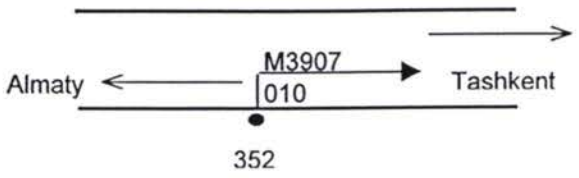

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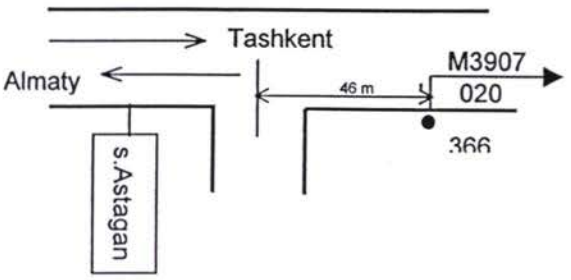

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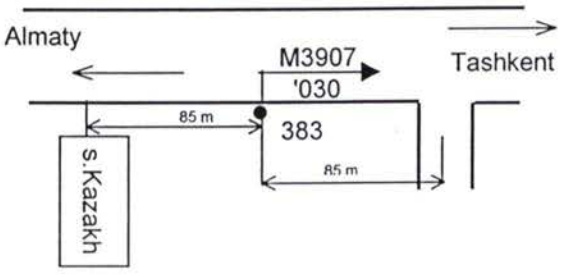

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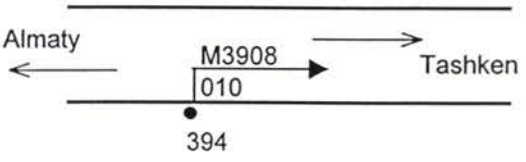

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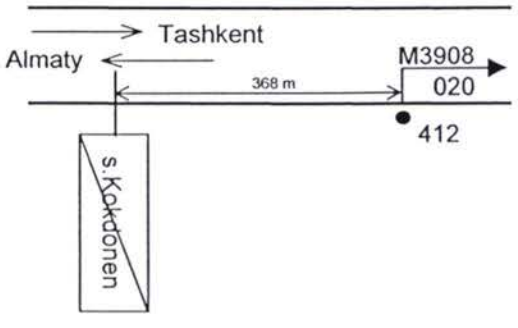

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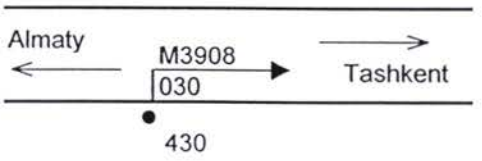

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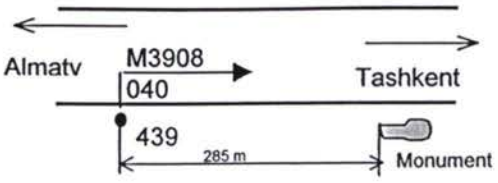

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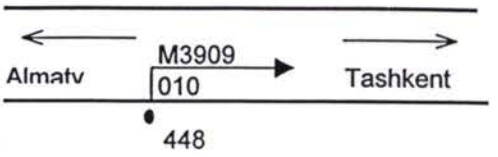

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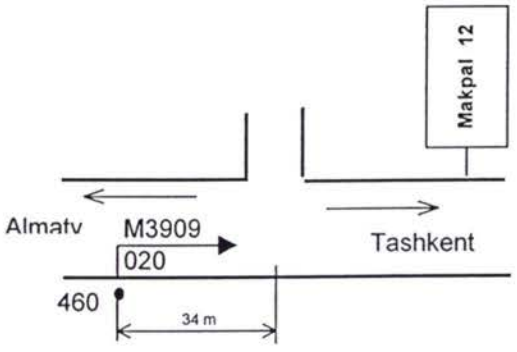

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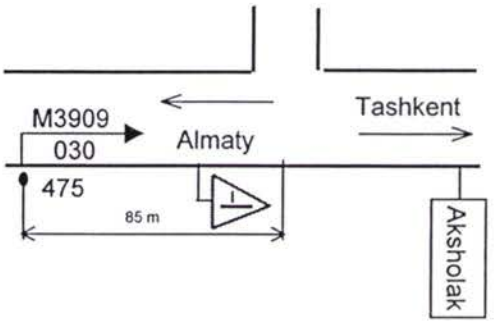

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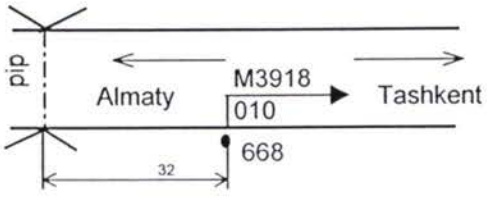

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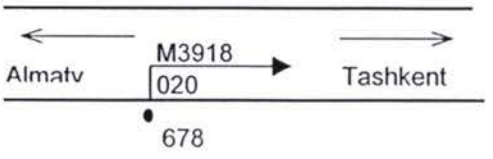

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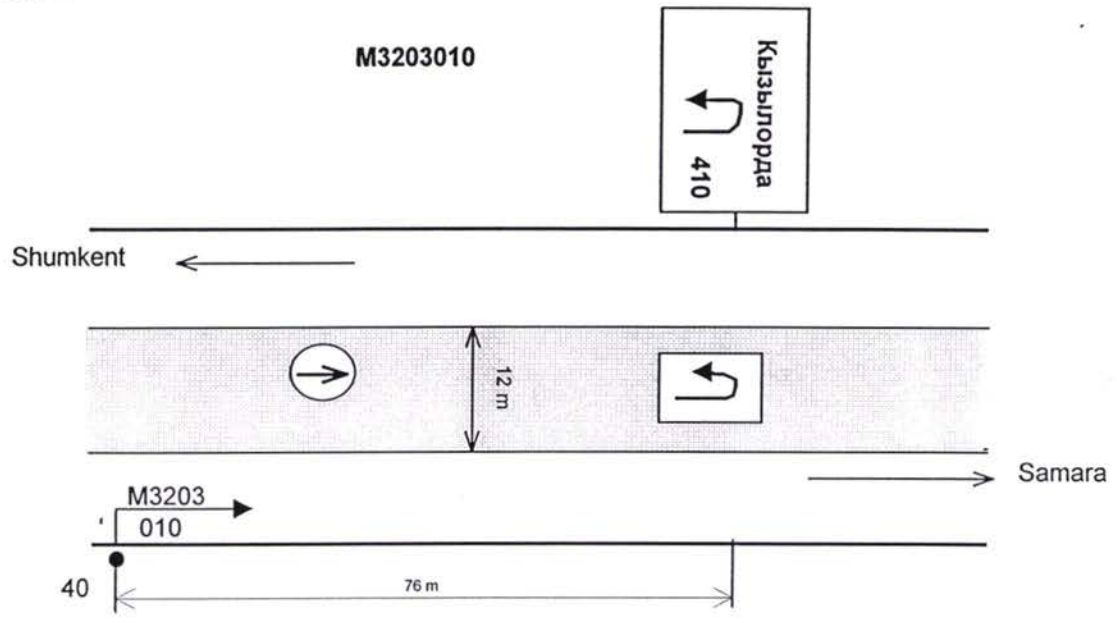

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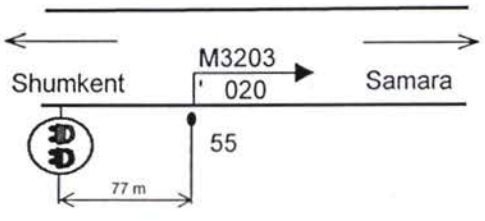

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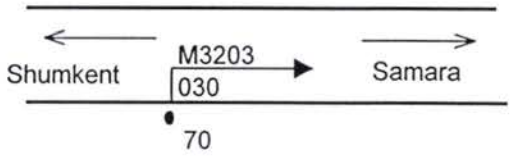

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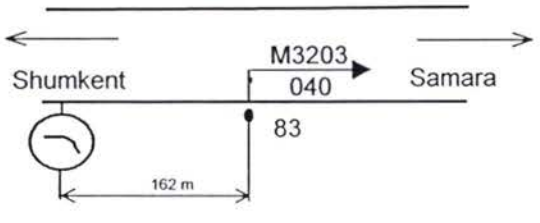

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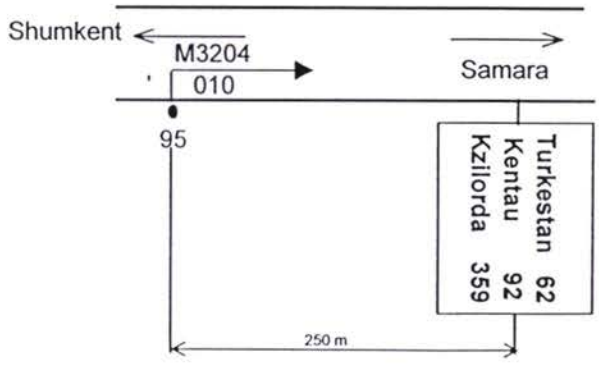

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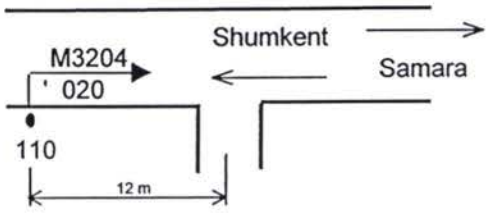

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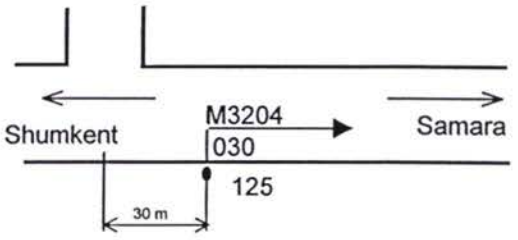

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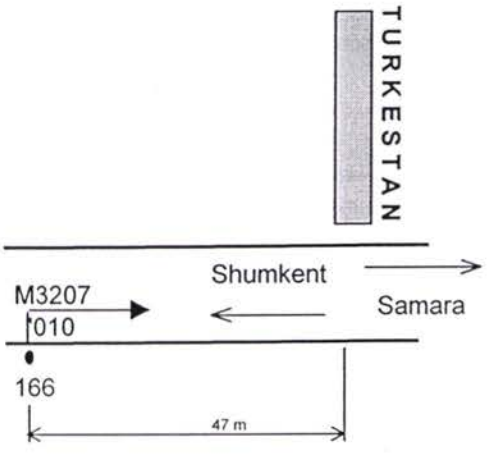

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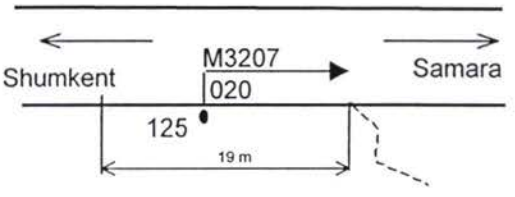

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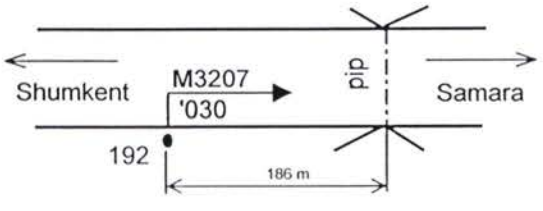

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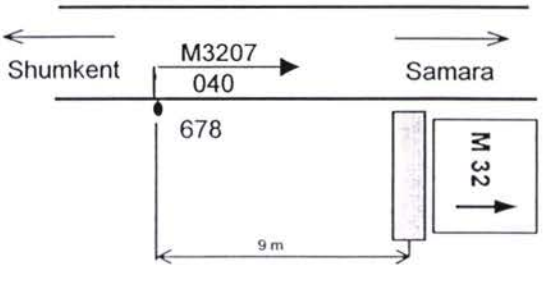

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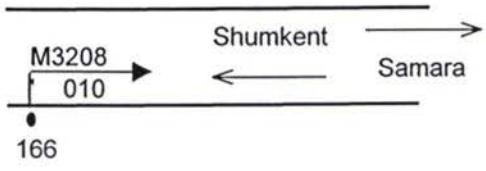

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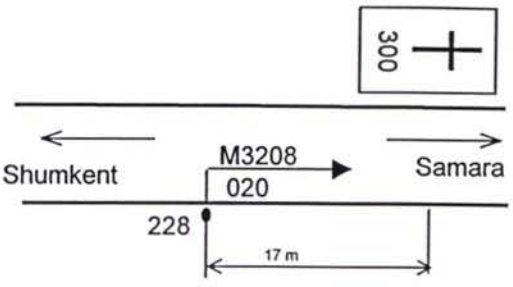

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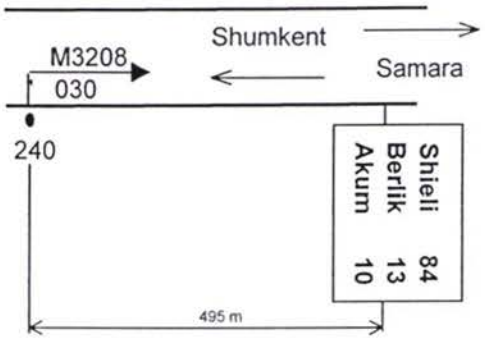

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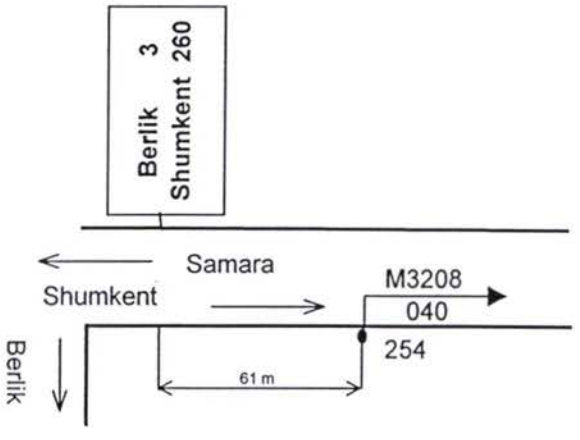

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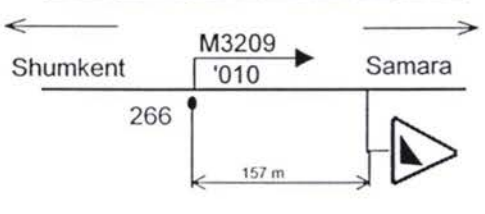

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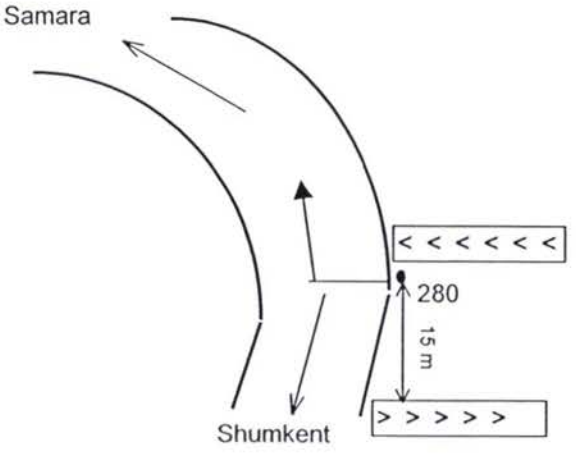

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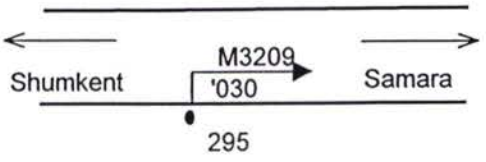

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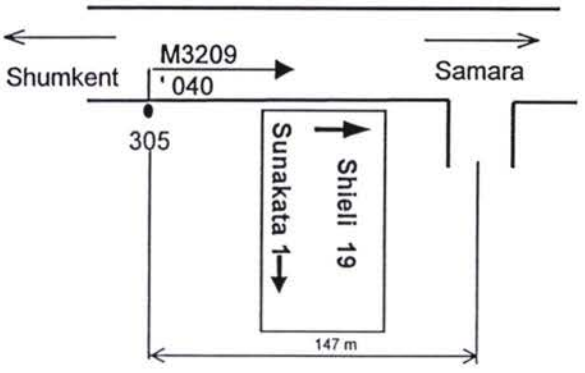

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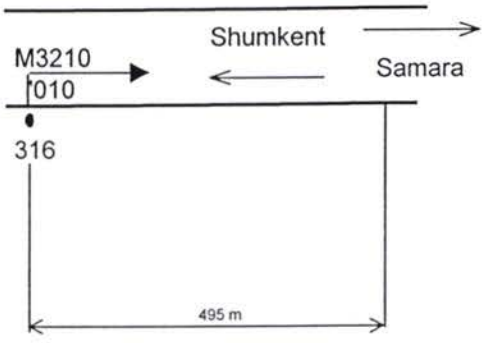

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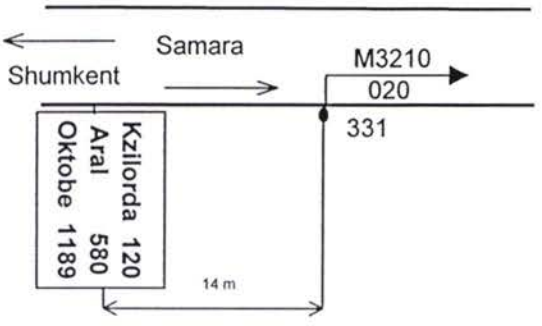

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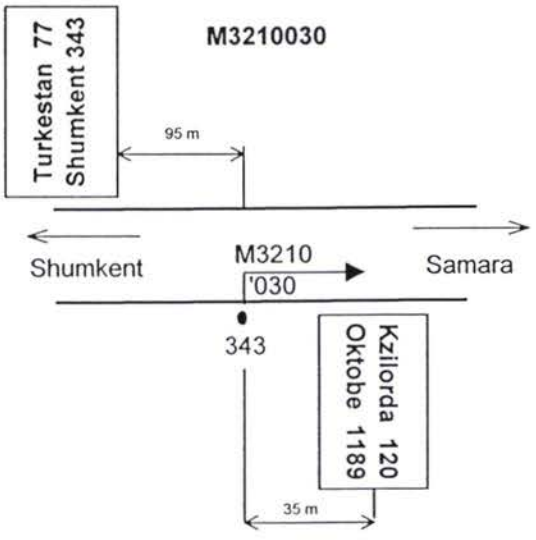

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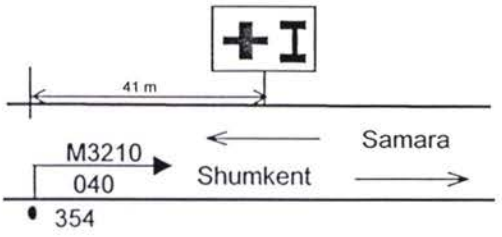

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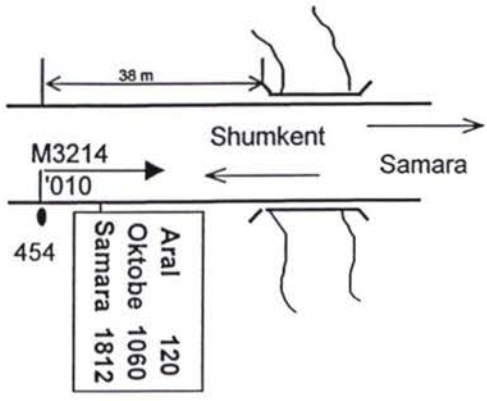

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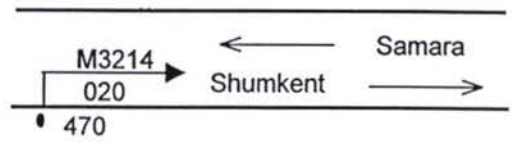

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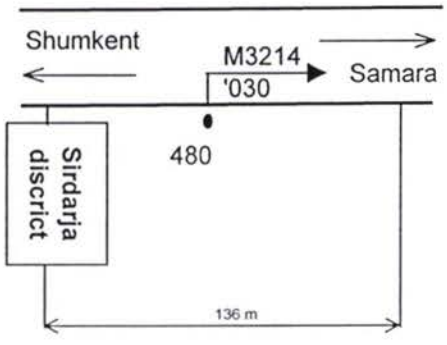

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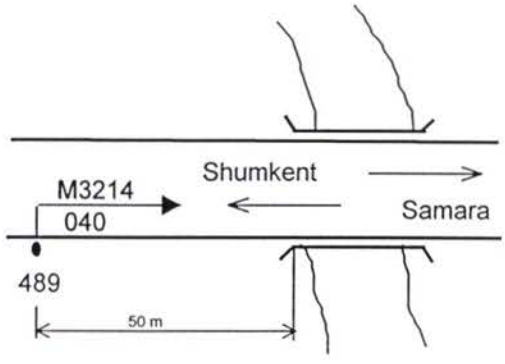

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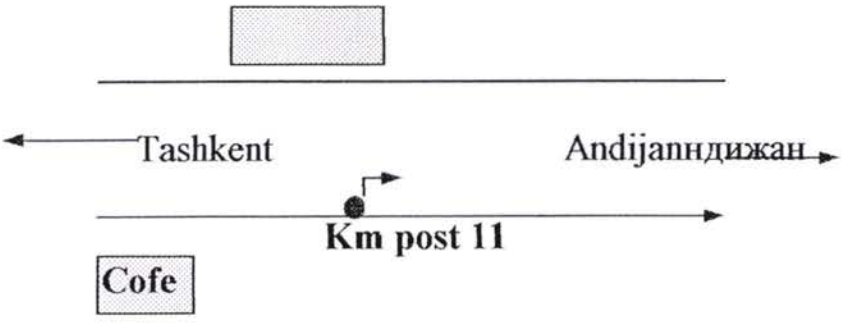

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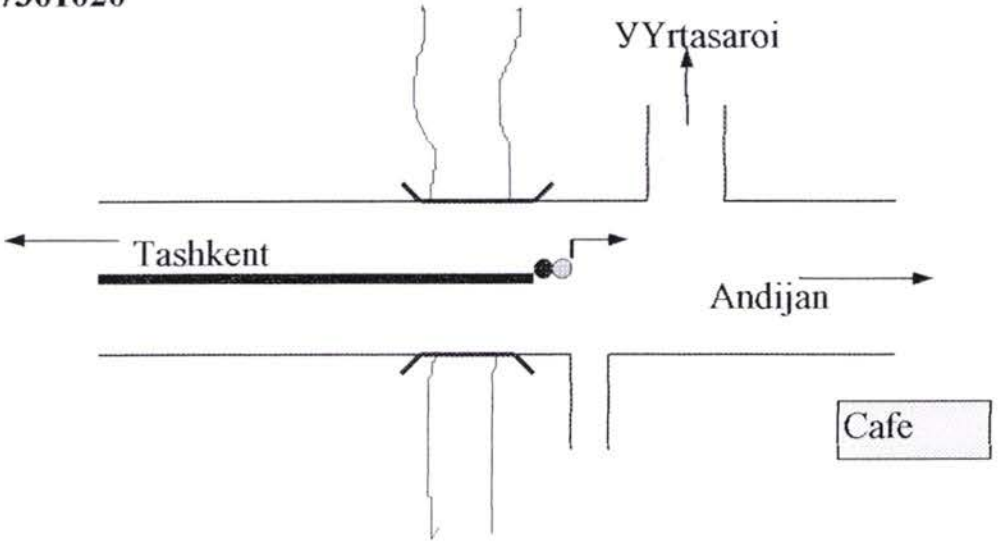

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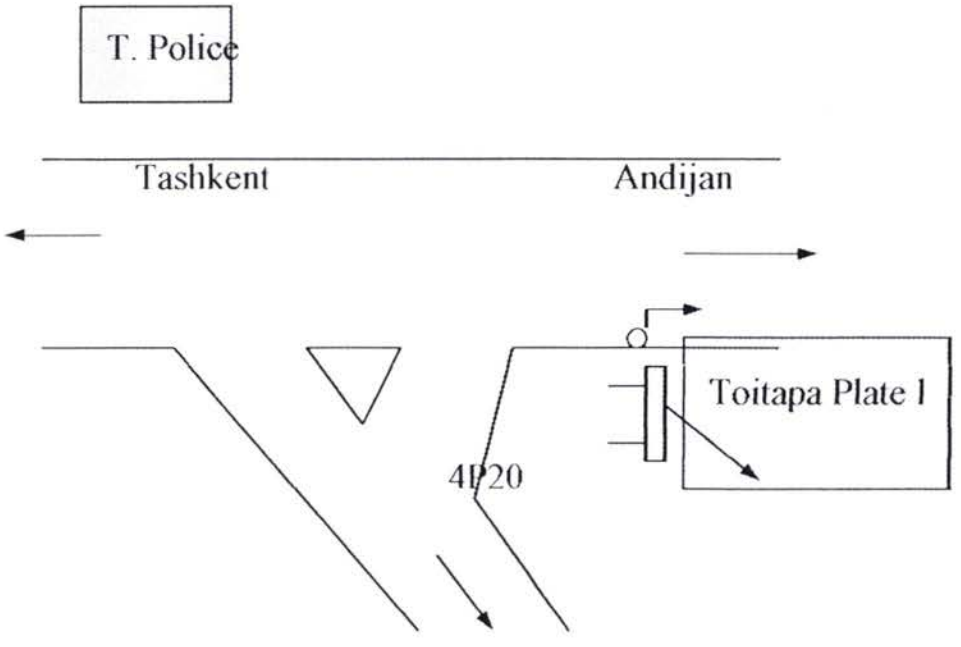

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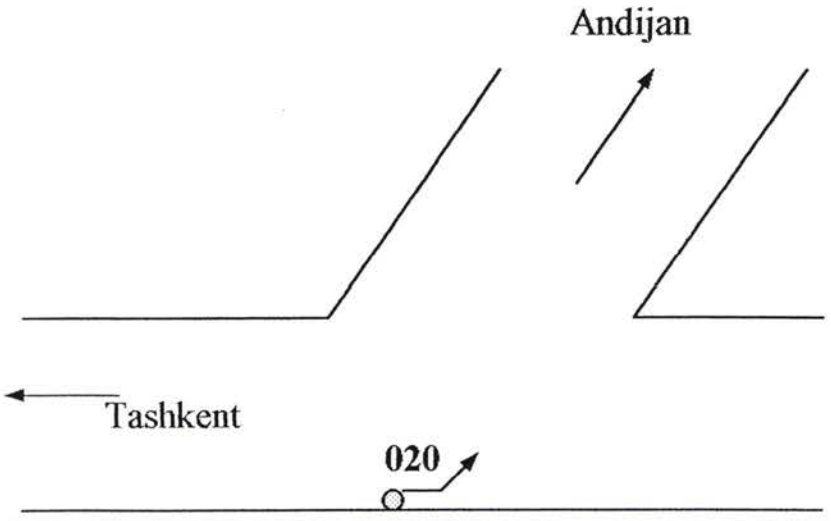

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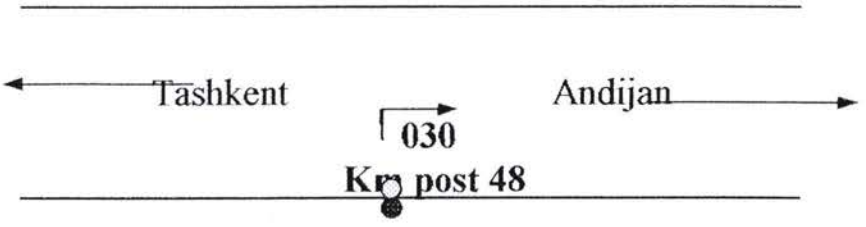

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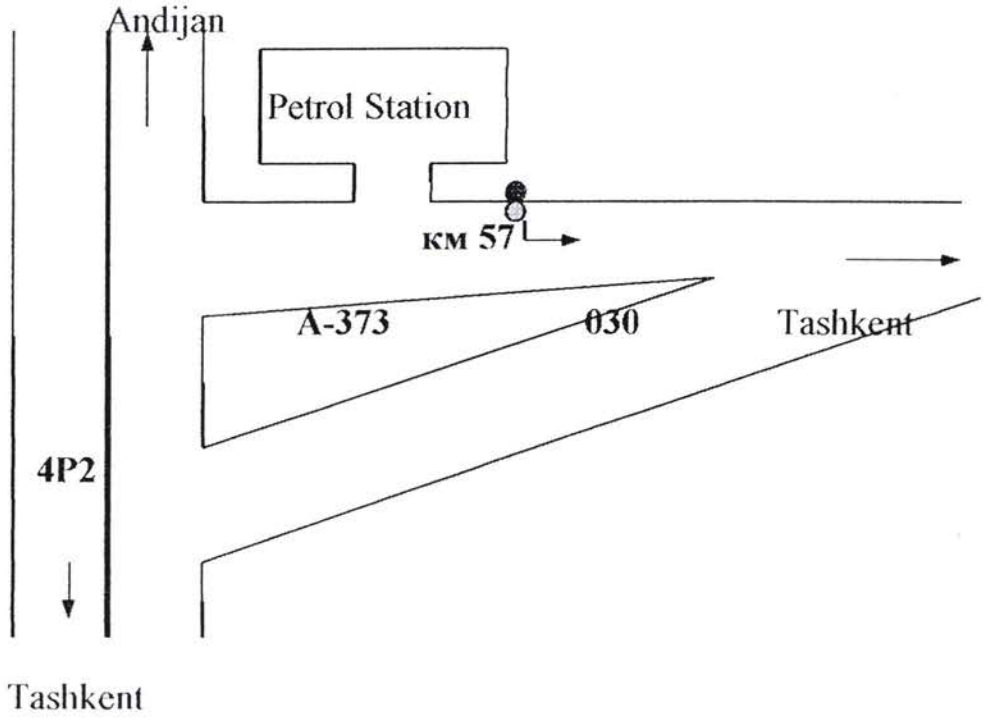

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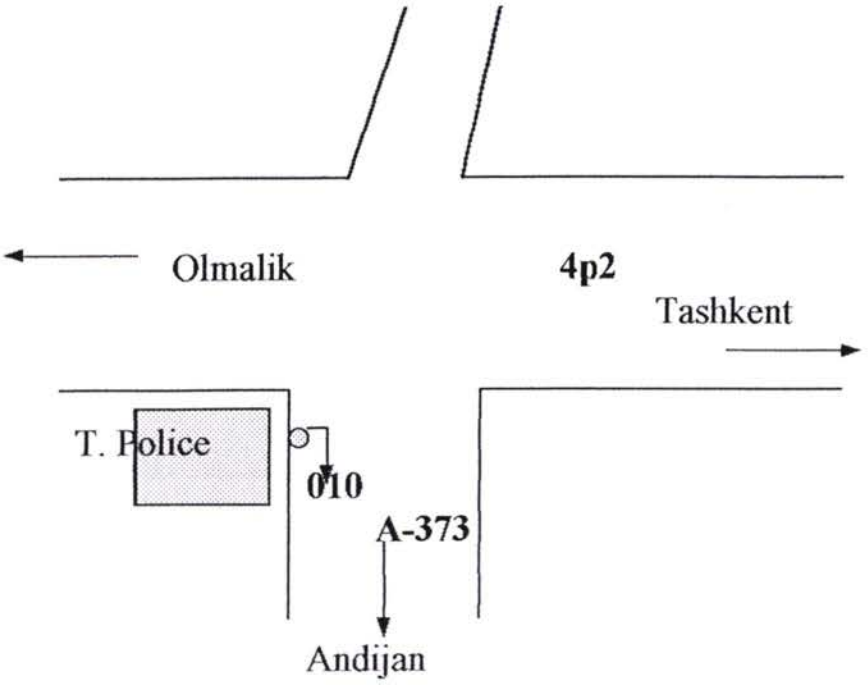

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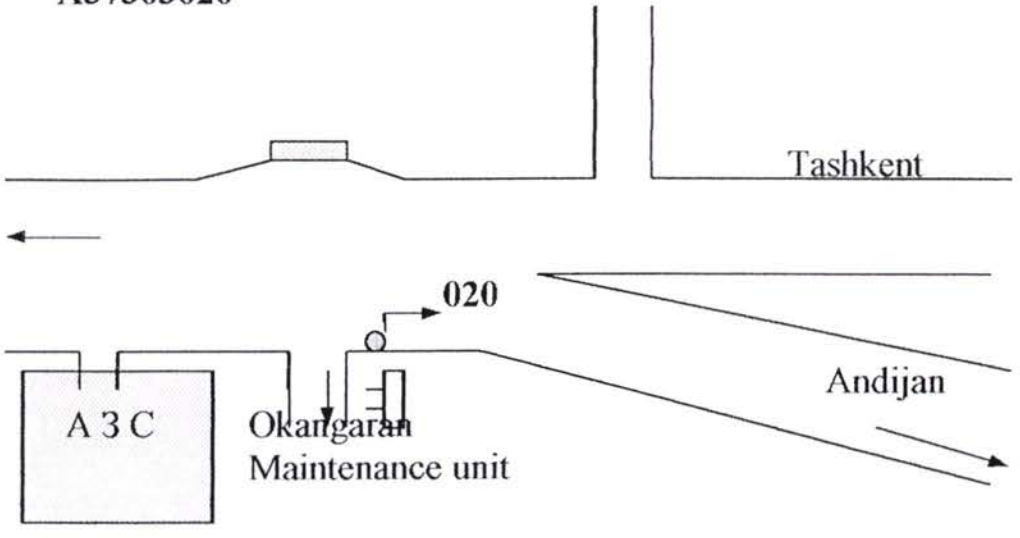

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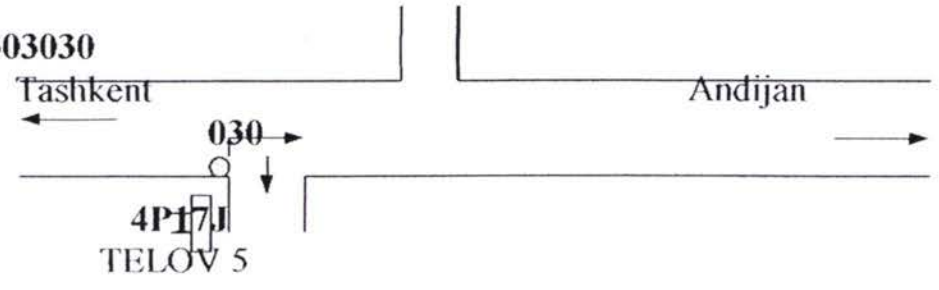

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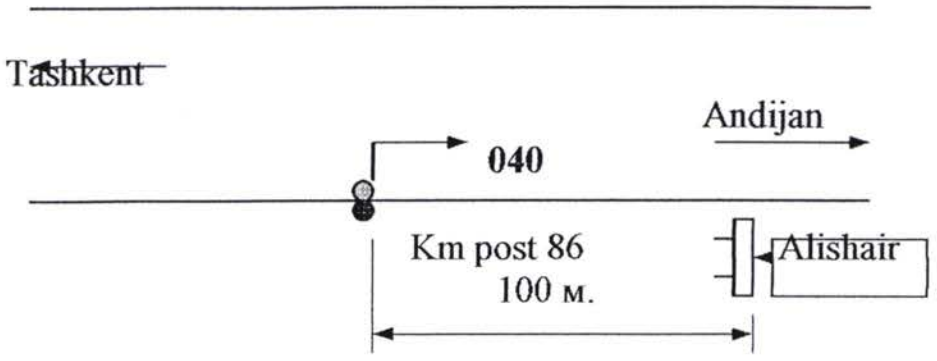

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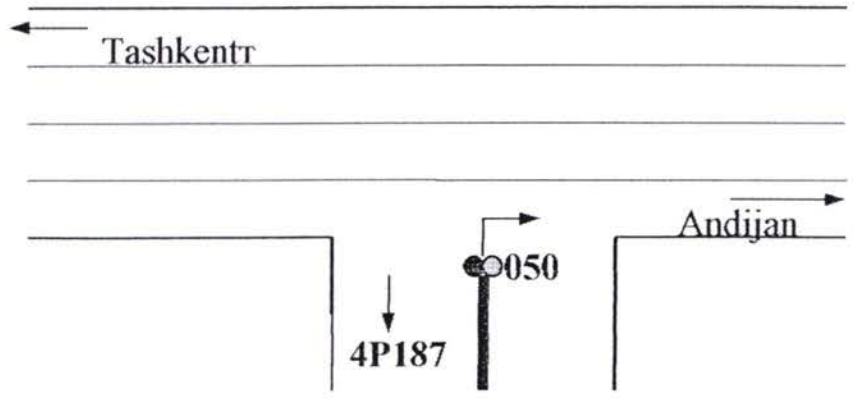

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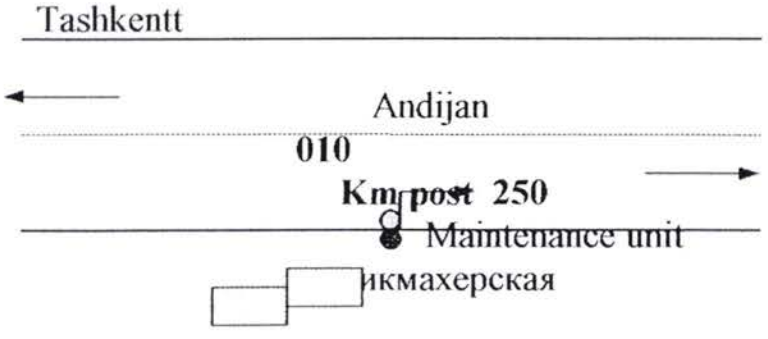

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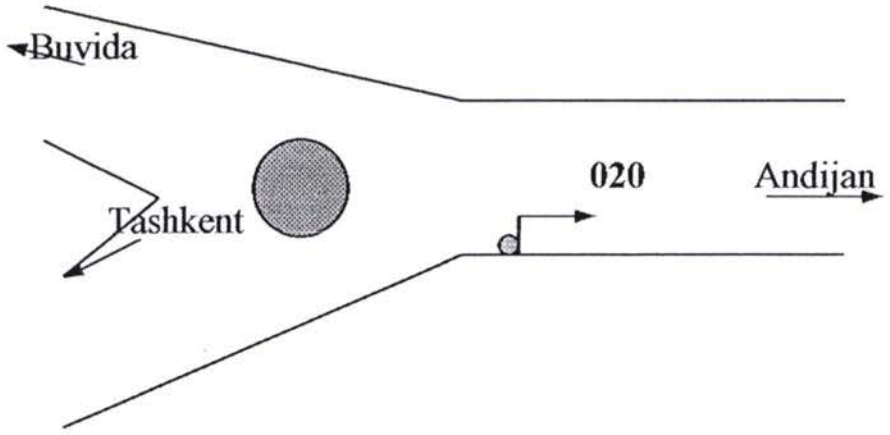

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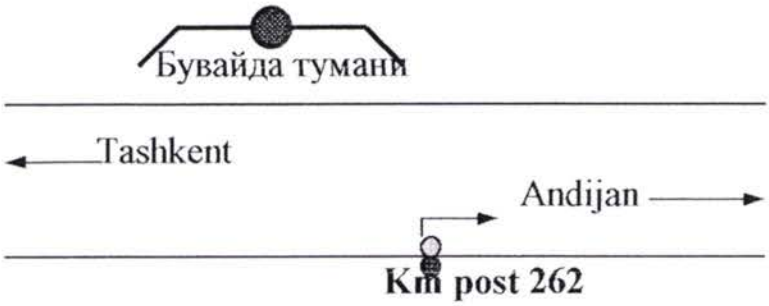

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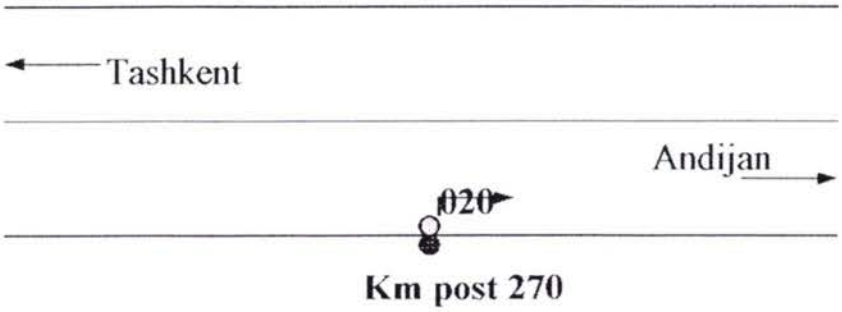

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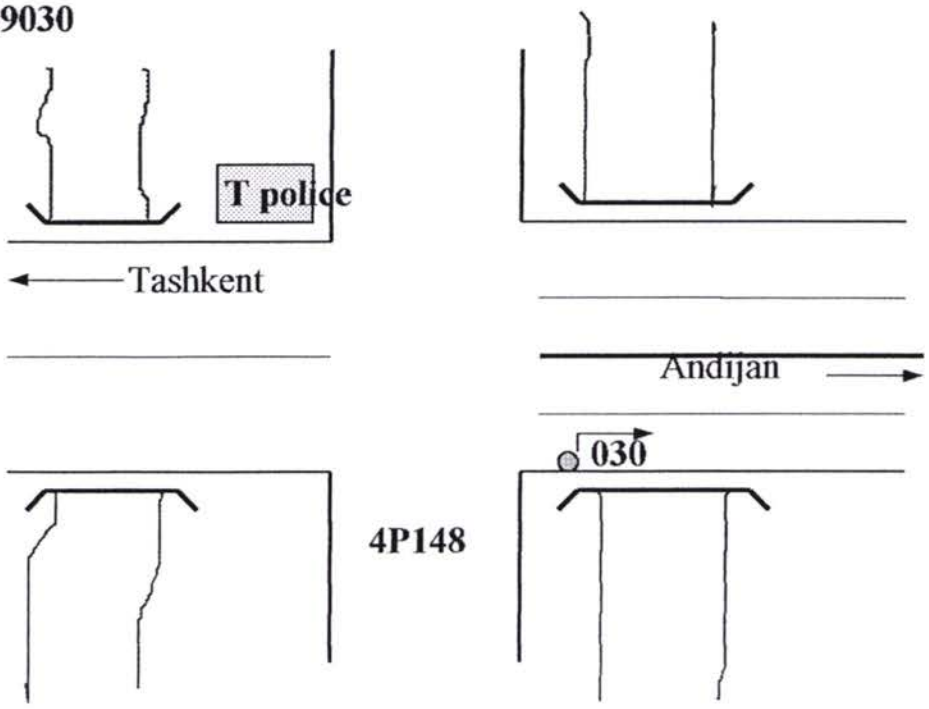

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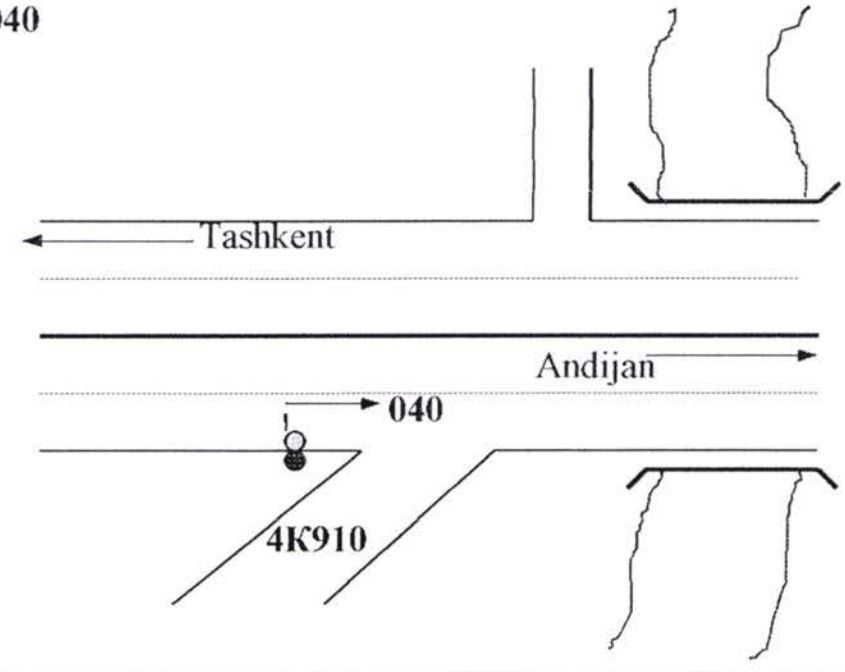

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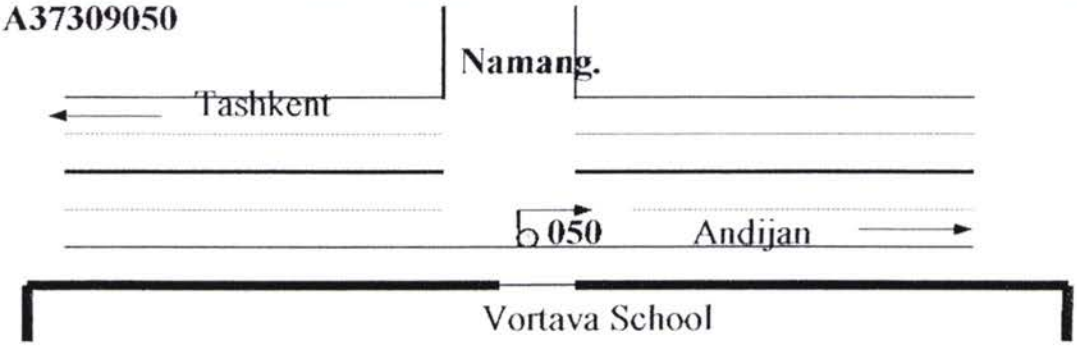

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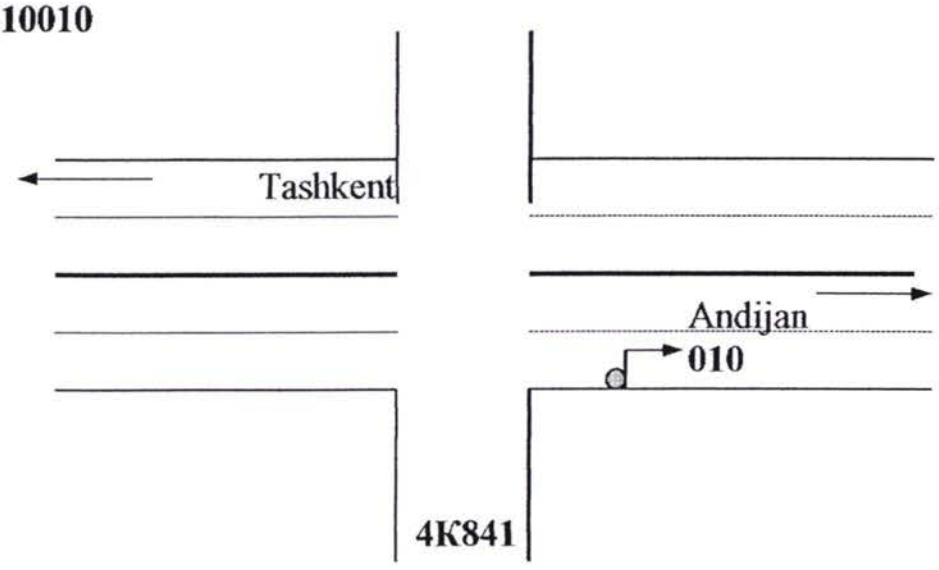

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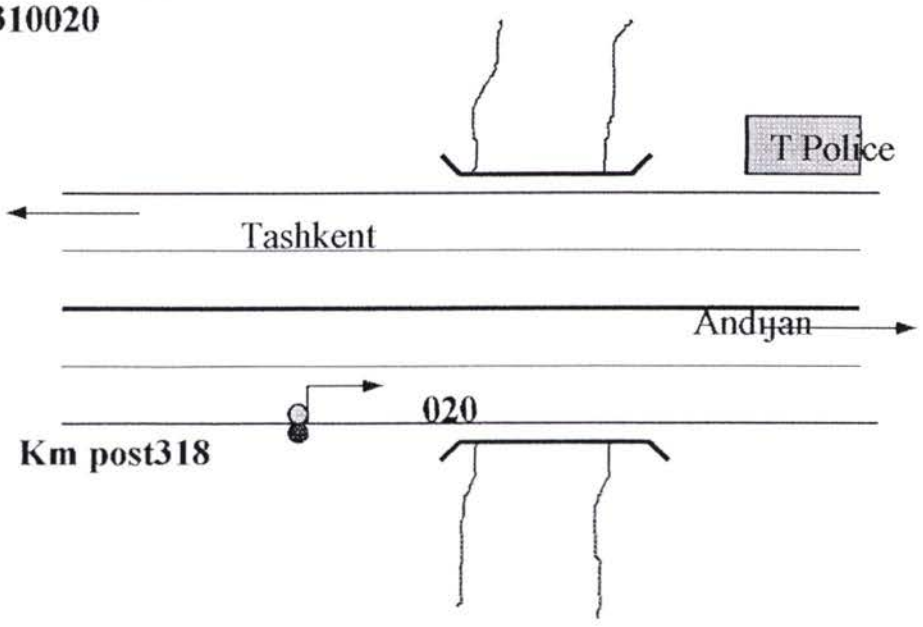

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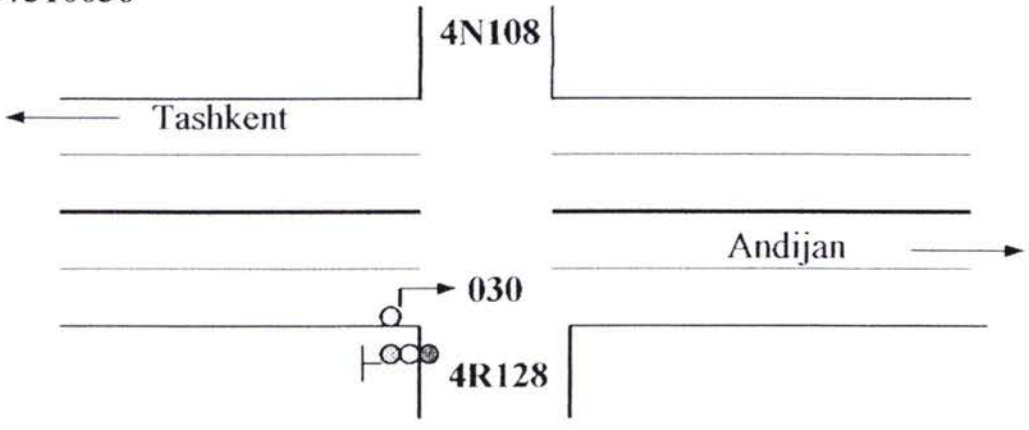

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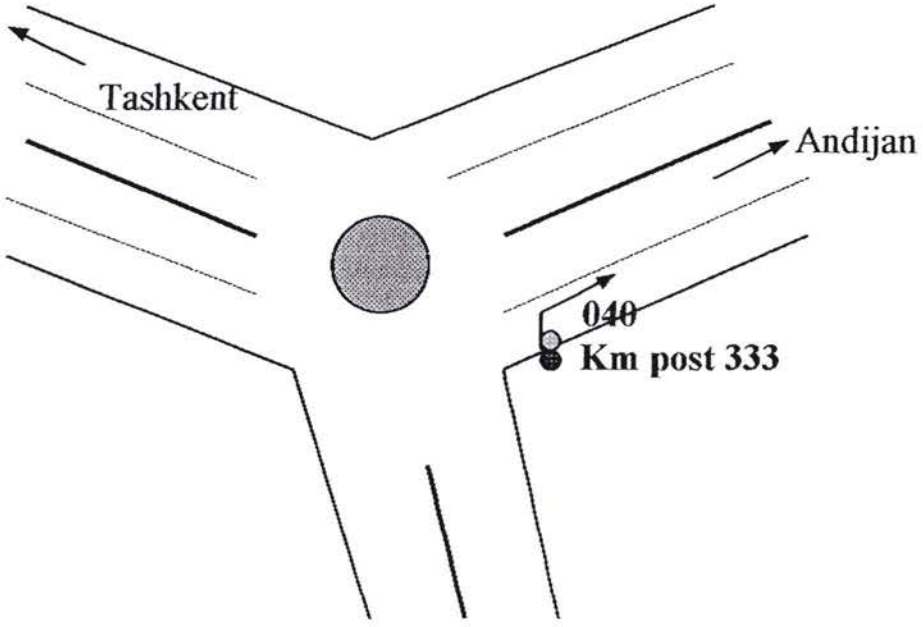

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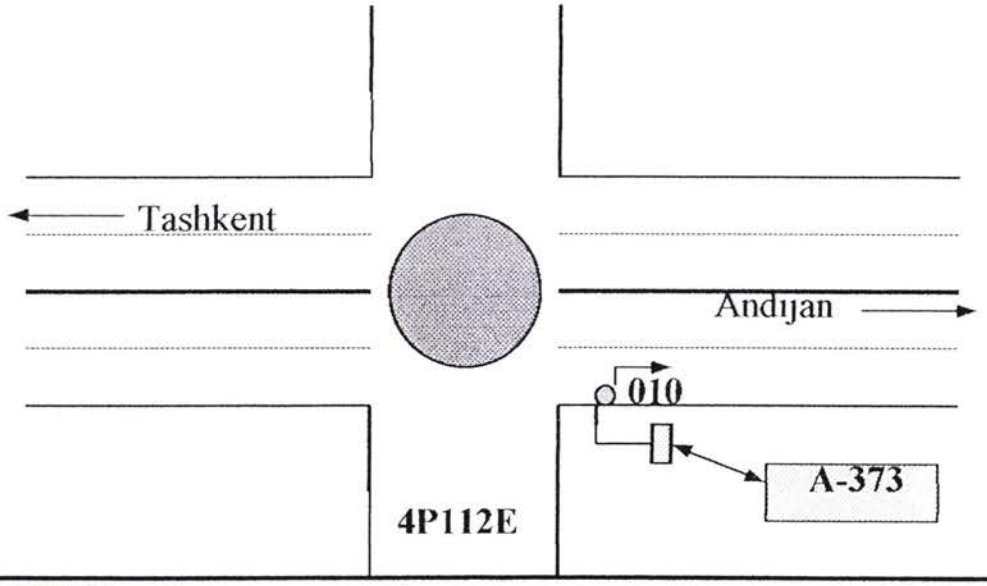

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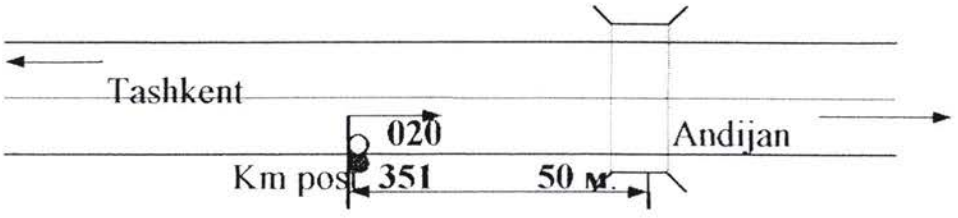

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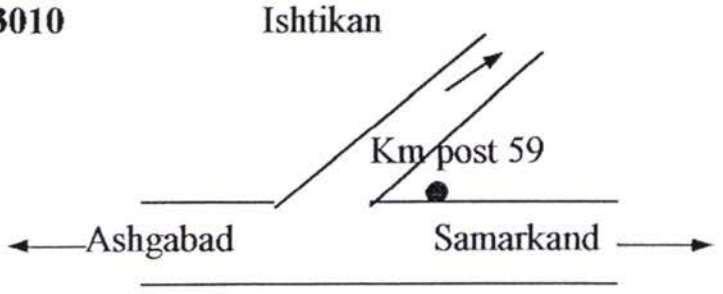

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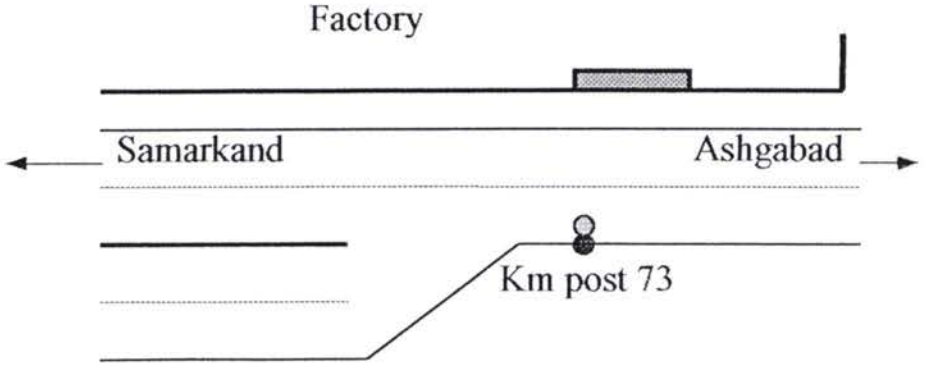

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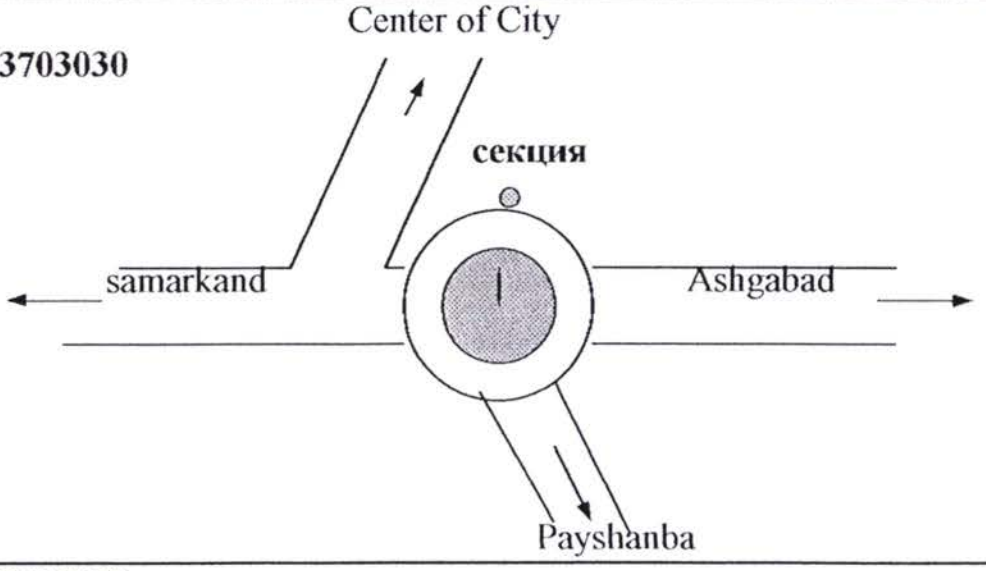

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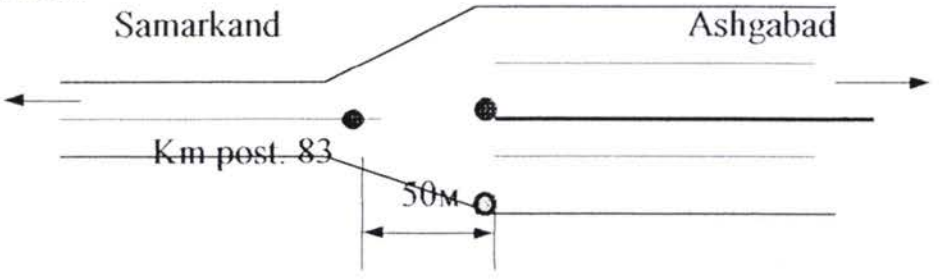

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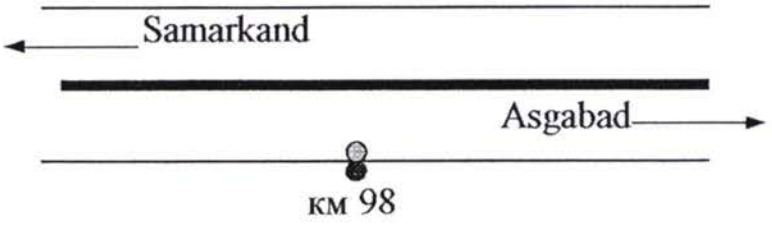

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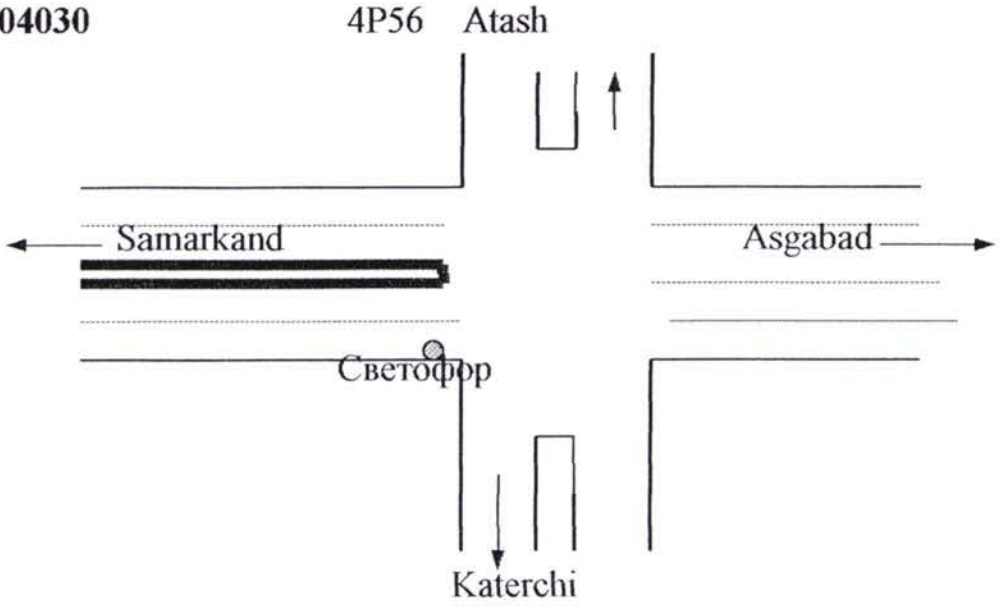

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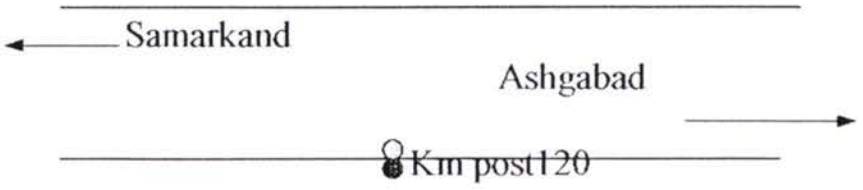

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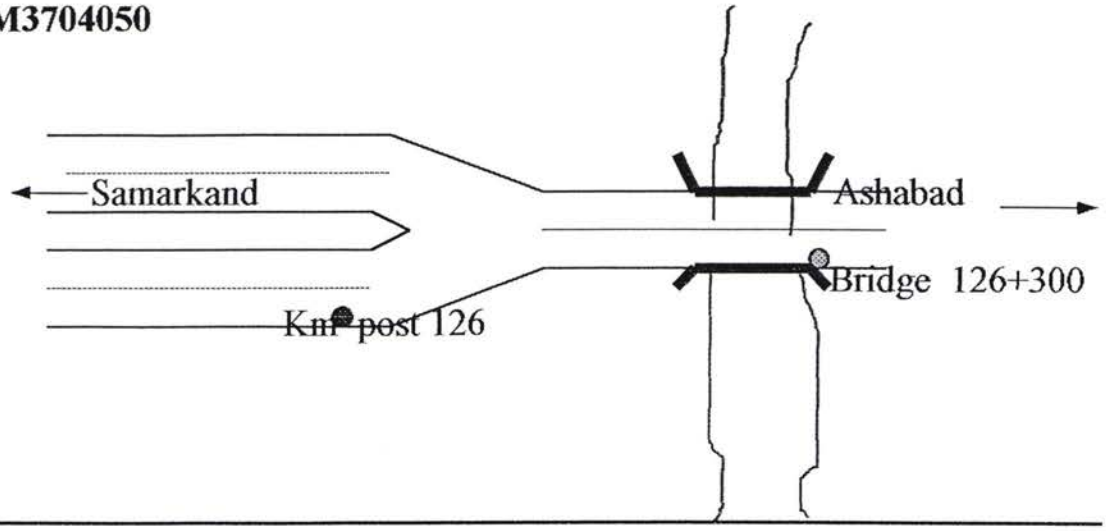

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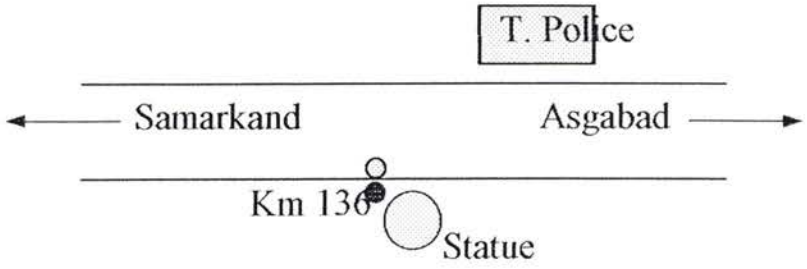

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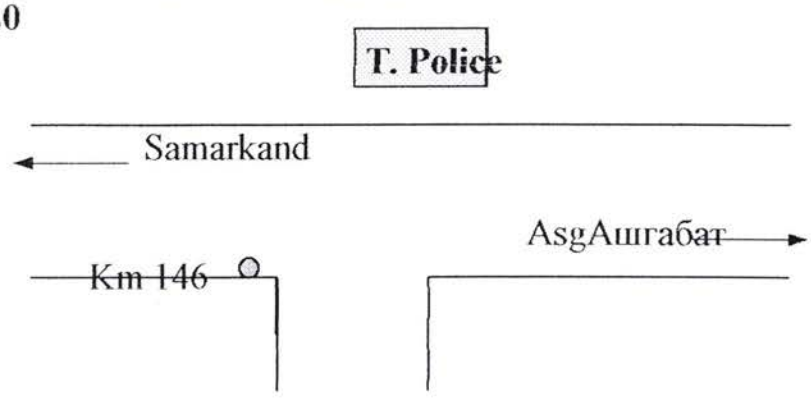

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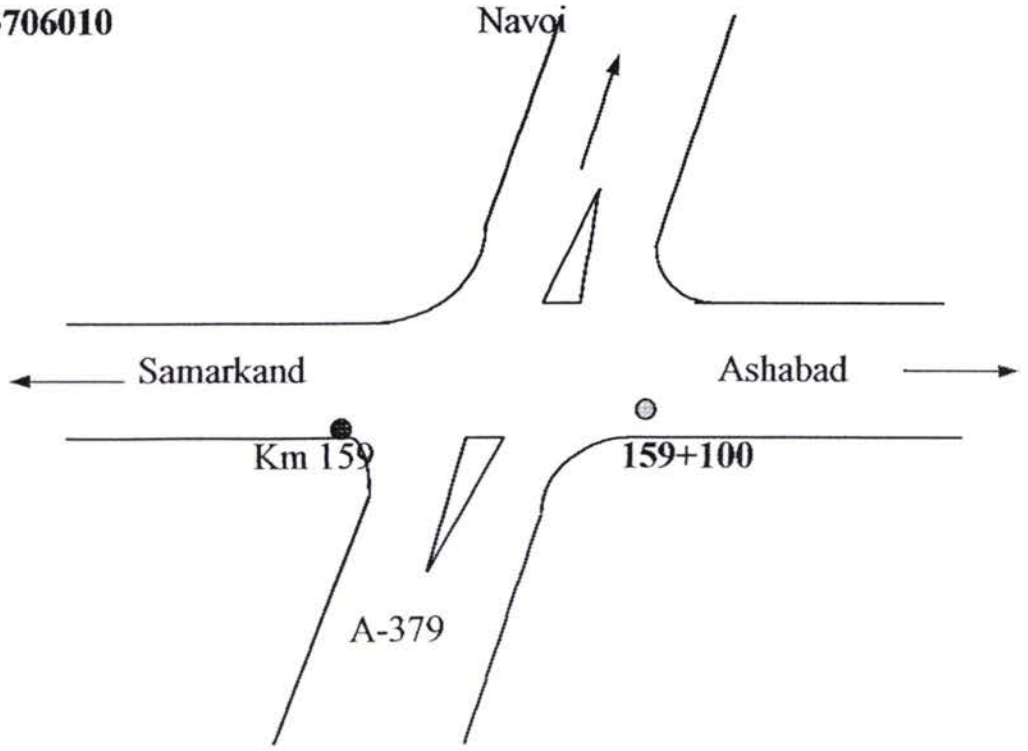

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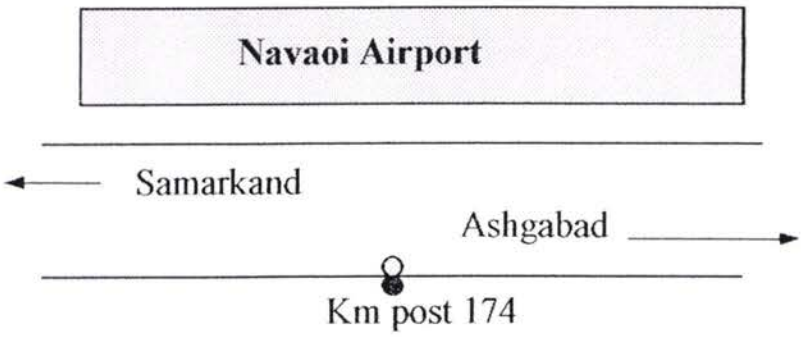

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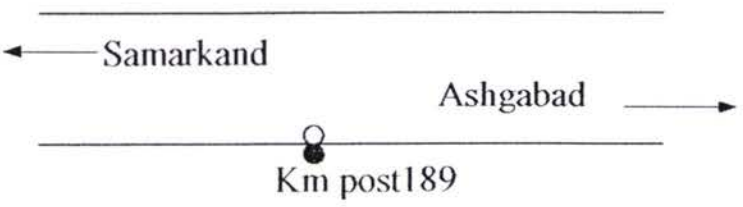

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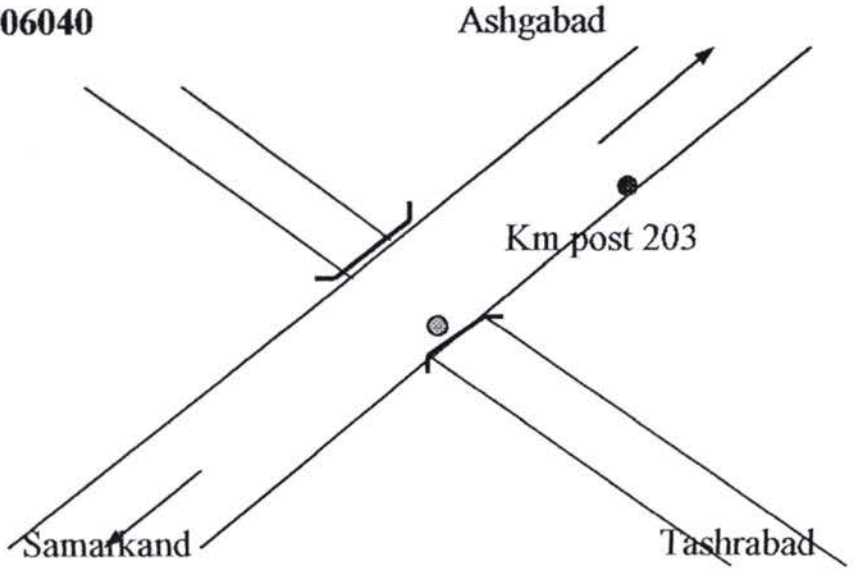

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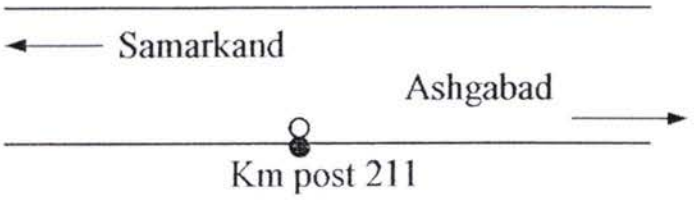

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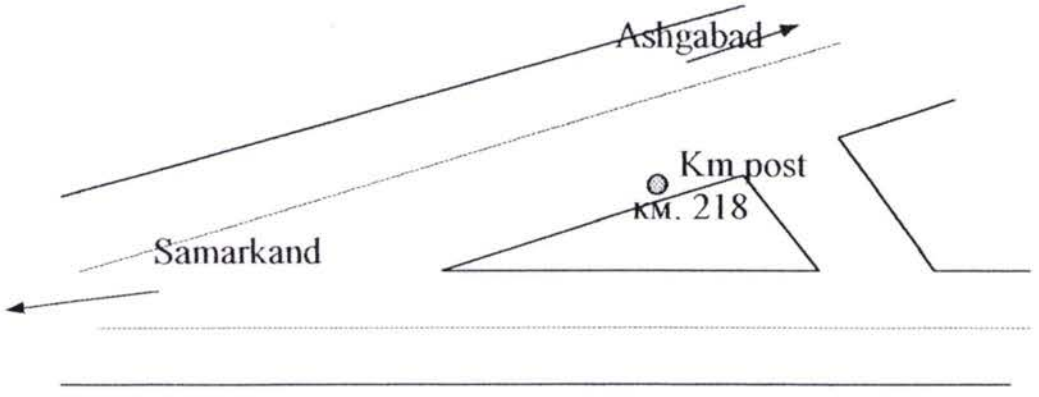

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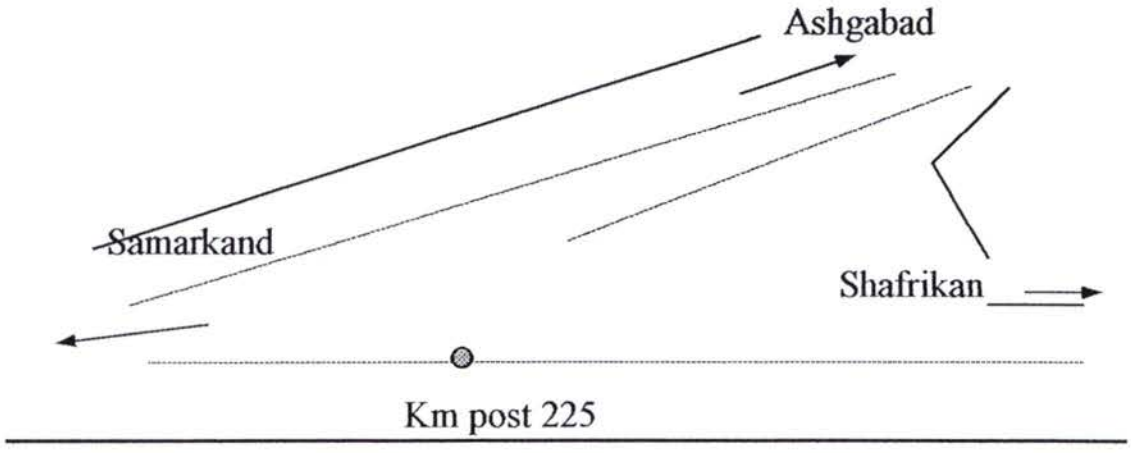

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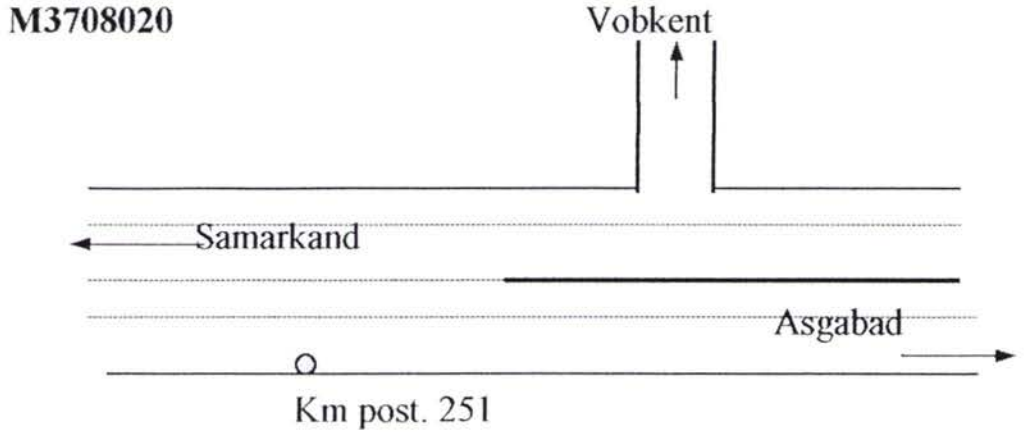

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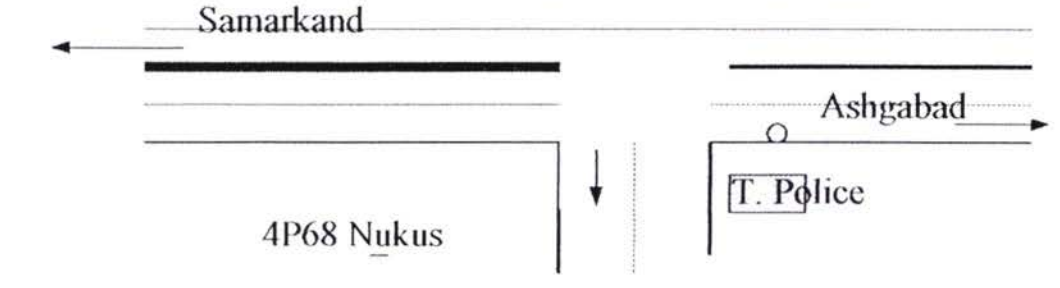

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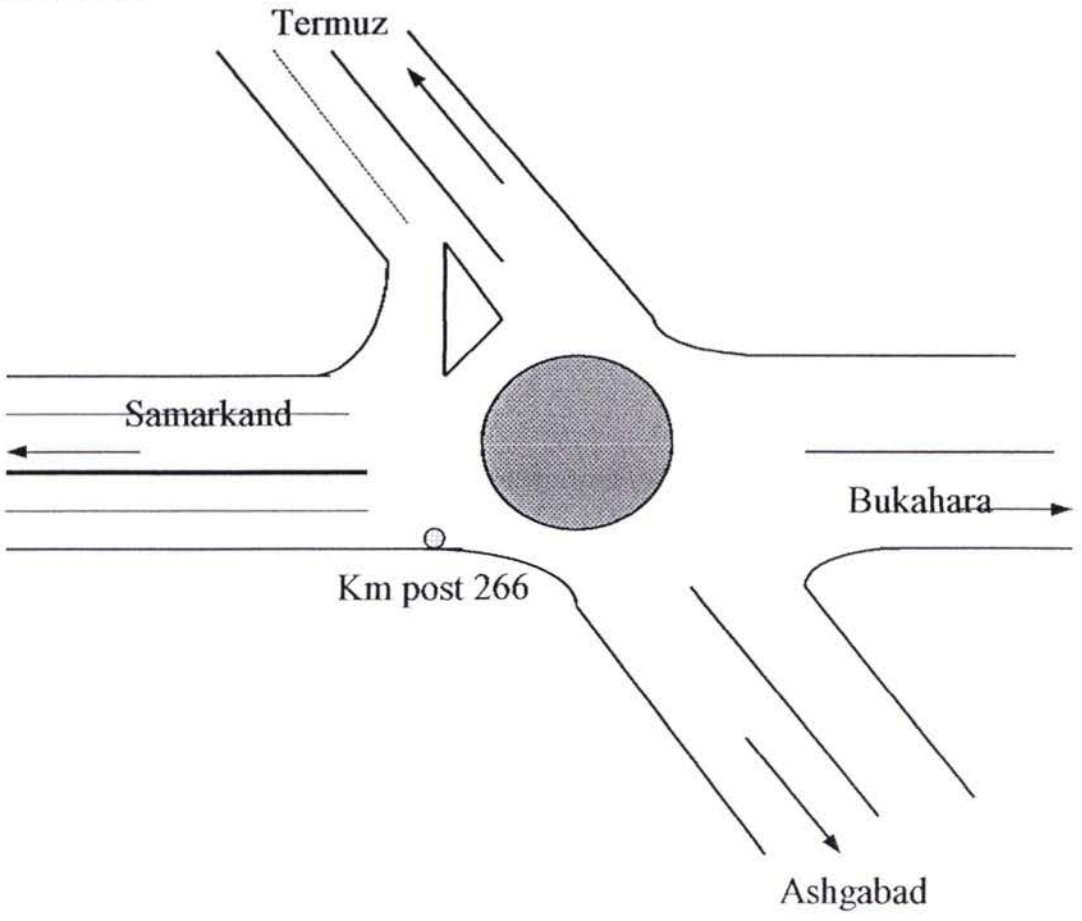

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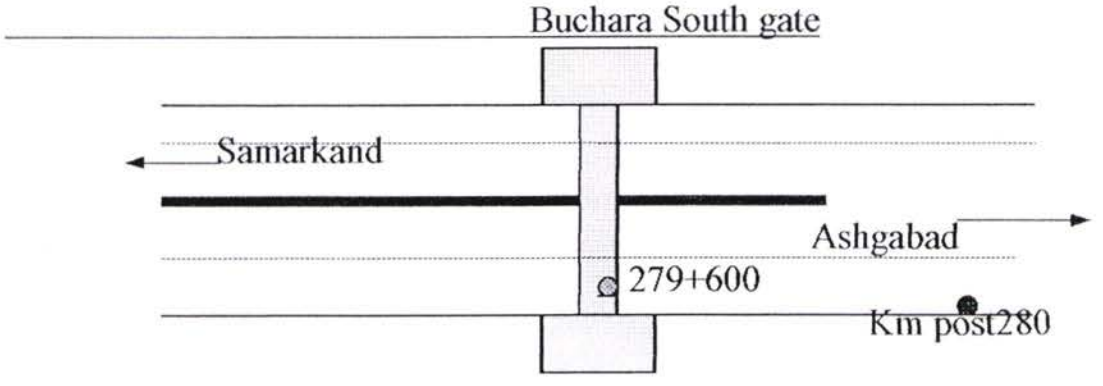

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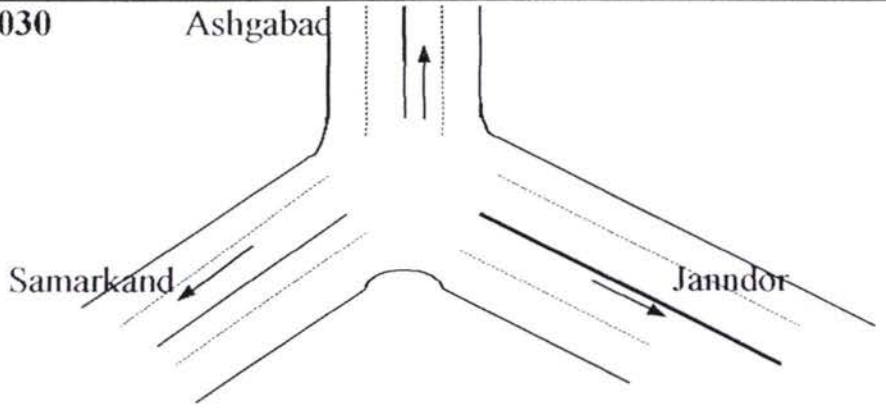

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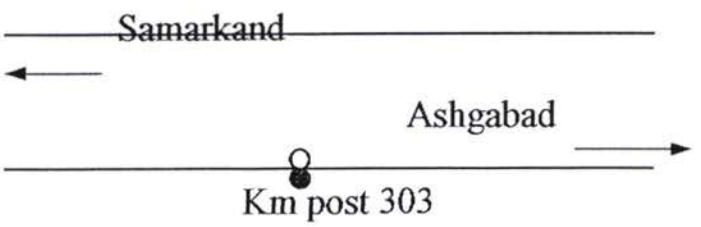

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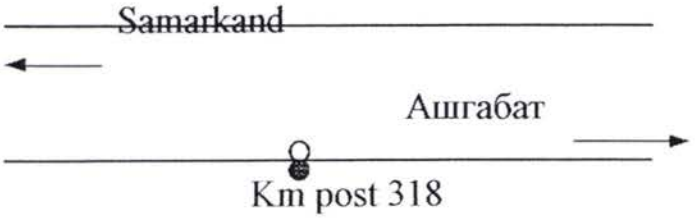

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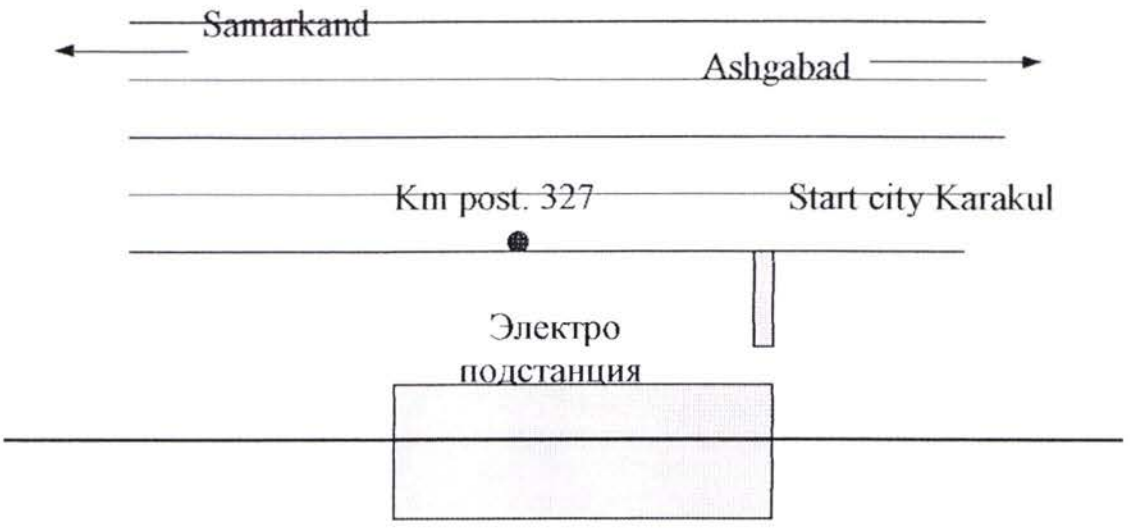

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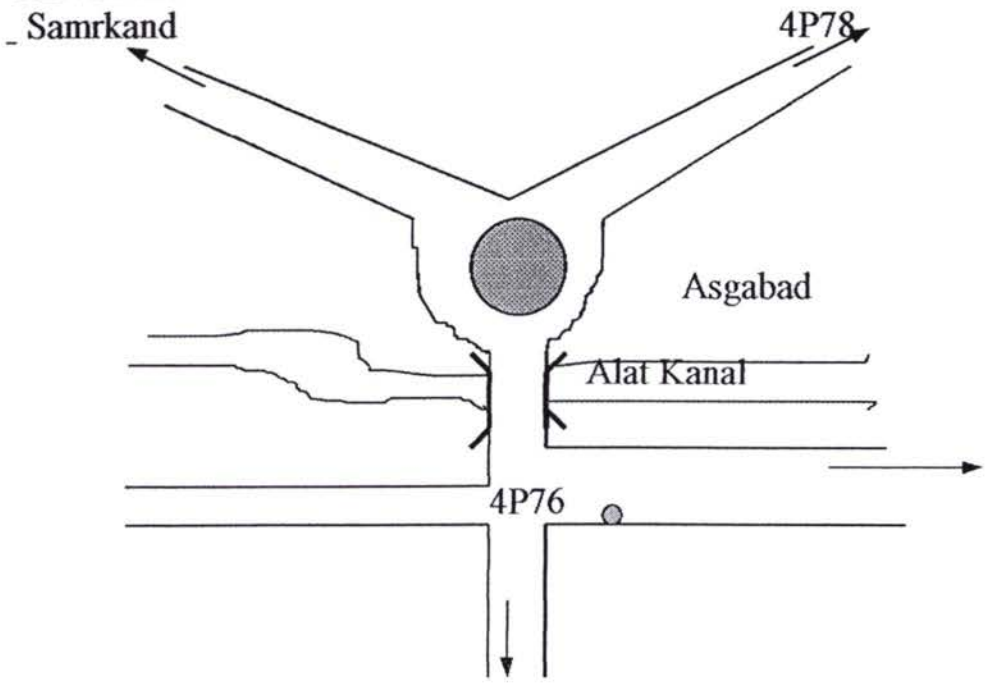

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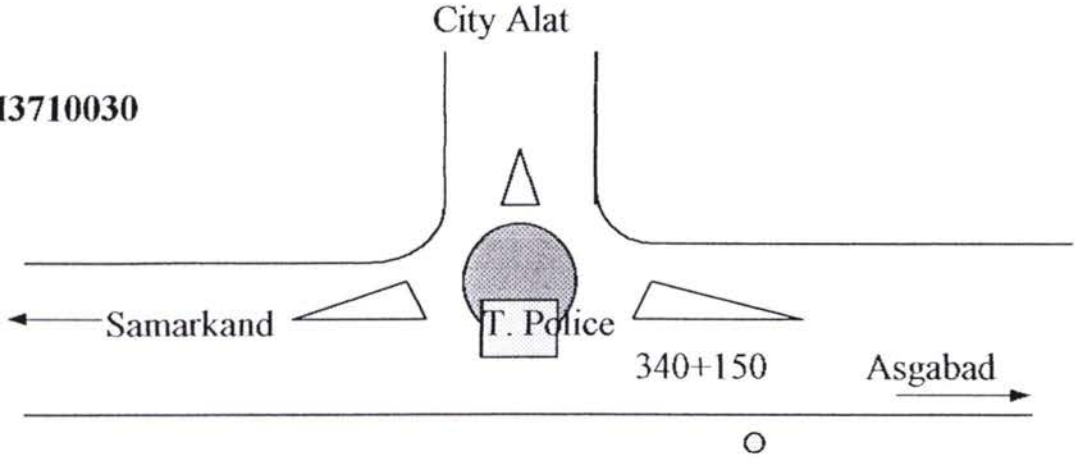


ANNEX 12

SUMMARY OF VISUAL SURVEY - SAMPLE

ANNEX 12: TRACECA ROADS MAINTENANCE PROJECT : MODULE D

Summary of Visual Survey

Country	Uzbekistan	Type of Pavement	Type 1	Type 1	Bitmac
Road No	A373	Date	17.08.98	Type 2	Jointed Concrete
Link/Section No	01/010	Operator	AU	Type 3	Continuous Concrete
Length of Section	6800 m			Type4	Block

Defects

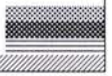
Start chainage	End Chainage	Rutting	Deforma-tion	Cracking > 5mm	Cracking < 5mm	Crazing	Potholing	Patching	Drainage Failure Left	Drainage Failure right	Channel Failure left	Channel Failure right	Kerb Failure left	Kerb Failure right
m	m	m2	m2	m2	m2	m2	m2	m2	m	m	m	m	m	m
0	225	0	1000	0	200	0	0	0	0	0	43	0	175	0
225	350	0	180	0	125	0	0	0	0	0	0	0	0	0
350	825	0	1664	0	475	0	0	0	0	0	260	0	0	0
825	1000	0	280	0	175	0	0	42	0	0	0	0	0	0
1000	1100	0	372	0	100	0	0	45	0	0	0	0	0	0
1100	1200	0	168	0	100	0	0	0	0	0	0	0	72	0
1200	1375	0	532	0	175	0	1	0	0	0	0	0	11	115
1375	1600	0	92	0	225	0	0	114	0	0	0	0	153	91
1600	1875	0	756	0	275	270	0	0	0	0	0	0	0	248
1875	2025	0	112	0	150	450	0	0	0	0	0	0	0	0
2025	3700	618	1135	0	262	303	1	0	0	0	0	0	1544	71
3701	3825	0	800	0	0	0	0	0	0	0	0	0	100	0
3825	4200	0	501	0	606	0	0	0	0	0	0	0	375	131
4200	6800	954	7424	0	4856	0	0	152	0	0	0	0	504	769
	Total	1572	15016	0	7724	1023	2	353	0	0	303	0	2934	1425

Carriageway Width

Start chainage	End Chainage	Width (m)	Asphalt type
0	1013	15	1
1013	3700	15	1
3700	6800	18	1

Pavement Construction Details

Wearing Course	5 cm
Binder Course	8 cm
Subbase	65 cm
Subgarde	



Asphalt Type

Type	1	Asphalt (16 mm)
Type	2	Asphalt (16 mm)
Type	3	Asphalt (6-10 mm)

Country	Kazakhstan	Type of Pavement	Type 1	Type 1	Bitmac
Road No. & Category	A351/ I	Date	03/09/98	Type 2	Jointed Concrete
Link/Section No	02/020	Operator	Nail	Type 3	Continuous Concrete
Length of Section	15500			Type4	Block

Defects

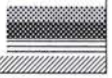
Start chainage	End Chainage	Rutting	Deforma-tion	Cracking > 5mm	Cracking < 5mm	Crazing	Potholing	Patching	Drainage Failure Left	Drainage Failure right	Channel Failure left	Channel Failure right	Kerb Failure left	Kerb Failure right
m	m	m2	m2	m2	m2	m2	m2	m2	m	m	m	m	m	m
0	5365	0	0	955	373	0	34.50	6387	0	0	0	0	3850	2068
5365	15500	0	62	0	1347	0	10.5	1264	0	0	0	0	1676	3560
	Total	0	62	955	1720	0	0	7651	0	0	0	0	5526	5628

Carriageway Width

Start chainage	End Chainage	Width (m)	Asphalt type
0	4383	15	1
4383	8026	11	1
8026	15126	15	1
15126	15500	12	1

Pavement Construction Details

Wearing Course	5 cm
Binder Course	14 cm
Subbase	40 cm
Subgarde	



Asphalt Type

Type	1	Asphalt (16 mm)
Type	2	Asphalt (16 mm)
Type	3	Asphalt (6-10 mm)

Country	Armenia	Type of Pavement	Type 1	Type 1	Bitmac
Road No	M3	Date	02.12.98	Type 2	Jointed Concrete
Link/Section No	13/010	Operator	KA	Type 3	Continuous Concrete
Length of Section	10400 m			Type4	Block

Defects

Start chainage	End Chainage	Rutting	Deforma-tion	Cracking > 5mm	Cracking < 5mm	Crazing	Potholing	Patching	Drainage Failure Left	Drainage Failure right	Channel Failure left	Channel Failure right	Kerb Failure left	Kerb Failure right
m	m	m2	m2	m2	m2	m2	m2	m2	m	m	m	m	m	m
0	10400	0	43834	0	1011	3066	12.5	210	0	0	0	0	592	501
	Total	0	43834	0	1011	3066	12.5	210	0	0	0	0	592	501

Carriageway Width

Start chainage	End Chainage	Width (m)	Asphalt type
0	10400	8	1

Pavement Construction Details

Wearing Course	3 cm
Binder Course	4 cm
Subbase	16 cm
Subgarde	

Asphalt Type

Type	1	Asphalt (16 mm)
Type	2	Asphalt (16 mm)
Type	3	Asphalt (6-10 mm)

Country	Kyrgyzstan	Type of Pavement	Type 1	Type 1	Bitmac
Road No	M39	Date	12.11.98	Type 2	Jointed Concrete
Link/Section No	03/020	Operator	AA	Type 3	Continuous Concrete
Length of Section	14800 m			Type4	Block

Defects

Start chainage	End Chainage	Rutting	Deformation	Cracking > 5mm	Cracking < 5mm	Crazing	Potholing	Patching	Drainage Failure Left	Drainage Failure right	Channel Failure left	Channel Failure right	Kerb Failure left	Kerb Failure right
m	m	m2	m2	m2	m2	m2	m2	m2	m	m	m	m	m	m
0	1007	0	1510	2519	9105	194	2.5	0	73	305	0	0	8666	8860
1007	10170	0	6	35	44	0	0	0	0	0	0	0	100	100
10170	10970	0	900	0	800	0	0	0	46	0	0	0	800	800
10970	11120	0	9	0	150	0	2	0	0	0	0	0	150	150
11120	14800	0	6490	279	4278	0	4	0	39	0	0	0	3783	3783
	Total	0	8915	2833	14377	194	8.5	0	158	305	0	0	13499	13693

Carriageway Width

Start chainage	End Chainage	Width (m)	Asphalt type
0	14800	11	1

Pavement Construction Details

Wearing Course	6 cm
Binder Course	28 cm
Subbase	42 cm
Subgarde	

Asphalt Type

Type	1	Asphalt (16 mm)
Type	2	Asphalt (16 mm)
Type	3	Asphalt (6-10 mm)

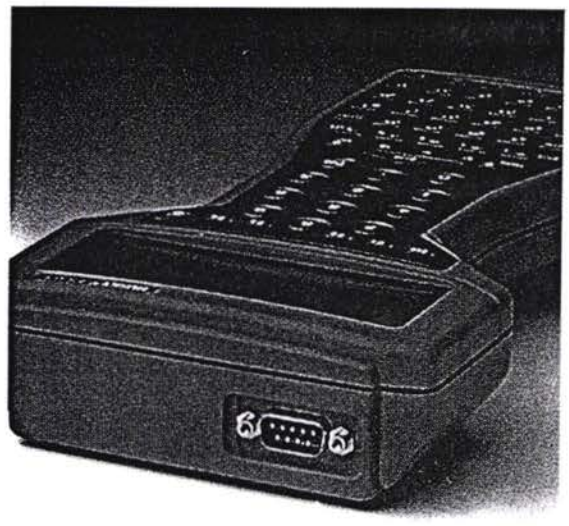
The Husky FS/GS

HUSKY
A Peek company.

From the acknowledged leader in rugged field computing comes the latest addition to the FS Series of handhelds. Building on 15 years experience of working closely with the geotechnical market, the Husky FS/GS has been developed specifically to handle the data collection requirements of surveying and GIS applications.

Engineered to the high standards of quality and reliability you expect from Husky, the FS/GS ensures you can access your information, first time every time, even in the most difficult working conditions.

The FS/GS offers MS-DOS operation and RS232 communications, providing access to a wide range of industry standard applications at a highly competitive price. And with Husky's long history of working with the leading surveying manufacturers, you can always be sure of total system compatibility.



Technical Specification	
Construction	Die cast magnesium alloy case. Integral backstrap. High visibility paint finish
Dimensions	236mm x 128mm x 43mm (9.3 ins x 5.0 ins x 1.7 ins) 71mm (2.8ins) at handgrip
Environmental Standards	Certified to appropriate IEC 68, EN60068, MIL-STD-810E, BS2011 standards for; temperature, moisture and immersion, dust and sand, drop test, shock, vibration and altitude
Weight	700g (25oz) including batteries
Operating Temperature	-30°C to +60°C (-22°F to +140°F)
Storage Temperature	-30°C to +70°C (-22°F to +158°F)
Sealing	Waterproof against accidental immersion (IP67)
Shock	Withstands 2m (6ft) drop onto hard surface
Electromagnetic Compatibility (EMC)	Certified to EN55022, EN50082-1&-2, BS6527, FCC Rules 47 CFR Part 15
Electrostatic Discharge (ESD)	Certified to IEC801-2, EN50082-1&-2
Mandatory Conformance	CE marked, FCC, CSA
Screen	240 x 64 pixel full graphics LCD (8 lines x 40 chars)
Keyboard	56 key tactile action with separate alpha and numeric keypads. All keys software programmable
Operating System	MS-DOS v3.3
Microprocessor	8MHz NEC V25+ processor
Memory	1 - 2 Mbytes low power SRAM
Data Retention	Automatic data retention with battery back-up
Calendar/Clock Accuracy	Typically +/-2 seconds per day
Serial Communications	RS232/V24 Com2 serial port via DB9 for communications and charging Emulated 8250 UART available as standard Com2 serial port
Batteries	3 x AA alkaline batteries or NiCad rechargeable battery pack

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FM11667

ANNEX 13

SAMPLE OF FALLING WEIGHT DEFLECTOMETER DATA AND RESULTS

ANNEX 13 : FALLING WEIGHT DEFLECTOMETER DATA AND RESULTS

```
IKUAB FWD FILE     : M312010.FWD
Hcountry           : Armenia
Hproject           : Traceca-D
Hroad no           : M-3
Hlink no           : 12
Hsection no        : 010

IDate Created      : 1999-07-05
ILoad Mode         : 4          (6 buffers, 22 plates)
IPlate Radius      : 15         (cm)
IExtra Field Set   : TRACECA - D
IDrop Sequence     : 222
INo of drops       : 111
IRecord Drop?      : NYY
IDrop Height       :     1     2     3     4
IImpact Load       :  3000  5000  7500 12000 kgf
ISensor Number     :      0      1      2      3      4      5      6      7
8
ISensor Distance   :    0.0   24.0   37.0   55.0   85.0  127.0  150.0    0.0
0.0 (cm)
ISensor Position   : CENTER BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND ??????
??????

IReference Offset :       0 m
ITestpoint spacing:     500 m
```

J	Distance m	Imp Num	Load kgf	D0 µm	D1 µm	D2 µm	D3 µm	D4 µm	D5 µm	D6 µm	Air øC	Pave øC	time
D	0	2	5399	918	609	453	283	129	52	52	21	24	10:45:25
D	0	3	5395	919	604	451	281	126	52	52	21	24	10:45:31
D	499	2	5500	655	329	238	145	97	62	52	22	23	10:47:53
D	499	3	5485	644	324	235	145	93	61	61	22	23	10:48:01
D	1005	2	5349	670	337	200	119	59	34	34	22	25	10:50:23
D	1005	3	5355	759	342	204	127	65	37	34	22	25	10:50:29
D	2006	2	5627	400	317	288	223	149	89	76	22	25	10:53:32
D	2006	3	5561	390	309	279	217	144	86	74	22	25	10:53:38
D	3021	2	5460	615	434	353	245	121	49	49	22	26	10:57:35
D	3021	3	5382	603	422	348	238	118	51	49	22	26	10:57:42
D	4066	2	4896	2275	1451	1067	557	249	92	80	21	27	11:00:46
D	4066	3	4868	2188	1435	1063	556	250	93	80	21	27	11:00:53
D	5021	2	5264	967	671	520	335	140	40	40	21	26	11:03:13
D	5021	3	5239	968	668	515	333	138	39	39	21	26	11:03:20
D	6005	2	5397	842	537	425	288	167	96	86	21	27	11:05:48
D	6005	3	5338	827	536	428	292	169	98	88	21	27	11:05:54
D	7006	2	5247	993	521	340	207	132	87	79	22	24	11:08:38
D	7006	3	5225	930	491	327	201	127	85	79	22	24	11:08:45
D	8031	2	5334	748	512	420	286	169	99	85	23	25	11:10:58
D	8031	3	5305	750	517	424	290	171	100	85	23	25	11:11:05
D	9001	2	5405	842	587	493	340	202	125	115	23	24	11:13:17
D	9001	3	6014	798	571	484	323	196	120	110	23	24	11:13:25
D	9001	2	6487	813	574	482	331	192	114	107	22	24	11:14:00
D	9001	3	5422	828	589	498	346	204	125	121	22	24	11:14:07
D	9001	2	6020	813	579	480	335	194	117	106	22	24	11:14:44

D	9001	3	5405	827	591	498	348	207	126	117	22	24 11:14:50
D	10004	2	5377	731	361	277	186	123	84	83	22	28 11:17:23
D	10004	3	5349	704	358	273	185	120	83	83	22	28 11:17:30
D	11022	2	5299	888	443	376	279	177	99	99	22	30 11:19:43
D	11022	3	5290	874	432	386	282	179	99	99	22	30 11:19:50
D	12010	2	5198	1168	847	712	525	357	252	218	23	30 11:22:08
D	12010	3	5164	1156	840	707	523	356	249	216	23	30 11:22:15
D	13008	2	5159	1122	718	501	285	105	105	105	23	29 11:24:43
D	13008	3	5131	1094	705	493	280	102	90	90	23	29 11:24:50
D	14001	3	5491	324	173	116	116	116	116	116	23	28 11:27:26
D	15000	2	5372	793	533	447	314	190	119	108	24	29 11:30:03
D	15000	3	5372	781	528	445	314	189	119	106	24	29 11:30:10
D	16004	2	5320	952	605	497	349	212	126	104	23	25 11:32:47
D	16004	3	5305	944	594	504	337	216	127	107	23	25 11:32:54
D	16642	2	5366	667	454	344	224	137	91	83	25	29 11:35:06
D	16642	3	5329	656	442	336	218	136	91	85	25	29 11:35:13
D	16638	2	5880	935	431	300	177	92	52	52	23	30 13:56:46
D	16638	3	5931	836	429	301	180	97	56	52	23	30 13:56:53
D	16139	2	5259	783	486	378	253	138	73	67	23	30 14:00:08
D	16139	3	5250	772	479	376	248	136	73	67	23	30 14:00:15
D	15133	2	5374	577	305	210	149	93	59	52	23	26 14:03:06
D	15133	3	5355	557	304	208	150	93	59	53	23	26 14:03:12
D	13478	2	4946	1836	347	132	102	76	60	64	24	33 14:07:36
D	13478	3	4982	1686	341	134	103	78	62	67	24	33 14:07:43
D	12497	2	5080	1033	737	554	383	213	105	105	25	35 14:11:07
D	12497	3	5130	1053	735	554	382	211	100	100	25	35 14:11:13
D	11476	2	5899	854	491	425	319	252	192	177	25	36 14:13:49
D	11476	3	6021	822	480	414	311	248	189	175	25	36 14:13:56
D	10486	2	4976	1731	612	321	245	42	42	42	25	40 14:16:25
D	10486	3	4907	1585	531	294	128	40	40	40	25	40 14:16:32
D	10486	2	4887	1574	542	296	137	44	19	19	26	37 14:19:50
D	10486	3	4937	1544	543	302	141	46	40	40	26	37 14:19:57
D	10486	2	4917	1527	531	295	138	47	40	40	26	37 14:20:26
D	10486	3	4939	1509	534	299	141	46	40	30	26	37 14:20:33
D	9494	2	4929	966	528	464	348	229	145	126	27	35 14:23:20
D	9494	3	4975	954	540	469	351	230	147	126	27	35 14:23:27
D	8489	2	5409	873	528	387	247	158	102	90	27	38 14:25:59
D	8489	3	5228	856	514	384	247	160	102	90	27	38 14:26:06
D	7486	2	4604	1480	462	285	212	136	87	81	26	30 14:29:10
D	7486	3	4796	1386	447	277	208	139	87	82	26	30 14:29:18
D	6696	2	5243	894	601	484	335	207	122	105	26	29 14:31:12
D	6696	3	5203	886	593	476	327	206	121	105	26	29 14:31:20
D	5740	2	4828	1729	760	511	281	115	48	48	25	41 14:33:55
D	5740	3	4810	1640	749	503	280	115	47	47	25	41 14:34:02
D	4729	2	5565	1091	498	333	180	80	44	44	26	42 14:36:41
D	4729	3	5054	950	508	346	194	89	48	44	26	42 14:36:49
D	3749	2	5393	673	406	327	215	135	98	95	27	40 14:39:53
D	3749	3	5988	718	422	332	216	137	99	93	27	40 14:40:00
D	2712	2	5044	1766	908	257	41	84	52	49	27	37 14:42:55
D	2712	3	5087	1652	864	264	57	88	54	49	27	37 14:43:02
D	1760	2	5993	477	358	301	203	107	48	48	27	39 14:45:58
D	1760	3	5319	471	357	305	206	109	50	50	27	39 14:46:04
D	751	3	5178	449	180	134	84	83	26	20	27	37 14:49:00

KUAB FWD FILE : M312010.FWD
country : Armenia
project : Traceca-D
road no : M-3
link no : 12
section no : 010
Date Created : 1999-07-05 / 10:45
Load Mode : 4 (6 buffers, 22 plates)
Plate Radius : 15 (cm)
Extra Field Set : TRACECA - D
Drop Sequence : 222
No of drops : 111
Record Drop? : NYY
Drop Height : 1 2 3 4
Impact Load : 3000 5000 7500 12000 kgf
Sensor Number : 0 1 2 3 4 5 6 7
8
Sensor Distance : 0.0 24.0 37.0 55.0 85.0 127.0 150.0 0.0
0.0 (cm)
Sensor Position : CENTER BEHIND BEHIND BEHIND BEHIND BEHIND BEHIND ??????
??????
Reference Offset : 0 m
Testpoint spacing: 500 m

Moduli for Road Structure - Section 1 (0 -> 16643)

Road Structure According to : EX
Number of 10 ton loads per day (N10) : 250
Growth in N10 per year (%) : 2.5
Design lifetime for section (years) : 10
Modulus (E) for asphalt overlay (MPa) : 3500
Poisson Ratio for asphalt overlay : .35

Layer -	Thickness cm	Poisson ratio	Emax MPa	Emin MPa	Eseed MPa	Reference microStrain	Kexponent
1	12	.35	7000	1500	3500	195	5.62
2	22	.35	2000	150	400	885	4.00
3	400	.35	2000	20	100	885	4.00

Drop number 3 is analysed.

MEASUREMENT AND CALCULATION RESULTS:

AIR TEMPERATURE:
MAXIMUM : 27 øC
MEAN VALUE : 24 øC
MINIMUM : 21 øC

SURFACE TEMPERATURE:
MAXIMUM : 42 øC
MEAN VALUE : 30 øC
MINIMUM : 23 øC

Asphalt moduli corrected for temperature
- according to : : - KUAB's Standard
Choose Temperature for Temp Corrections : - surface temp
Reference temperature for calculations : 25 øC

Posn	E	E(25)	Emod2	Emod3	Emod4	Esub	Hasf	H5app	cr	Aov	Life	RMSdev
0	1827	1666	167	0	0	51	12	193	1	10	0	15.7 %
499	1821	1514	151	0	0	169	12	1433	1	11	0	9.8 %
1005	1604	1604	160	0	0	138	12	333	1	10	0	15.7 %
1760	1889	6889	582	0	0	68	12	212	1	0	10	13.8 %
2006	5539	5539	760	0	0	97	12	691	1	0	10	3.5 %
2712	543	1647	165	0	0	85	12	193	1	10	0	88.9 %
3021	3577	3923	150	0	0	93	12	366	1	7	0	11.1 %
3749	737	2948	404	0	0	121	12	2064	1	3	2	7.9 %
4066	1348	1622	162	0	0	32	12	333	1	10	0	42.9 %
4729	356	1715	171	0	0	89	12	314	1	10	0	13.4 %
5021	1542	1692	169	0	0	37	12	134	1	10	0	19.2 %
5740	374	1643	164	0	0	58	12	278	1	10	0	25.8 %
6005	1302	1567	205	0	0	74	12	576	1	9	0	5.4 %
6696	1055	1527	236	0	0	61	12	576	1	8	0	5.1 %
7006	1735	1581	158	0	0	78	12	400	1	10	0	18.7 %
7486	1001	1589	159	0	0	60	12	278	1	10	0	32.7 %
8031	1880	1880	258	0	0	63	12	400	1	7	0	7.1 %
8489	623	2073	244	0	0	88	12	995	1	7	0	5.4 %
9001	2279	2077	245	0	0	51	12	400	1	7	0	9.8 %
9001	2924	2666	254	0	0	60	12	400	1	6	0	9.9 %
9001	2515	2293	218	0	0	51	12	400	1	8	0	11.2 %

```
   9494   595  1500   253     0     0    67   12  1870    1    8     0  4.3
%
  10004  1181  1558   163     0     0   146   12 99999    1   10     0  8.3
%
  10486   414  1656   166     0     0    92   12   231    1   10     0 50.5
%
  10486   546  1654   165     0     0    86   12   231    1   10     0 45.3
%
  10486   548  1662   166     0     0    90   12   231    1   10     0 40.6
%
  11022   945  1500   228     0     0    73   12   509    1    9     0 14.2
%
  11476   543  1500   663     0     0    82   12 99999    1    0    10 11.7
%
  12010   960  1523   247     0     0    43   12  2477    1    8     0  3.5
%
  12497  1145  2884   150     0     0    41   12   271    1    9     0 12.1
%
  13008  1110  1607   161     0     0    60   12   333    1   10     0 31.4
%
  13478   768  1609   161     0     0    89   12   193    1   10     0 62.4
%
  15000  1282  1855   324     0     0    65   12   593    1    6     0  6.7
%
  15133  1368  1500   242     0     0   170   12  1462    1    8     0  4.0
%
  16004  1565  1565   169     0     0    60   12   576    1   10     0  5.5
%
  16139  1039  1649   223     0     0    78   12   400    1    9     0  7.9
%
  16638   945  1500   158     0     0   125   12   450    1   10     0  9.2
%
  16642  1495  2163   306     0     0    92   12   691    1    6     0  9.5
%
```

ANNEX 14

SAMPLE SUMMARY OF ROUGHNESS MEASUREMENTS IRI (mm/km)

ANNEX 14
TRACECA ROADS MAINTENANCE PROJECT : MODULE D

Summary of Roughness Measurements IRI (mm/Km)

Country Kazakhstan
Road No A351
Link/Section No 03/030
Length of the sec 16800m

Distance(m)	IRI Lane 1	IRI Lane 2	Average IRI
0			
250	5.80	4.83	2.725
500	5.45	5.31	4.86
750	4.89	3.82	4.97
1000	4.63	3.65	3.695
1250	3.57	4.2	3.61
1500	3.57	3.4	4.48
1750	4.76	3.57	4.08
2000	4.76	3.57	3.735
2250	3.90	4.13	3.885
2500	4.20	4.49	3.72
2750	3.31	3.74	3.805
3000	3.12	3.4	3.285
3250	2.83	3.57	3.215
3500	3.03	3.22	3.44
3750	3.31	3.12	3.31
4000	3.40	3.4	3.26
4250	3.40	3.74	3.215
4500	3.03	3.31	3.43
4750	3.12	3.82	3.31
5000	3.31	3.57	3.695
5250	3.57	3.57	3.61
5500	3.65	3.48	3.695
5750	3.82	3.48	3.395
6000	3.31	3.31	3.3
6250	3.12	3.12	3.355
6500	3.40	3.31	3.545
6750	3.97	3.48	3.355
7000	3.4	3.74	3.525
7250	3.57	3.82	3.61
7500	3.48	4.2	4.085
7750	4.35	4.69	4.415
8000	4.63	3.48	5.13
8250	5.57	4.05	3.985
8500	4.49	4.27	4.69
8750	5.33	3.65	5.535
9000	6.8	3.65	4.49
9250	5.33	4.49	4.14
9500	4.63	4.69	4.825
9750	4.96	3.9	5.73
10000	7.56	4.13	5.49
10250	6.85	5.33	6.015
10500	6.7	6.02	5.22

10750	4.42	6.13	5.13
11000	4.13	3.9	3.69
11250	3.48	3.48	3.61
11500	3.74	4.69	4.95
11750	5.21	3.9	5.095
12000	6.29	5.15	4.36
12250	3.57	4.83	4.155
12500	3.48	4.69	4.215
12750	3.74	3.31	3.44
13000	3.57	4.69	4.295
13250	3.9	3.82	3.735
13500	3.65	4.27	4.005
13750	3.74	3.97	4.195
14000	4.42	3.03	3.995
14250	4.96	3.4	4.115
14500	4.83	4.56	4.725
14750	4.89	3.9	4.125
15000	4.35	3.65	3.775
15250	3.9	3.57	3.525
15500	3.48	3.22	4.245
15750	5.27	4.35	4.59
16000	4.83	4.96	4.86
16250	4.76	4.2	3.865
16450	3.53	3.84	1.92
	IRI for the section		4.05

TRACECA ROADS MAINTENANCE PROJECT : MODULE D

Summery of Roughness Measurements I

Country	Uzbekistan
Road No	M37
Link/Section No	10/010
Length of the sect	4500 m

Distance(m)	IRI Lane 1	IRI Lane	Average IRI
0	0	4.5	2.25
250	6.8	3.6	5.2
500	4.5	3.9	4.2
750	4.1	4.2	4.15
1000	4.2	4.5	4.35
1250	3.8	4.5	4.15
1500	3.5	4.1	3.8
1750	3.8	3.7	3.75
2000	3.4	4.2	3.8
2250	4.1	4.4	4.25
2500	3.7	5.4	4.55
2750	6.6	5.8	6.2
3000	5.3	4.1	4.7
3250	4.6	4.2	4.4
3500	5.3	5.2	5.25
3750	7.2	4.8	6
4000	7.1	5.6	6.35
4250	6.1	4.8	5.45
4500	5.1	5.1	5.1

IRI for the section 4.8

Country	Kyrgyzstan
Road No	M39
Link/Section No	01010
Length of the section	10000 m

Distance(m)	IRI Lane 1	IRI Lane 2	Average IRI
0	6.89	4.52	5.70
250	6.00	4.74	5.37
500	4.52	4.41	4.46
750	4.96	4.30	4.63
1000	4.30	4.63	4.46
1250	3.15	3.27	3.21
1500	3.15	3.62	3.38
1750	2.55	4.41	3.48
2000	3.27	5.59	4.43
2250	4.30	4.30	4.30
2500	5.69	5.80	5.75
2750	5.28	7.81	6.54
3000	7.72	7.54	7.63
3250	5.06	5.69	5.38
3500	5.17	3.62	4.39
3750	4.63	4.85	4.74
4000	4.85	4.96	4.90
4250	4.74	4.19	4.46
4500	5.17	5.06	5.12
4750	4.96	3.96	4.46
5000	3.27	3.85	3.56
5250	4.96	3.85	4.40
5500	4.96	5.80	5.38
5750	5.06	4.85	4.96
6000	4.96	4.30	4.63
6250	4.19	5.69	4.94
6500	4.07	5.69	4.88
6750	3.62	4.96	4.29
7000	3.73	4.30	4.02
7250	3.15	3.62	3.38
7500	3.38	4.52	3.95
7750	4.74	3.73	4.24
8000	5.28	4.74	5.01
8250	4.19	3.50	3.84
8500	2.91	3.27	3.09
8750	2.67	3.27	2.97
9000	4.30	3.62	3.96
9250	3.73	4.52	4.13
9500	3.73	4.52	4.13
9750	3.73	4.41	4.07
10000			
	IRI for the section		4.52

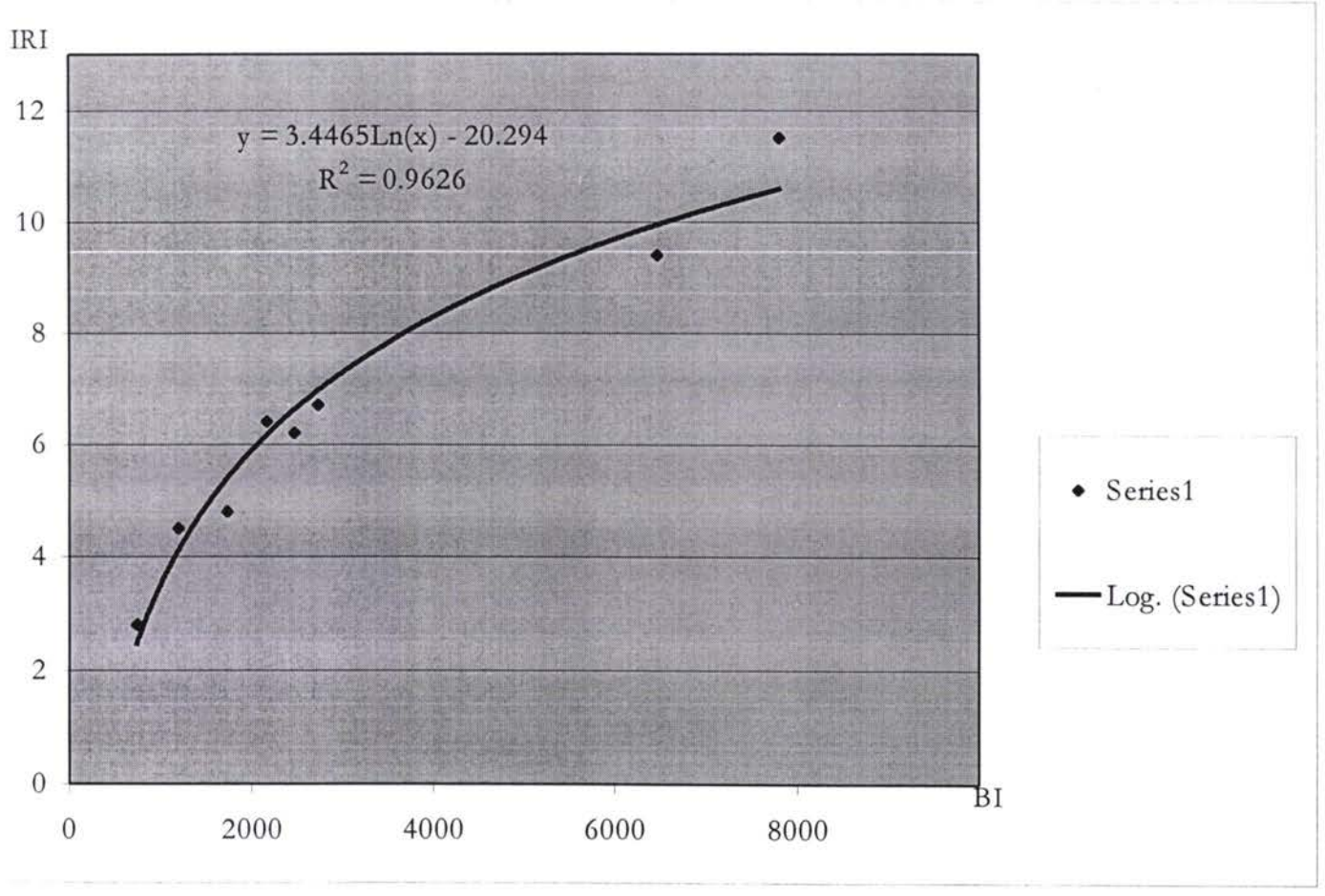
ANNEX 15

MERLIN CALIBRATION CURVE

ANNEX 15 : MERLIN CALIBRATION CURVE

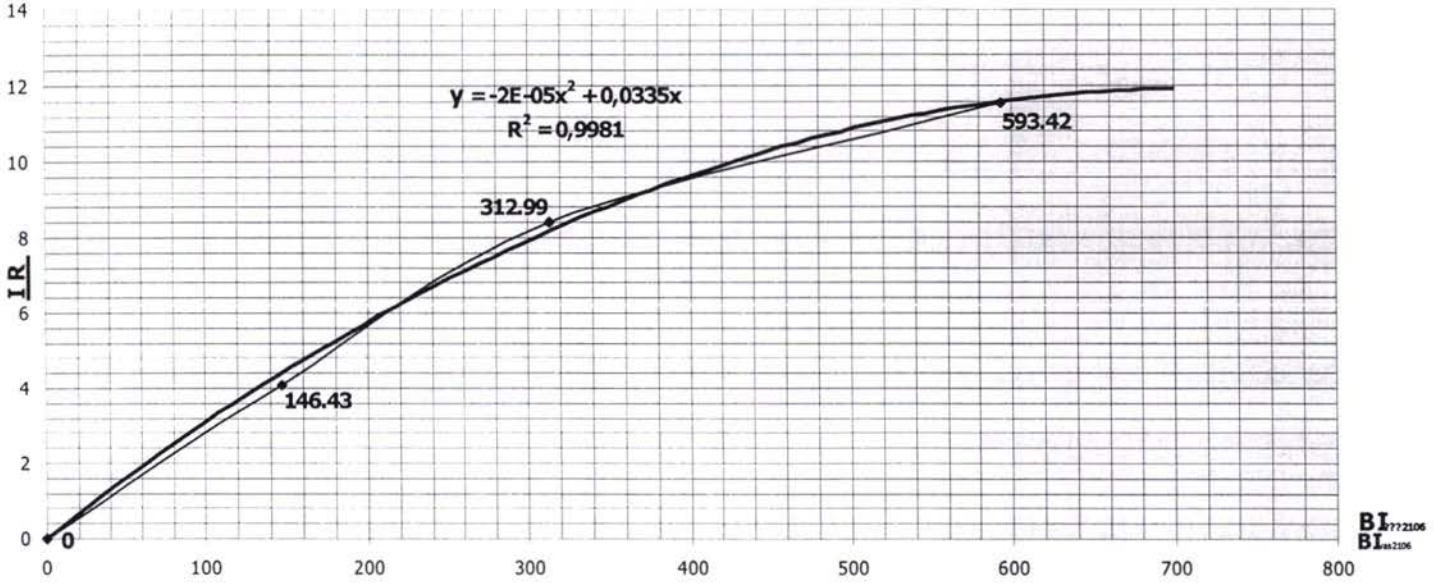
KAZAKSTAN

The diagram shows the relation between IRI of MERLIN and the built-in-vehicle Bump Integrator (BI)



KYRGYZSTAN

Relation between IRI of MERLIN and the built-in-vehicle Bump Integrator (BI)



TRACECA ROADS MAINTENANCE PROJECT : MODULE D
Bump Integrator Calibration Form

Country Uzbekistan Vehicle RAF 0605 Driver Baktiar Alibaba

Inspector Abror eshankolov, A Amangilov Speed 32.5 Km/h Date 10,11/09/98

Calibration Section (No and Location)	Section Length (L m)	IRI Note 1	Run No		Counter Reading	Mean Count (N)	Roughness (mm/km) (Nx10x1000)/m
1.Ferganskaya St. (before the ist bridge) (auto service)	210	5,9	1			81	3857
			2	*	80		
			3	*	81		
			4	*	83		
			5				
2. Ferganskaya St. (Cafe)	210	7,8	1	*	99	106	5048
			2	*	109		
			3	*	105		
			4	*	104		
			5				
3. after crossing of Furkat St. With tram line	210	7,4	1	*	114	105	5000
			2	*	103		
			3	*	108		
			4	*	103		
			5				

Note : 1. As measured by Merlin

TRACECA ROADS MAINTENANCE PROJECT : MODULE D
Bump Integrator Calibration Form

Country _____ Vehicle _____ Driver _____

Inspector _____ Speed _____ Date _____

Calibration Section (No and Location)	Section Length (L m)	IRI Note 1	Run No	Counter Reading	Mean Count (N)	Roughness (mm/km) (Nx10x1000)/m
4. Furkat St. (200 m following Risoviy market)	210	4,9	1 *	65	54	2571
			2 *	53		
			3 *	55		
			4 *	61		
			5 *	54		
5. Intizot St. (next to Gulistan Park)	210	9,1	1 *	131	129	6143
			2 *	122		
			3 *	129		
			4 *	128		
			5			
6. Khusanbaev St. (east side)	210	7,1	1 *	97	92	4381
			2 *	92		
			3 *	96		
			4 *	86		
			5 *	88		

Note : 1. As measured by Merlin

TRACECA ROADS MAINTENANCE PROJECT : MODULE D
Bump Integrator Calibration Form

Country _____ Vehicle _____ Driver _____

Inspector _____ Speed _____ Date _____

Calibration Section (No and Location)	Section Length (L m)	IRI Note 1	Run No		Counter Reading	Mean Count (N)	Roughness (mm/km) (Nx10x1000/m)
7. Khusanbaev St. (west side)	210	7,4	1	*	122	120	5714
			2	*	120		
			3	*	130		
			4	*	119		
			5				
8. Zulaykho St. (following the turn to Karasu)	210	4,7	1			40	1905
			2	*	39		
			3	*	41		
			4	*	41		
			5				
			1				
			2				
			3				
			4				
			5				

Note : 1. As measured by Merlin.

ANNEX 16

DESCRIPTION OF BI AND MERLIN

ANNEX 16 : DESCRIPTION OF BI AND MERLIN

The Bump Integrator and Counter is a Response Type Road Roughness Measurement System.

RTRRM systems record the cumulative displacement of an axle relative to the body of the vehicle induced by the roughness of the road. The system consists of a vehicle - one with a solid and transverse back axle fitted with the bump integrator instrument A1471 capable of summing the movement of the back axle as it is travelling along the road and a counter unit A1473 to record the counts indiscreet units of measure.

The RTRRMS must be regularly calibrated against an instrument such as the TRI, Profile Beam, the MERLIN or a rod and level survey. This calibration should preferably be carried out before the survey and checked on 'control' sites during the survey period to ensure that the RTRRMS remains within calibration. The calibration of the RTRRMS will need to be re-checked before any subsequent surveys or after any part of the suspension of the vehicle is replaced.

The calibration exercise basically involves comparing the results from the RTRRMS and the calibration instrument over several short road sections. The relationship obtained by this comparison can then be used to convert RTRRMS survey results into units of E[M.The recommended practice for roughness calibration is described below.

A minimum of eight sections should be selected with varying roughness levels that span the range of roughness of the road network. The calibration sites should be on a similar type of road (ie paved or unpaved roads) to those being surveyed. The sections should have a minimum length of 200m and should be of uniform roughness over their length. In practice it may be difficult to find long homogeneous sections on very rough roads. In this case it is better to include a shorter section than to omit high roughness sites from the calibration. The sections should be straight and flat, with adequate run-up and slow-down lengths and should have no hazards such as junctions so that the vehicle can travel in a straight course at constant speed along the whole section.

The roughness of each section should be measured by the RTRRMS at the same vehicle speed that is to be used for the general survey. The value of VR (mm/km) should be the mean value of at least three test runs.

The calibration instrument should measure roughness in both wheelpaths. The average of these IRI values (in m/km) is then plotted against the vehicle response for each of the test sections. The calibration equation for the RTRRMS is then derived by calculating the best fit line for the points. This relationship generally has a quadratic form but has also been found to be logarithmic depending upon the characteristics of the vehicles suspension and the levels of roughness over which the RTRRMS is being calibrated.

ANNEX 17

SAMPLE OF CLASSIFIED TRAFFIC COUNTS

CLASSIFIED TRAFFIC COUNTS - TRACECA Module D - ARMENIA **ANNEX 17**

Section: **Yerevan-Sevan** **M4** Staff 1 Aerapetian Valarik Parkman: Kimo Karini

Station: **Km 26** 2 Avatisan Aram

Date: **30.11- 01.12.1998** 3 Martorussian Rudik

Time		Car			Pickup &MB			Bus			2 axle truck			3 axle truck			> 3 axle truck			Others			TOTAL		
from	to	left	right	Total	left	right	Total	left	right	Total	left	right	Total	left	right	Total	left	right	Total	left	right	Total	left	right	Total
08-00	09-00	160	93	253	14	6	20	17	7	24	15	14	29	0	0	0	0	0	0	0	0	0	206	120	326
09-00	10-00	200	146	346	13	20	33	11	9	20	14	2	16	14	12	26	2	0	2	0	0	0	254	189	443
10-00	11-00	190	225	415	15	15	30	12	10	22	30	25	55	0	0	0	0	0	0	0	0	0	247	275	522
11-00	12-00	285	195	480	22	19	41	15	8	23	12	16	28	20	17	37	1	4	5	0	0	0	355	259	614
12-00	13-00	230	255	485	20	20	40	10	20	30	20	15	35	19	23	42	3	2	5	0	1	1	302	336	638
13-00	14-00	227	209	436	18	28	46	11	15	26	14	18	32	2	4	6	0	0	0	0	1	1	272	275	547
14-00	15-00	229	229	458	21	23	44	14	8	22	16	14	30	13	16	29	8	4	12	0	0	0	301	294	595
15-00	16-00	230	222	452	12	26	38	12	20	32	10	15	25	6	11	17	1	4	5	0	0	0	271	298	569
16-00	17-00	232	218	450	19	11	30	23	17	40	12	9	21	13	12	25	6	3	9	0	0	0	305	270	575
17-00	18-00	210	186	396	19	21	40	11	8	19	7	10	17	3	4	7	0	2	2	0	0	0	250	231	481
18-00	19-00	177	163	340	12	9	21	8	9	17	7	4	11	4	6	10	2	1	3	0	0	0	210	192	402
19-00	20-00	187	155	342	11	13	24	8	2	10	3	4	7	3	4	7	0	4	4	0	0	0	212	182	394
20-00	21-00	96	97	193	7	7	14	2	2	4	11	11	22	3	2	5	0	0	0	0	0	0	119	119	238
21-00	22-00	97	106	203	21	32	53	0	0	0	26	34	60	8	12	20	0	0	0	0	0	0	152	184	336
22-00	23-00	77	71	148	22	13	35	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	99	85	184
23-00	24-00	32	31	63	0	2	2	1	0	1	0	2	2	0	0	0	0	0	0	0	0	0	33	35	68
24-00	01-00	21	18	39	0	2	2	0	2	2	0	1	1	1	0	1	0	0	0	0	0	0	22	23	45
01-00	02-00	37	43	80	3	12	15	0	0	0	3	2	5	0	0	0	0	0	0	0	0	0	43	57	100
02-00	03-00	28	32	60	12	11	23	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	40	44	84
03-00	04-00	58	52	110	12	8	20	2	1	3	2	7	9	0	0	0	0	0	0	0	0	0	74	68	142
04-00	05-00	39	39	78	8	9	17	7	4	11	4	3	7	1	0	1	0	0	0	0	0	0	59	55	114
05-00	06-00	56	43	99	3	2	5	0	0	0	4	1	5	0	0	0	0	0	0	0	0	0	63	46	109
06-00	07-00	51	38	89	2	8	10	0	0	0	2	3	5	0	0	0	0	0	0	0	0	0	55	49	104
07-00	08-00	45	43	88	16	10	26	17	3	20	11	4	15	4	3	7	0	0	0	0	0	0	93	63	156
TOTAL		3194	2909	**6103**	302	327	**629**	181	146	**327**	223	215	**438**	114	126	**240**	23	24	**47**	0	2	**2**	4037	3749	**7786**

CLASSIFIED TRAFFIC COUNTS - TRACECA Module D - KAZAKHSTAN

ANNEX 17

Section: **Chemkent-Samara**
Station: **180 km ?32**
Date: **16.10-17.10.1998**

Staff
1 Vjatheslav Pack
2 Aleksandr Antonov
3 Vitali Bagashov

Parkman: Kimo Karini

Time		Motocycle			Car			Pickup &MB			Bus			2 axle truck			3 axle truck			> 3 axle truck			Others		
from	to	West	East	Total	West	East	Total	West	East	Total	West	East	Total	West	East	Total	West	East	Total	West	East	Total	West	East	Total
08-00	09-00	0	0	0	26	9	35	1	3	4	4	0	4	0	1	1	0	2	2	0	0	0	2	2	4
09-00	10-00	1	0	1	52	19	71	5	3	8	6	1	7	3	2	5	0	1	1	2	1	3	3	0	3
10-00	11-00	0	0	0	44	30	74	8	4	12	9	6	15	3	3	6	2	3	5	2	0	2	12	0	12
11-00	12-00	1	0	1	43	29	72	4	4	8	4	3	7	5	3	8	4	1	5	1	4	5	5	3	8
12-00	13-00	0	1	1	36	34	70	2	7	9	2	5	7	2	6	8	2	2	4	4	1	1	1	3	4
13-00	14-00	0	0	0	22	32	54	4	4	8	0	1	1	2	3	5	2	2	4	1	2	3	2	9	11
14-00	15-00	0	2	2	25	28	53	2	5	7	4	5	9	3	2	5	3	4	7	1	3	4	1	2	3
15-00	16-00	0	1	1	36	33	69	4	5	9	5	10	15	4	3	7	5	3	8	1	0	1	5	0	5
16-00	17-00	0	0	0	35	39	74	1	6	7	1	6	7	2	4	6	0	7	7	1	2	3	2	1	3
17-00	18-00	1	0	1	24	41	65	6	6	12	5	2	7	3	3	6	5	2	7	2	2	4	4	4	8
18-00	19-00	0	1	1	22	51	73	4	4	8	6	4	10	7	4	11	2	2	4	2	3	5	4	2	6
19-00	20-00	0	1	1	34	38	72	3	6	9	1	5	6	5	6	11	3	0	3	1	0	1	2	6	8
20-00	21-00	0	0	0	24	36	60	2	0	2	1	1	2	3	3	6	3	5	8	1	1	2	2	6	8
21-00	22-00	1	0	1	21	16	37	1	0	1	0	2	2	1	1	2	2	1	3	5	2	7	0	0	0
22-00	23-00	0	0	0	27	13	40	1	0	1	0	1	1	2	1	3	0	2	2	2	1	3	0	0	0
23-00	24-00	0	0	0	14	12	26	0	1	1	1	1	2	1	2	3	0	1	1	0	3	3	0	2	2
24-00	01-00	0	0	0	17	12	29	0	0	0	0	1	1	1	0	1	6	1	7	3	0	3	1	1	2
01-00	02-00	0	0	0	17	7	24	2	0	2	2	3	5	2	1	3	4	0	4	1	3	4	0	0	0
02-00	03-00	0	0	0	10	6	16	1	0	1	3	0	3	2	3	5	0	0	0	2	1	3	0	0	0
03-00	04-00	0	0	0	3	4	7	0	0	0	2	2	4	1	3	4	5	1	6	1	1	2	0	0	0
04-00	05-00	0	0	0	5	1	6	1	0	1	4	0	4	1	1	2	1	3	4	3	0	3	0	0	0
05-00	06-00	0	0	0	5	2	7	0	0	0	1	1	2	3	0	3	3	1	4	1	0	1	0	0	0
06-00	07-00	0	0	0	7	4	11	1	1	2	0	2	2	0	0	0	1	0	1	1	1	2	0	0	0
07-00	08-00	0	0	0	9	1	10	0	1	1	0	3	3	1	0	1	1	2	3	0	1	1	1	0	1
TOTAL		4	6	10	558	497	1055	53	60	113	61	65	126	57	55	112	54	46	100	38	32	66	47	41	88

CLASSIFIED TRAFFIC COUNTS - TRACECA Module D

ANNEX 17

Section: **Tashkent- Andijan**

Station: **20 km A 373**

Date: **08.07-09.07.1998**

Staff 1 Kahraman Zukorov

2 Amangaldi Rahimov

3 Abdulhakim Jumangulov

Parkman: Kimo Kari

Time		Motorcycle			Car			Pickup &MB			Bus			2 axle truck			3 axle truck			> 3 axle truck			Others		
from	to	West	East	Total	West	East	Total	West	East	Total	West	East	Total	West	East	Total	West	East	Total	West	East	Total	West	East	Total
08-00	09-00																								
09-00	10-00		1	1	295	295	590	18	21	39	13	23	36	37	27	64	14	22	36	8	9	17	2	2	4
10-00	11-00	3	1	4	316	263	579	12	9	21	14	10	24	19	26	45	4	13	17	10	7	17	1	2	3
11-00	12-00		2	2	328	252	580	8	9	17	23	15	38	24	28	52	19	12	31	2	11	13	1		1
12-00	13-00	1	2	3	357	216	573	8	4	12	21	14	35	29	25	54	19	21	40	12	6	18			
13-00	14-00	1	1	2	290	163	453	11	3	14	23	16	39	20	12	32	14	10	24	4	5	9	2	5	7
14-00	15-00	2	1	3	294	205	499	5	2	7	14	10	24	24	16	40	16	3	19	5	10	15		3	3
15-00	16-00	2	1	3	308	217	525	6	6	12	11	17	28	16	15	31	16	6	22	3	5	8	1		1
16-00	17-00	2		2	266	188	454	10	1	11	19	11	30	19	16	35	11	11	22	12	2	14	1		1
17-00	18-00	2	1	3	282	210	492	5	7	12	21	11	32	11	5	16	19	11	30	10	8	18			
18-00	19-00	2		2	328	284	612	9	8	17	16	9	25	15	12	27	7	9	16	1	11	12	3	1	4
19-00	20-00				365	301	666	5	10	15	8	7	15	12	11	23	11	2	13	6	2	8		1	1
20-00	21-00		1	1	280	258	538	6	11	17	11	1	12	13	2	15	11	4	15	1	1	2			
21-00	22-00	1		1	209	184	393	2	2	4	8	4	12	7	8	15	5	3	8	1	7	8		1	1
22-00	23-00				137	111	248	5	3	8	4	3	7		9	9	4	3	7	2		2	1		1
23-00	24-00	1	2	3	90	101	191	6	7	13	3	4	7	8	5	13	1	2	3		2	2	1		1
24-00	01-00	1		1	73	95	168	7	6	13	3	3	6	2	8	10	1	1	2						
01-00	02-00				55	42	97	1	9	10	2	6	8	1	7	8	4	1	5		2	2		1	1
02-00	03-00				26	63	89	2	4	6	3	5	8	1	5	6	3	5	8	1		1			
03-00	04-00				28	110	138		6	6	1	13	14	8	3	11	13	5	18	1	2	3			
04-00	05-00				43	195	238	3	4	7	4	10	14	4	7	11		5	5						
05-00	06-00				93	292	385	7	16	23	8	23	31	5	6	11	1	3	4	2	1	3			
06-00	07-00				192	360	552	9	12	21	18	26	44	10	11	21	4	10	14	8	3	11			
07-00	08-00		1	1	206	383	589	11	10	21	7	23	30	13	25	38	4	9	13	2	10	12		8	8
08-00	09-00	1	2	3	305	368	673	10	10	20	17	26	43	21	19	40	3	19	22	11	6	17	2	2	4

CLASSIFIED TRAFFIC COUNTS - TRACECA Module D - KYRGYZSTAN

ANNEX 17

Section: **Left - Chaldovar Right-Osh**
Station: **km 60 M - 39**
Date: **11.11- 12.11.1998**

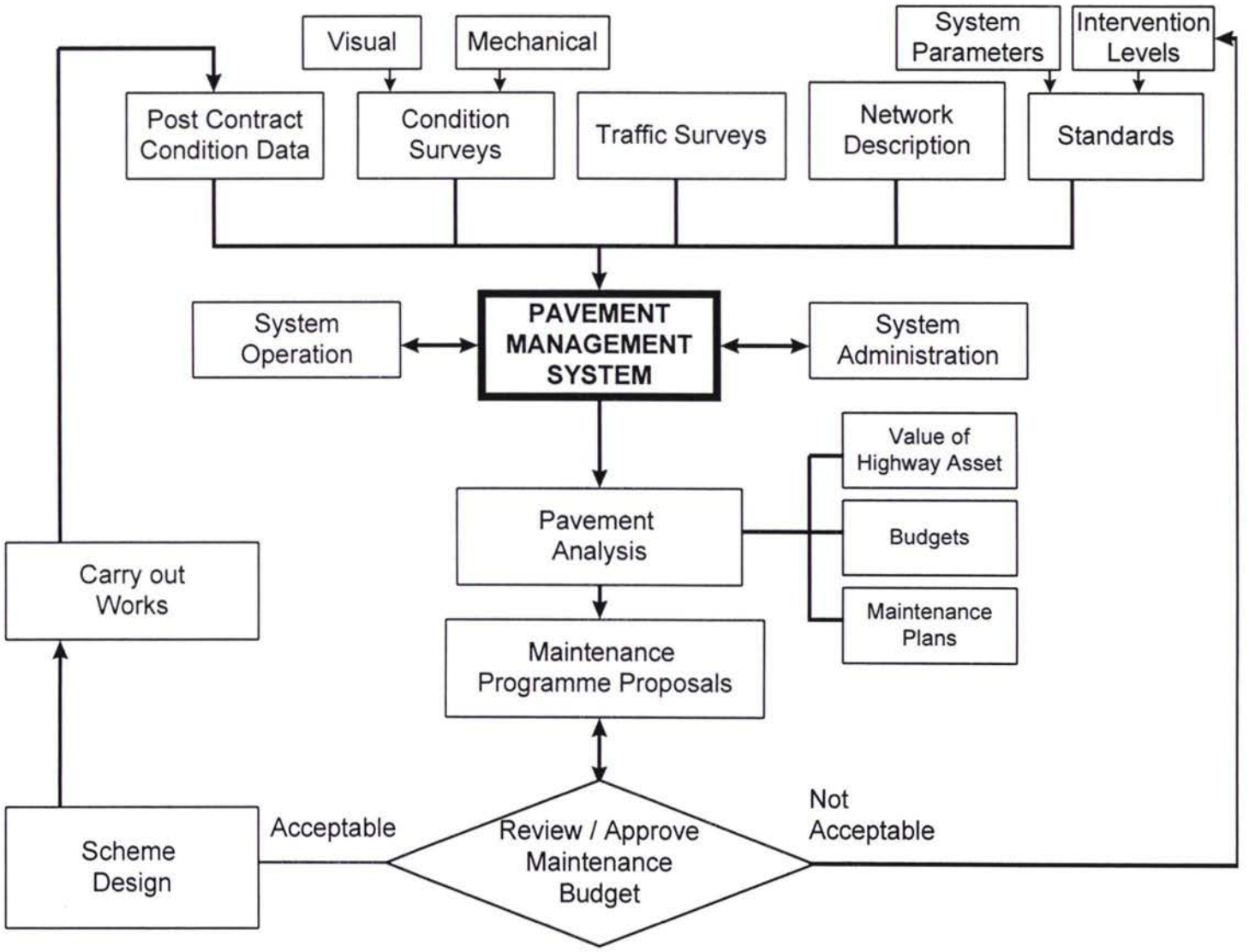
Staff
1 Gainutdinov I.
2 Mambetaliev M.
3 Mambetkaziev O.

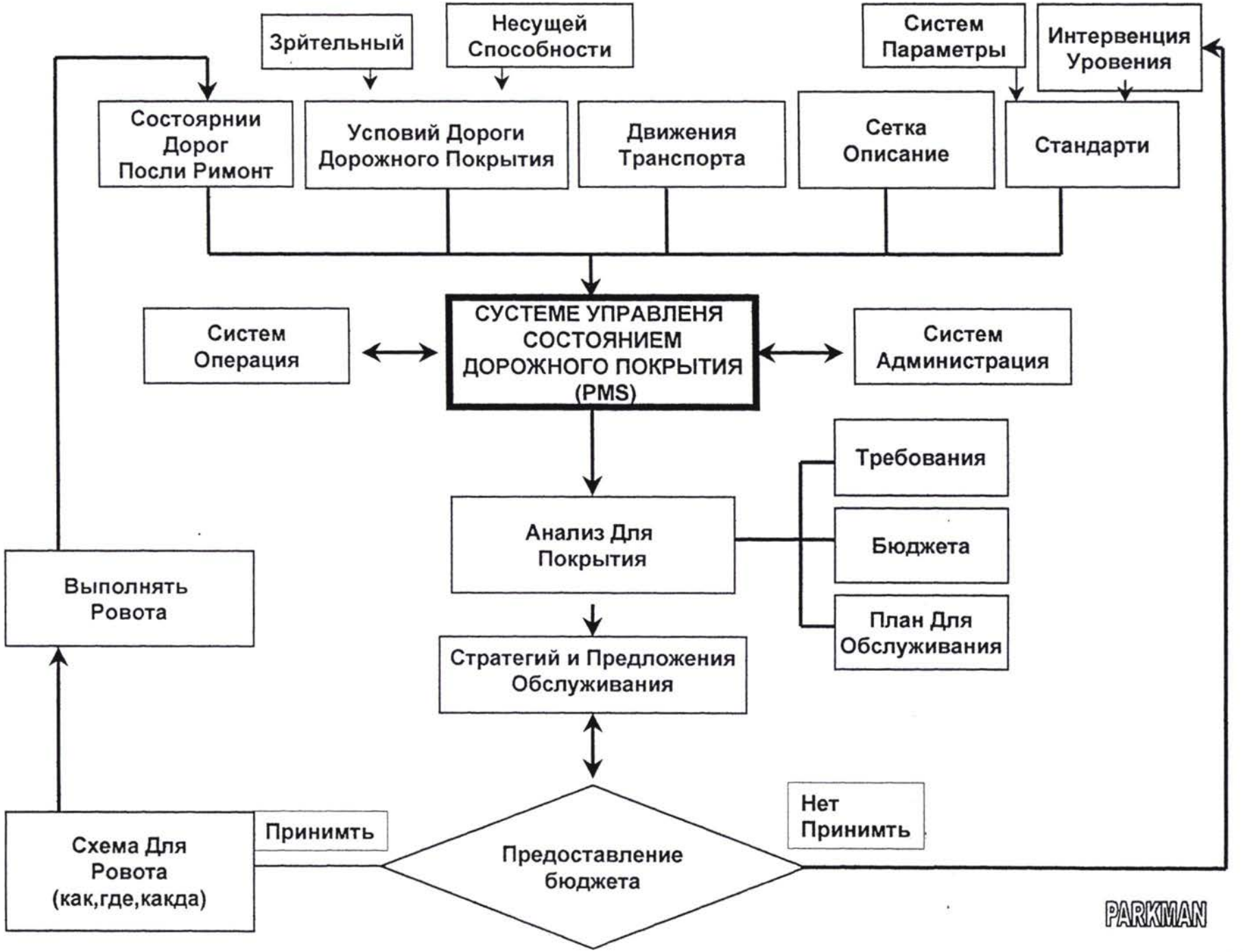
Parkman: Kimo Karini

Time		Car			Pickup &MB			Bus			2 axle truck			3 axle truck			> 3 axle truck			Others			TOTAL		
from	to	left	right	Total	left	right	Total	left	right	Total	left	right	Total	left	right	Total	left	right	Total	left	right	Total	left	right	Total
12-00	13-00	86	33	119	6	2	8	3	1	4	17	3	20	8	1	9	3	0	3	4	0	4	127	40	167
13-00	14-00	72	32	104	4	4	8	1	2	3	12	2	14	6	7	13	0	0	0	2	0	2	97	47	144
14-00	15-00	47	23	70	5	1	6	0	1	1	12	2	14	7	1	8	5	1	6	1	0	1	77	29	106
15-00	16-00	72	24	96	6	0	6	2	1	3	5	1	6	3	1	4	2	0	2	2	1	3	92	28	120
16-00	17-00	88	24	112	5	1	6	2	0	2	6	2	8	4	2	6	0	3	3	0	0	0	105	32	137
17-00	18-00	77	33	110	6	0	6	3	5	8	12	20	32	5	12	17	3	0	3	0	1	1	106	71	177
18-00	19-00	17	10	27	2	0	2	0	0	0	4	0	4	1	0	1	0	0	0	0	0	0	24	10	34
19-00	20-00	16	8	24	2	1	3	1	1	2	1	0	1	0	0	0	0	0	0	0	0	0	20	10	30
20-00	21-00	11	9	20	2	0	2	0	0	0	2	1	3	4	1	5	0	0	0	0	0	0	19	11	30
21-00	22-00	13	6	19	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	14	6	20
22-00	23-00	7	7	14	1	0	1	0	0	0	1	1	2	4	0	4	0	0	0	0	0	0	13	8	21
23-00	24-00	2	3	5	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	4	6
24-00	01-00	1	2	3	0	0	0	0	0	0	0	2	2	2	0	2	0	0	0	0	0	0	3	4	7
01-00	00:00	1	11	12	0	1	1	1	4	5	0	0	0	1	0	1	0	0	0	0	0	0	3	16	19
02-00	03-00	1	0	1	1	0	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	3	1	4
03-00	04-00	1	1	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2	1	3
04-00	05-00	2	1	3	0	0	0	0	0	0	2	0	2	0	0	0	1	1	2	0	0	0	5	2	7
05-00	06-00	10	4	14	1	0	1	1	0	1	5	3	8	2	1	3	0	0	0	0	0	0	19	8	27
06-00	07-00	42	6	48	3	1	4	2	1	3	4	3	7	1	0	1	0	0	0	1	0	1	53	11	64
07-00	08-00	46	16	62	3	3	6	1	1	2	16	0	16	11	4	15	1	0	1	4	0	4	82	24	106
08-00	09-00	71	43	114	5	0	5	6	1	7	8	3	11	11	5	16	6	0	6	2	0	2	109	52	161
09-00	10-00	78	43	121	7	7	14	3	2	5	11	8	19	2	1	3	2	0	2	3	2	5	106	63	169
10-00	11-00	32	25	57	3	3	6	3	3	6	5	2	7	2	0	2	0	0	0	5	2	7	50	35	85
11-00	12-00	23	21	44	3	3	6	2	3	5	11	3	14	1	0	1	2	0	2	3	0	3	45	30	75
TOTAL		816	385	**1201**	65	27	**92**	31	27	**58**	137	57	**194**	75	36	**111**	25	5	**30**	27	6	**33**	1176	543	**1719**

ANNEX 18

PMS/BMS FLOW CHART


Visual
Mechanical
System Parameters
Intervention Levels
Post Contract Condition Data
Condition Surveys
Traffic Surveys
Network Description
Standards
System Operation
PAVEMENT MANAGEMENT SYSTEM
System Administration
Value of Highway Asset
Pavement Analysis
Budgets
Maintenance Plans
Carry out Works
Maintenance Programme Proposals
Scheme Design
Acceptable
Review / Approve Maintenance Budget
Not Acceptable


Зрйтельный
Несущей Способности
Систем Параметры
Интервенция Уровения
Состоярнии Дорог Посли Римонт
Усповий Дороги Дорожного Покрытия
Движения Транспорта
Сетка Описание
Стандарти
Систем Операция
СУСТЕМЕ УПРАВЛЕНЯ СОСТОЯНИЕМ ДОРОЖНОГО ПОКРЫТИЯ (PMS)
Систем Администрация
Требования
Анализ Для Покрытия
Бюджета
План Для Обслуживания
Выполнять Ровота
Стратегий и Предложения Обслуживания
Нет Принимть
Принимть
Схема Для Ровота (как,где,какда)
Предоставление бюджета
PARKMAN

ANNEX 19

LISTS OF THE PERSONS ATTENDING THE SEMINARS

ANNEX 19 : LIST OF SEMINAR PARTICIPANTS

Bridge Management System Seminars
Road Condition Surveys and Pevement Management System Seminars
(Persons initially trained for inspection indicated *)

Armenia

ATTENDANCE	ORGANISATION
Visual Inspection	
P Karchikian	Armenian Road Directorate
R Atabekian	Armenian Road Directorate
D Hovsepian *	Dorproject (Sub-contractor)
K Karapetian *	Dorproject
S Badalian*	Dorproject
H Gjulzadian	Technical University
Traffic Counting	
Akobian Hanzel *	Dorproject (Sub-contractor)
Karapetian Janibek *	Dorproject
Makinian Pavel *	Dorproject
Markovka Kartoshkian *	National Expert
Roughness Survey	
Karen Avpachian *	Dorproject (Sub-contractor)
S Badalian *	Dorproject
Falling Weight Deflectometer	
K Karapetian*	Dorproject (Sub-contractor)
D Hovsepian *	Dorproject
K Karapetian *	Dorproject
S Badalian	Dorproject
H Gjulzadian	Technical University
R Azoian	Technical University
A Sargsian	Technical University
PMS Input & Feasibility Studies	
Hakop Petrosian *	Armenian Road Directorate

ATTENDANCE	ORGANISATION
Bridge Inspection	
P Karchikian	Armenian Road Directorate
R Atabekian	Armenian Road Directorate
K Badalian	Project Implementation Unit of ARD
D Hovsepian *	Dorproject (Sub-contractor)
A Karapetian *	Dorproject
S Badalian	Dorproject
H Gjulzadian	Technical University
R Azoian	Technical University
A Sargsian	Technical University

Georgia

ATTENDANCE	ORGANISATION
Bridge Inspection	
L Korkia	Chief of Technical Office, Department of State Roads
K Mtvaradze	Chief of Safety Division, Department of State Roads
A Salaghaia	Vice-Chief, International Road Office
Sh Kikoev	Engineer, International Road Office
T Shalamberidze	Controller, National Roads
R Tshomakhidze	Controller, National Roads
Z Akhvlediani	Controller, National Roads
G Tshigogidze	Chief Engineer, Sakgzametsniereba (Sub-contractor)
R Dzneladze *	Chief, Artifical Construction Dept, Sakgzametsniereba
B Oragvelidze	Chief, Bridge Testing Laboratory, Sakgzametsniereba
B Vatsharadze	Chief Engineer, Artifical Construction Dept, Sakgzametsniereba

Azerbaijan

ATTENDANCE	ORGANISATION
Bridge Inspection	
R Movlyarov	Chief Engineer, Road Research Institute of Azeravtoyol

ATTENDANCE	ORGANISATION
	(Sub-contractor)
S Safarov	Chief of Department, Road Research Institute of Azeravtoyol
I Baharoinov	Chief Engineer, Road Research Institute of Azeravtoyol
M Nurullayev	Chief Specialist, Road Research Institute of Azeravtoyol
H Tahmazov	Senior Engineer, Road Research Institute of Azeravtoyol
Y Yusifov	Senior Engineer, Road Research Institute of Azeravtoyol
G Mehtiyev	Chief of Department, Road Research Institute of Azeravtoyol
A Samedova	Engineer, Azerbridge Company
T Hajimammadova	Engineer, Azerbridge Company
N Kerimov	Computer Programmer, Azerbridge Company
S Aslanov	Chief of Department, Baku City Road Organisation
N Yusifov	Chief of Department, Design Institute
R Ahmadov	Chief of Department, Design Institute

Uzbekistan

ATTENDANCE	ORGANISATION
Visual Inspection	
Abror Ashankolov *	Intertechnology center – Uzavtoyul (sub-contractor)
Ziadulla Kudabardiov *	Intertechnology center – Uzavtoyul (sub-contractor)
Alishair Satarov *	Intertechnology center – Uzavtoyul (sub-contractor)
Tahair Mirzaiov *	Intertechnology center – Uzavtoyul (sub-contractor)
Kakhraman Zukhurov *	Intertechnology center – Uzavtoyul
Amangulidi Rahimov	Intertechnology center – Uzavtoyul
Abdulhakim Jumankolov	Intertechnology center – Uzavtoyul
Traffic Counting	
Kakhraman Zukhurov *	Intertechnology center – Uzavtoyul
Amangulidi Rahimov*	Intertechnology center – Uzavtoyul
Abdulhakim Jumankolov *	Intertechnology center – Uzavtoyul
Abror Ashankolov *	Intertechnology center – Uzavtoyul
Alishair Satarov *	Intertechnology center – Uzavtoyul
Roughness Survey	
Abdulhakim Jumankolov *	Intertechnology center – Uzavtoyul
Abror Ashankolov *	Intertechnology center – Uzavtoyul
Amangulidi Rahimov*	Intertechnology center – Uzavtoyul

ATTENDANCE	ORGANISATION
Falling Weight Deflectometer	
Abdulhakim Jumankolov *	Intertechnology center – Uzavtoyul
Abror Ashankolov *	Intertechnology center – Uzavtoyul
Amangulidi Rahimov*	Intertechnology center – Uzavtoyul
Tahair Mirzaiov	Intertechnology center – Uzavtoyul (sub-contractor)
PMS Input & Feasibility Studies	
Abdulhakim Jumankolov *	Intertechnology center – Uzavtoyul (sub-contractor)
Abror Ashankolov *	Intertechnology center – Uzavtoyul
Amangulidi Rahimov*	Intertechnology center – Uzavtoyul
Wahid Azamov	Director Uzyullaka
Bridge Inspection	
Abror Ashankolov *	Intertechnology center – Uzavtoyul (sub-contractor)
Ziadulla Kudabardiov *	Intertechnology center – Uzavtoyul (sub-contractor)
A. Madfiov *	Uzyullaka – Uzavtoyul
Tahair Mirzaiov	Intertechnology center – Uzavtoyul (sub-contractor)
Amangulidi Rahimov *	Intertechnology center – Uzavtoyul
Abdulhakim Jumankolov *	Intertechnology center – Uzavtoyul

Kazakhstan

ATTENDANCE	ORGANISATION
Visual Inspection	
Krasikov O. A.	Deputy Director - Kazdornii
Yousupov N.N. *	Chief of division - Kazdornii
Bagashov V.V.	Chief of division - Kazdornii
Cycenko N.A. *	Leading Expert - Kazdornii
Pak V.D. *	Leading Engineer – Kazdornii
Antonov A.V.	**ENGINEER - KAZDORNII**

ATTENDANCE	ORGANISATION
Rovicz kaya G.B.	Leading Engineer – Kazdornii
Pavlovskaya E.P.*	Leading Engineer – Kazdornii
Solnczeva V.V.	Engineer – Kazdornii
Kurapova V.B.	Engineer – Kazdornii
Medvedeva T.V.	Engineer – Kazdornii
Roughness Survey	
Krasikov O. A.	Deputy Director - Kazdornii
Yousupov N.N. *	Chief of division - Kazdornii
Bagashov V.V.	Chief of division - Kazdornii
Cycenko N.A. *	Leading Expert - Kazdornii
Pak V.D. *	Leading Engineer – Kazdornii
Traffic counting	
Yousupov N.N. *	Chief of division - Kazdornii
Bagashov V.V.	Chief of division - Kazdornii
Cycenko N.A. *	Leading Expert - Kazdornii
Pak V.D. *	Leading Engineer – Kazdornii
Falling Weight Deflectometer	
Krasikov O. A.	Deputy Director – Kazdornii
Yousupov N.N. *	Chief of division – Kazdornii
Bagashov V.V.	Chief of division – Kazdornii
Cycenko N.A. *	Leading Expert - Kazdornii
Pak V.D. *	Leading Engineer – Kazdornii
Antonov A.V.	**ENGINEER – KAZDORNII**
Rovicz kaya G.B.	Leading Engineer – Kazdornii
Pavlovskaya E.P.*	Leading Engineer – Kazdornii
Medvedeva T.V.	Engineer – Kazdornii
G.N. Eremin *	Senior Specialist – Kazavtodor
PMS Input & Feasibility Studies	
Krasikov O. A.	Deputy Director – Kazdornii
Yousupov N.N. *	Chief of division – Kazdornii
Bagashov V.V.	Chief of division – Kazdornii
Cycenko N.A.	Leading Expert - Kazdornii
Pak V.D.	Leading Engineer – Kazdornii
Antonov A.V.	**ENGINEER – KAZDORNII**
Rovicz kaya G.B.	Leading Engineer – Kazdornii

ATTENDANCE	ORGANISATION
Pavlovskaya E.P.*	Leading Engineer – Kazdornii
Medvedeva T.V.*	Engineer – Kazdornii
G.N. Eremin *	Senior Specialist – Kazavtodor
Zabarka A.L.	Deputy director- Kazavtodor
K.N. Akhmetov	Investment board – Kazavtodor\ Astana
Prof. Ratzen. Z. E	Director - Kazdornii
Bridge Inspection	
Krasikov O. A.	Deputy Director – Kazdornii
Yousupov N.N. *	Chief of division – Kazdornii
Bagashov V. V *	Chief of division – Kazdornii
Cycenko N.A. *	Leading Expert - Kazdornii
Pak V.D. *	Leading Engineer – Kazdornii
Antonov A.V.	**ENGINEER – KAZDORNII**
Rovicz kaya G.B.	Leading Engineer – Kazdornii
Pavlovskaya E.P.*	Leading Engineer – Kazdornii

KYRGYZSTAN

ATTENDANCE	ORGANISATION
Visual Inspection	
Kakinos Vassilly	Senior Engineer – Kyrgzdortransproject
Rukina Irena	Engineer – Kyrgzdortransproject
Visosky Sergie	Engineer – Kyrgzdortransproject
Shabdanov Iskender	Soft support – Kyrgzdortransproject
Traffic Counting	
Mambetaliev Mametbek *	Senior Engineer – Kyrgzdortransproject
Gainutdinov Erick *	Specilalist – Kyrgzdortransproject
Izebiev Askar *	Specialist – Kyrgzdortransproject
Mambetkaziev Azeov *	Engineer – Kyrgzdortransproject
Roughness Survey	
Lubenyk Sergie *	Head of Department – Kyrgzdortransproject
Safonov Aleksander *	Engineer – Kyrgzdortransproject

ATTENDANCE	ORGANISATION
Falling Weight Deflectometer	
Kakinos Vassilly *	Senior Engineer – Kyrgzdortransproject
Lubenik Sergie *	Head of Department – Kyrgzdortransproject
Visosky Sergie *	Engineer – Kyrgzdortransproject
Shabdanov Iskender	Soft support – Kyrgzdortransproject
Nuraleiv Nurland *	Engineer – Kyrgzdortransproject
Kadrali Kudaiov *	Specialist- Minstry of Transport
PMS Input & Feasibility Studies	
Kakinos Vassilly *	Senior Engineer – Kyrgzdortransproject
Rukina Irena *	Engineer – Kyrgzdortransproject
Yampulskaya Emilia *	Economist – Kyrgzdortransproject
Lubenyk Sergie *	Head of Department
Shabdanov Iskender *	Soft support
Jumashov Kutman	Leading Specialst Ministry of Transport
Bridge Inspection	
1- Lubenyk Sergie	Head of Department – Kyrgzdortransproject
2- Visosky Sergie	Engineer – Kyrgzdortransproject
3- Mambetkaziev Azeov	Engineer – Kyrgzdortransproject
4- Proninko Valintina	Head specialst – Kyrgzdortransproject
5- Didenko Natalia	Engineer – Kyrgzdortransproject
6- Darinko Elvera	Engineer – Kyrgzdortransproject
7- Safchenko Olga	Engineer – Kyrgzdortransproject
8- Shemkov Vladislav	Engineer- Kyrgzdortransproject

ANNEX 20

ARMENIA – FEASIBILITY STUDY OUTPUTS

ANNEX 20.1

Itinerary

ITINERARY – FEASIBILITY STUDY TRAINING
REPUBLIC OF ARMENIA

Tuesday 27 July	**Data Input /training in PMS system commences**	
Tuesday 3 August	**Feasibility Study Commences**	**JP/KK/KO**
Tuesday 3 August	**Introductions***	**JP/KK/KO/HP/NE**
	Visit Overview and Objectives*	
	Pavement Management Systems overview*	

Tuesday 3August and Wednesday 21 July

Workshops:-
Review of PMS input data
Objective: To reinforce the understanding of the elements of data input eg condition surveys ,traffic data and network description. Verify with beneficiary that data input is complete and best quality available.

System Parameters and Intervention Levels
Objective: To increase the quality of the input data through discussion and "hands on" approach with beneficiaries.

Maintenance standards
Objective: To ensure that beneficiaries understand the inter relationship between the standards defined and the budget constraints. Several iterations of process to be carried out jointly to achieve this.

Treatment methods and costs
Objective: to discuss and input appropriate data and to demonstrate the effects of change on constrained budget. Several iterations jointly carried out.

Thursday 4 August
Friday 5th August
Saturday 6 August

Workshops:-
Scheme Prioritisation using PMS
Objective: To take PMS input collected in project and process using PMS. Use Rosy reporting system to produce appropriate style of output and manipulate into acceptable format for external funding organisations. Extremely important objective –must be achievable by beneficiary

	independent of visiting specialists.(Note prioritisation must be by IRI reduction which is linked to VOC's which are primary factor in Eastern European roads. **Scheme design and Cost estimates** Objective: Progress from prioritised scheme assessment to basic principles of design and bill of quantities preparation (exact scope depends on current level of knowledge of beneficiary. Best approach probably is to review an existing design with beneficiary and offer improvements.	
Monday 9th August	**Presentation of Results to Senior Management *** Objective: to appraise senior management of the results of the workshops ie the production of feasibility study. Ideally this should be "around the desk" with the technical staff performing the PMS processing, reporting etc **Discussions*** Objective:- question and answer session anticipated to be led by senior management, ideally answered by technical beneficiary staff initially. (Specialists present to supplement answers if necessary) The issue of the future autonomous training programme can be agreed at this time which should concentrate on perceived weaknesses discovered during visit.	
Saturday 24 July	**Available for additional workshops (topics to be discussed and agreed with beneficiary)**	
Sunday 25 July	**Parkman/ Carl Bro Team leave Yerevan**	**JP/KO**

Items marked * are intended to include senior management of the beneficiaries

ANNEX 20.2

ARMENIA

Traffic Figures

Зарегистрированная транспортная нагрузка

AADT/ESA (8,16 t)

Авто колея	Обновлено	От пункта.	До пункта	Вид рег.	AADT	ESA	Примечание
No. дороги: M310010	**Класс: 1**	**Назв.: M3 Vanadzor - Tashir - Geor**		**Пикет:**	**127 km from Markara**		
0	07-28-1998	0	15.000	Автомобиль	414	0.04	
		0	15.000	Мини автобус/пикап	7	0.01	
		0	15.000	Большой автобус	31	19.68	
		0	15.000	Грузовик, 2-хосевый	11	2.27	
		0	15.000	Грузовик, 3-хосевый	11	5.85	
		0	15.000	Грузовик > 3 осей	5	2.28	
		0	15.000	Сельхоз.техника	15	0.00	
No. дороги: M310020	**Класс: 1**	**Назв.: M3 Vanadzor - Tashir - Geor**		**Пикет:**	**142 km from Markara**		
0	07-28-1998	0	10.800	Автомобиль	414	0.04	
		0	10.800	Мини автобус/пикап	7	0.01	
		0	10.800	Большой автобус	31	19.68	
		0	10.800	Грузовик, 2-хосевый	11	2.27	
		0	10.800	Грузовик, 3-хосевый	11	5.85	
		0	10.800	Грузовик > 3 осей	5	2.28	
		0	10.800	Сельхоз.техника	15	0.00	
No. дороги: M312010	**Класс: 1**	**Назв.: M3 Vanadzor - Tashir - Geor**		**Пикет:**	**158.5 km from Markara**		
0	07-28-1998	0	15.100	Автомобиль	414	0.04	
		0	15.100	Мини автобус/пикап	7	0.01	
		0	15.100	Большой автобус	31	19.68	
		0	15.100	Грузовик, 2-хосевый	11	2.27	
		0	15.100	Грузовик, 3-хосевый	11	5.85	
		0	15.100	Грузовик > 3 осей	5	2.28	
		0	15.100	Сельхоз.техника	15	0.00	
No. дороги: M313010	**Класс: 1**	**Назв.: M3 Vanadror - Tashir - Geor**		**Пикет:**	**173.6 km from Markara**		
0	07-28-1998	0	10.400	Автомобиль	414	0.04	
		0	10.400	Мини автобус/пикап	7	0.01	
		0	10.400	Большой автобус	31	19.68	
		0	10.400	Грузовик, 2-хосевый	11	2.27	
		0	10.400	Грузовик, 3-хосевый	11	5.85	
		0	10.400	Грузовик > 3 осей	5	2.28	
		0	10.400	Сельхоз.техника	15	0.00	

ANNEX 20.3

ARMENIA

Sample Product and Repair Costs

Материалы для дорожного покрытия

Дата 14 окт 1999

Один.пов.обр.10мм

Обновлено: 11 окт 1999

Цена за м2 при 10 м2

От	До	Цена
0	999 999	0,56

Грузонапряжённость ESA --- Срок службы

От	До	Год(а)/лет
0	50	5,00
50	1 000	4,00

Материал может использоваться для дорог, со следующими критериями

Класс дороги:
*

Район:
*

Грузонапряжённость:
0 --- 10 000 000 000 ESA

Ограничение скорости:
0 --- 999 км/ч

Используется для:
Асфальта

Сетка трещин (0 --- 15) % и остаточная несущая способность (0 --- 9 999) год(а)/лет

Укладка

Перед укладкой устранить следующие повреждения

Выбоины
Просадка
Образование колеи

Необходимо покрытие

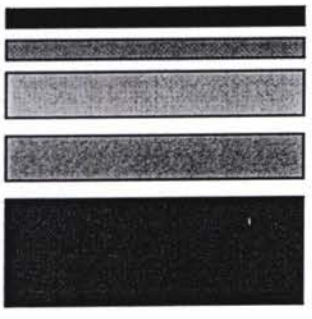
Последовательная укладка

Максимум 2 раз(а)

Или: *ПО*

Описание продукта

Верхний слой



Объёмный вес	18,00	**кг/м2/см**
Укрепление:	100,00	**%**
Е модуль	2 000,00	**МПа**

Толщина слоя
10 мм

Понижение IRI
5% от действ.знач. IRI,
мин. знач. 4,0

Материалы для укладки покрытия

Дата 14 окт 1999

Обновлено: 27 май 1999

Срочный ремонт выбоин

Цена за м2

От	До	Цена
0	999 999	10,00

Движение ESA --- Срок службы

От	До	Год/лет
0	999 999	1

Продукт может применяться для дорог, удовлетворяющих следующим критериям

Класс дороги:
*

Район:
*

Пропускная способность:
0 --- 10 000 000 000 ESA

Ограничение скорости:
0 --- 999 км/ч

Применяется для:
Асфальта

Описание материала

Материал может использоваться для указанных типов повреждений

Выбоины

М.з. а.б.тип Б .марка 2,БНД 40 safe

ANNEX 20.4

ARMENIA

Prioritised Benefit/Cost Scheme List

- Unconstrained Solution

District	Number	MainDetails.Name	From	To	acc. Length	Area	IRI	AADT	ESAy	Sum Of Investment	Pavement Products.Name	BC	BC / ESAy
001	M313010	M3 Vanadror - Tashir - Georgian	0	10400	10400	83200	8.50	494.00	30.50	332800	50 Overlay	22.49111	0.74
001	M310020	M3 Vanadzor - Tashir - Georgian	0	9625	20025	67375	7.27	494.00	30.12	336875	60 Overlay	15.57136	0.52
001	M310020	M3 Vanadzor - Tashir - Georgian	9625	10800	21200	8225	7.27	494.00	30.12	41125	60 Overlay	13.80029	0.46
001	M310010	M3 Vanadzor - Tashir - Georgian	0	15000	36200	108866	7.03	494.00	30.12	435462	50 Overlay	8.329779	0.28
001	M312010	M3 Vanadzor - Tashir - Georgian	0	15100	51300	120800	6.30	494.00	30.12	483200	50 Overlay	-6.858056	-0.23

ANNEX 20.5

ARMENIA

Prioritised Benefit/Cost Scheme List

- Forced Solution

District	Number	MainDetails.Name	From	To	Acc. Length	Area	IRI	AADT	ESAy	SumOfInvestment	PavementProducts.Name	BC	BC / ESAy
001	M313010	M3 Vanadror - Tashir - Georgian B S	0	10400	10400	83200	8.50	494.00	30.50	166400	SD	13.038	0.43
001	M310010	M3 Vanadzor - Tashir - Georgian B S	0	15000	25400	108866	7.03	494.00	30.12	217731	SD	2.83833	0.09
001	M310020	M3 Vanadzor - Tashir - Georgian B S	0	9625	35025	67375	7.27	494.00	30.12	134750	SD	1.44992	0.05
001	M310020	M3 Vanadzor - Tashir - Georgian B S	9625	10800	36200	8225	7.27	494.00	30.12	16450	SD	-4.80898	-0.16
001	M312010	M3 Vanadzor - Tashir - Georgian B S	0	15100	51300	120800	6.30	494.00	30.12	241600	SD	-10.3711	-0.34

ANNEX 20.6

ARMENIA

15 year Detailed Work Plans

(i) Optimum Solution
(ii) Forced Solution

20 -летний план технического обслуживания

Финансовый план **Дата** 7 авг 1998

Район: 001 Дорога №: M310010 Название: M3 Vanadzor - Tashir - Georgia Класс дороги: 1. Магистральн

Рядность: 0 Расположение, м: 0 - 15,000 Площадь, м2: 108 866 ВС: 19.3

Год	ESA	Начальные знач. Капитальные знач.	VOC	IRI	Долговечн. Визуальн./ реальн. (лет)	Усиливающий слой, мм	Повреждения, % Малые трещ.	Сетка трещ.	Выбоины	Просадка	Колея	Площадь с выбоинами
1998	30,1	0	388 637	7,0	3/30лет	0	2	9.4		1.3		1.1
1999	30,1	0	327 390	3,4	8/30лет	0						
							+++Cracks, Трещины			3 810 м2		30 482$
							+++Crazing, Сетка трещин			12 846 м2		102 769$
							+++Potholes, Выбоины			218 м2		2 177$
							+++Rutting, Образование колеи			54 м2		544$
							+++Settlement, Просадка			2 286 м2		34 293$
							50 Overlay			108 866 м2		435 462$
2000	31,6	0	345 760	3,6	7/29лет	0						
							Safety measure, Выбоины			218 м2		2 177$
2001	33,2	0	365 240	3,7	6/28лет	0						
							Safety measure, Выбоины			435 м2		4 355$
2002	34,9	0	385 904	3,8	5/27лет	0						
							Safety measure, Выбоины			653 м2		6 532$
2003	36,6	0	407 831	3,9	4/26лет	0						
							Safety measure, Выбоины			871 м2		8 709$
2004	38,4	0	431 107	4,1	3/25лет	0						
							Safety measure, Выбоины			1 089 м2		10 887$
2005	40,4	0	455 833	4,2	2/24лет	0						
							Safety measure, Выбоины			1 960 м2		19 596$
2006	42,4	0	482 101	4,4	1/23лет	0						
							Safety measure, Выбоины			2 831 м2		28 305$
2007	44,5	0	483 705	3,4	8/30лет	0						
							+++Cracks, Трещины			3 810 м2		30 482$
							+++Crazing, Сетка трещин			4 137 м2		33 095$
							+++Potholes, Выбоины			3 701 м2		37 014$
							+++Rutting, Образование колеи			2 068 м2		20 684$
							+++Settlement, Просадка			1 415 м2		21 229$
							50 Overlay			108 866 м2		435 462$
2008	46,7	0	510 848	3,6	7/29лет	0						
							Safety measure, Выбоины			218 м2		2 177$
2009	49,1	0	539 630	3,7	6/28лет	0						
							Safety measure, Выбоины			435 м2		4 355$
2010	51,5	0	570 162	3,8	5/27лет	0						
							Safety measure, Выбоины			653 м2		6 532$
2011	53,1	0	591 083	3,9	4/26лет	0						
							Safety measure, Выбоины			871 м2		8 709$
2012	54,7	0	612 920	4,1	3/25лет	0						
							Safety measure, Выбоины			1 089 м2		10 887$
2013	56,3	0	635 733	4,2	2/24лет	0						
							Safety measure, Выбоины			1 960 м2		19 596$
2014	58,0	0	659 565	4,4	1/23лет	0						
							Safety measure, Выбоины			2 831 м2		28 305$
2015	59,7	0	649 135	3,4	8/30лет	0						
							+++Cracks, Трещины			3 810 м2		30 482$
							+++Crazing, Сетка трещин			4 137 м2		33 095$

20 -летний план технического обслуживания

Финансовый план **Дата** 7 авг 1998

Район: 001 Дорога №: M310010 Название: M3 Vanadzor - Tashir - Georgia Класс дороги: 1. Магистральн

Рядность: 0 Расположение, м: 0 - 15,000 Площадь, м2: 108 866 ВС: 19.3

							+++Potholes, Выбоины	3 701	м2	37 014$
							+++Rutting, Образование колеи	2 068	м2	20 684$
							+++Settlement, Просадка	1 415	м2	21 229$
							50 Overlay	108 866	м2	435 462$
2016	61,5	0	672 505	3,6	7/29лет	0				
							Safety measure, Выбоины	218	м2	2 177$
2017	63,4	0	696 866	3,7	6/28лет	0				
							Safety measure, Выбоины	435	м2	4 355$

Действительные значения

VOC		Инвестиции		Прирост капитала		Общая стоимость	Общий размер капиталовложений
4 229 976$	+	902,831 $	-	0 $	=	5132,807 $	976 .260$

✓

20 -летний план технического обслуживания

Финансовый план **Дата** 7 авг 1998

Район: 001 Дорога №: M310020 Название: M3 Vanadzor - Tashir - Georgia Класс дороги: 1. Магистральн

Рядность: 0 Расположение, м: 0 - 9,625 Площадь, м2: 67 375 ВС: 24.3

Год	ESA	Капитальные знач.	VOC	IRI	Долговечн. Визуальн./ реальн. (лет)	Усиливающий слой, мм	Повреждения, % Малые трещ.	Сетка трещ.	Выбоины	Просадка	Колея	Площадь с выбоинами
Начальные знач.												
1998	30,1	0	252 285	7,2	4/30лет	0	16	1.0	0.2	1.3		1.9
1998	30,1	0	208 135	3,2	8/30лет	0						
							+++Crazing, Сетка трещин				674 м2	5 390$
							+++Potholes, Выбоины				135 м2	1 347$
							+++Settlement, Просадка				876 м2	13 138$
							60 Overlay				67 375 м2	336 875$
1999	30,1	0	209 275	3,3	7/29лет	0						
							Safety measure, Выбоины				135 м2	1 347$
2000	31,6	0	220 987	3,5	6/28лет	0						
							Safety measure, Выбоины				269 м2	2 695$
2001	33,2	0	233 403	3,6	5/27лет	0						
							Safety measure, Выбоины				404 м2	4 042$
2002	34,9	0	246 570	3,7	4/26лет	0						
							Safety measure, Выбоины				539 м2	5 390$
2003	36,6	0	260 540	3,9	3/25лет	0						
							Safety measure, Выбоины				674 м2	6 738$
2004	38,4	0	275 369	4,0	2/24лет	0						
							Safety measure, Выбоины				1 213 м2	12 128$
2005	40,4	0	291 114	4,1	1/23лет	0						
							Safety measure, Выбоины				1 752 м2	17 518$
2006	42,4	0	295 597	3,4	8/30лет	0						
							+++Cracks, Трещины				2 358 м2	18 865$
							+++Crazing, Сетка трещин				2 560 м2	20 482$
							+++Potholes, Выбоины				2 291 м2	22 908$
							+++Rutting, Образование колеи				1 280 м2	12 801$
							+++Settlement, Просадка				876 м2	13 138$
							50 Overlay				67 375 м2	269 500$
2007	44,5	0	312 184	3,6	7/29лет	0						
							Safety measure, Выбоины				135 м2	1 347$
2008	46,7	0	329 774	3,7	6/28лет	0						
							Safety measure, Выбоины				269 м2	2 695$
2009	49,1	0	348 432	3,8	5/27лет	0						
							Safety measure, Выбоины				404 м2	4 042$
2010	51,5	0	368 231	3,9	4/26лет	0						
							Safety measure, Выбоины				539 м2	5 390$
2011	53,1	0	381 834	4,1	3/25лет	0						
							Safety measure, Выбоины				674 м2	6 738$
2012	54,7	0	396 046	4,2	2/24лет	0						
							Safety measure, Выбоины				1 213 м2	12 128$
2013	56,3	0	410 892	4,4	1/23лет	0						
							Safety measure, Выбоины				1 752 м2	17 518$
2014	58,0	0	404 397	3,4	8/30лет	0						
							+++Cracks, Трещины				2 358 м2	18 865$
							+++Crazing, Сетка трещин				2 560 м2	20 482$
							+++Potholes, Выбоины				2 291 м2	22 908$
							+++Rutting, Образование колеи				1 280 м2	12 801$

ANNEX 20.7

ARMENIA

Net Present Value and Internal Rate of Return

Traceca									
				15 years cashflow					
Financial plan									
District	Road No.:	Name:				Lane	Chainage:	Area in m²	
001	M310010	M3 Vanadzor - Tashir - Georgian B S				0	0 - 15.000	108,866	
Years	VOC - Do Nothing:		VOC - Optimum:			Investment	Cashflow		
1999		393,368		327,390		605,727	-539,748		
2000		418,247		345,760		2,177	70,310		
2001		444,901		365,240		4,355	75,306		
2002		473,474		385,904		6,532	81,038		
2003		504,124		407,831		8,709	87,584		
2004		537,025		431,107		10,887	95,031		
2005		572,367		455,833		19,596	96,938		
2006		610,357		482,101		28,305	99,952		
2007		651,224		483,705		577,966	-410,446		
2008		695,218		510,848		2,177	182,194		
2009		742,615		539,630		4,355	198,629		
2010		793,715		570,162		6,532	217,022		
2011		832,683		591,083		8,709	232,891	**IRR**	**13%**
2012		886,015		612,920		10,887	262,208	**NPV**	**$ 121,116**
2013		930,660		635,733		19,596	275,331	**NPV/COST**	**13%**
Interest rate	**10%**			Discounted INV in period:		**898,823**			

District	Road No.:	Name:				Lane	Chainage:	Area in m²	
001	M310020	M3 Vanadzor - Tashir - Georgian B S				0	0 - 9.625	67,375	
Years	VOC - Do Nothing:		VOC - Optimum:			Investment	Cashflow		
1999		255,463		208,135		369,215	-321,888		
2000		271,736		219,739		1,347	50,651		
2001		289,182		232,036		2,695	54,451		
2002		307,895		245,073		4,042	58,780		
2003		327,981		258,899		5,390	63,692		
2004		349,557		273,567		6,738	69,251		
2005		372,748		289,138		12,128	71,481		
2006		397,694		305,671		17,518	74,506		
2007		424,548		310,377		357,694	-243,523		
2008		453,477		327,794		1,347	124,336		
2009		484,665		346,263		2,695	135,707		
2010		518,316		365,854		4,042	148,420		
2011		544,086		379,279		5,390	159,417	**IRR**	**17%**
2012		579,262		393,291		6,738	179,234	**NPV**	**$ 158,449**
2013		608,829		407,929		12,128	188,772	**NPV/COST**	**29%**
Interest rate	**10%**			Discounted INV in period:		**550,606**			

District	Road No.:	Name:				Lane	Chainage:	Area in m²	
001	M310020	M3 Vanadzor - Tashir - Georgian B S				0	9.625 - 10.80	8,225	
Years	VOC - Do Nothing:		VOC - Optimum:			Investment	Cashflow		
1999		31,186		25,409		47,161	-41,384		
2000		33,173		26,825		164	6,184		
2001		35,302		28,326		329	6,647		
2002		37,586		29,918		493	7,175		
2003		40,038		31,606		658	7,774		
2004		42,672		33,396		822	8,453		
2005		45,503		35,297		1,480	8,725		
2006		48,548		37,316		2,139	9,093		
2007		51,826		37,890		43,667	-29,732		
2008		55,357		40,016		164	15,176		
2009		59,164		42,271		329	16,564		
2010		63,271		44,663		493	18,115		
2011		66,416		46,302		658	19,457	**IRR**	**16%**
2012		70,710		48,012		822	21,876	**NPV**	**$ 17,434**
2013		74,319		49,799		1,480	23,040	**NPV/COST**	**25%**
Interest rate	**10%**			Discounted INV in period:		**69,306**			

District	Road No.:	Name:				Lane	Chainage:	Area in m²	
001	M312010	M3 Vanadzor - Tashir - Georgian B S				0	0 - 15.100	120,800	
Years	VOC - Do Nothing:		VOC - Optimum:			Investment	Cashflow		
1999		381,794		329,572		704,868	-652,646		
2000		405,407		348,065		2,416	54,925		
2001		430,656		367,675		4,832	58,149		
2002		457,670		388,476		7,248	61,946		
2003		486,591		410,549		9,664	66,378		
2004		517,573		433,981		12,080	71,513		
2005		550,785		458,871		21,744	70,169		
2006		586,409		485,315		31,408	69,687		
2007		624,648		486,930		641,327	-503,608		
2008		665,722		514,253		2,416	149,052		
2009		709,872		543,228		4,832	161,812		
2010		757,364		573,963		7,248	176,153		
2011		793,086		595,024		9,664	188,398	**IRR**	**5%**
2012		842,384		617,006		12,080	213,298	**NPV**	**-$ 191,352**
2013		883,124		639,971		21,744	221,409	**NPV/COST**	**-19%**
Interest rate	**10%**			Discounted INV in period:		**1,030,094**			

District	Road No.:	Name:				Lane	Chainage:	Area in m²	
001	M313010	M3 Vanadror - Tashir - Georgian B S				0	0 - 10.400	83,200	
Years	VOC - Do Nothing:		VOC - Optimum:			Investment	Cashflow		
1999		293,566		231,824		451,277	-389,535		
2000		312,950		245,023		1,664	66,263		
2001		333,791		259,036		3,328	71,427		
2002		356,216		273,920		4,992	77,304		
2003		380,362		289,735		6,656	83,971		
2004		406,381		306,546		8,320	91,515		
2005		434,440		324,429		14,976	95,035		
2006		464,723		343,456		21,632	99,635		
2007		497,431		335,369		441,709	-279,647		
2008		532,788		354,188		1,664	176,936		
2009		571,040		374,144		3,328	193,568		
2010		612,459		395,312		4,992	212,154		
2011		644,822		409,818		6,656	228,348	**IRR**	**20%**
2012		688,429		424,958		8,320	255,150	**NPV**	**S 289,194**
2013		725,812		440,775		14,976	270,061	**NPV/COST**	**43%**
Interest rate	**10%**			Discounted INV in period:		**675,273**			
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Traceca									
				15 years cashflow					
Financial plan									
								Date	
District	Road No.:	Name:				Lane	Chainage:	Area in m²	
001	M310010	M3 Vanadzor - Tashir - Georgian B S				0	0 - 15.000	108,866	
Years	VOC - Do Nothing:		VOC - Forced:			Investment	Cashflow		
1999		393,368		383,983		387,996	-378,611		
2000		418,247		407,894		2,177	8,177		
2001		444,901		433,474		4,355	7,072		
2002		473,474		460,854		6,532	6,087		
2003		504,124		397,945		457,453	-351,274		
2004		537,025		420,275		2,177	114,573		
2005		572,367		443,953		4,355	124,059		
2006		610,357		469,071		6,532	134,755		
2007		651,224		495,724		8,709	146,791		
2008		695,218		524,018		10,887	160,313		
2009		742,615		554,074		19,596	168,945		
2010		793,715		586,006		28,305	179,405		
2011		832,683		576,748		577,966	-322,030	**IRR**	**8%**
2012		886,015		597,510		2,177	286,328	**NPV**	**-$ 58,790**
2013		930,660		619,154		4,355	307,151	**NPV/COST**	**-7%**
Interest rate	**10%**			Discounted INV in period:		**811,803**			

District	Road No.:	Name:				Lane	Chainage:	Area in m²	
001	M310020	M3 Vanadzor - Tashir - Georgian B S				0	0 - 9.625	67,375	
Years	VOC - Do Nothing:		VOC - Forced:			Investment	Cashflow		
1999		255,463		249,161		301,840	-295,539		
2000		271,736		264,782		1,347	5,607		
2001		289,182		281,503		2,695	4,984		
2002		307,895		299,411		4,042	4,441		
2003		327,981		256,742		283,110	-211,871		
2004		349,557		271,203		1,347	77,007		
2005		372,748		286,543		2,695	83,510		
2006		397,694		302,820		4,042	90,833		
2007		424,548		320,098		5,390	99,060		
2008		453,477		338,447		6,738	108,292		
2009		484,665		357,945		12,128	114,592		
2010		518,316		378,668		17,518	122,130		
2011		544,086		370,080		357,694	-183,688	**IRR**	**8%**
2012		579,262		383,403		1,347	194,513	**NPV**	**-$ 49,269**
2013		608,829		397,291		2,695	208,843	**NPV/COST**	**-9%**
Interest rate	**10%**			Discounted INV in period:		**564,126**			

District	Road No.:	Name:				Lane	Chainage:	Area in m²	
001	M310020	M3 Vanadzor - Tashir - Georgian B S				0	9.625 - 10.80	8,225	
Years	VOC - Do Nothing:		VOC - Forced:			Investment	Cashflow		
1999		31,186		30,417		48,148	-47,379		
2000		33,173		32,324		164	685		
2001		35,302		34,365		329	608		
2002		37,586		36,551		493	542		
2003		40,038		31,342		34,562	-25,866		
2004		42,672		33,108		164	9,400		
2005		45,503		34,980		329	10,193		
2006		48,548		36,968		493	11,087		
2007		51,826		39,077		658	12,091		
2008		55,357		41,317		822	13,218		
2009		59,164		43,697		1,480	13,987		
2010		63,271		46,227		2,139	14,905		
2011		66,416		45,179		43,667	-22,429	**IRR**	**6%**
2012		70,710		46,805		164	23,741	**NPV**	**-$ 16,298**
2013		74,319		48,500		329	25,489	**NPV/COST**	**-20%**
Interest rate	**10%**			Discounted INV in period:		**80,168**			

District	Road No.:	Name:				Lane	Chainage:	Area in m²	
001	M312010	M3 Vanadzor - Tashir - Georgian B S				0	0 - 15.100	120,800	
Years	VOC - Do Nothing:		VOC - Forced:			Investment	Cashflow		
1999		381,794		373,630		463,268	-455,104		
2000		405,407		396,413		2,416	6,578		
2001		430,656		420,742		4,832	5,081		
2002		457,670		446,738		7,248	3,684		
2003		486,591		400,598		507,601	-421,607		
2004		517,573		423,076		2,416	92,081		
2005		550,785		446,913		4,832	99,040		
2006		586,409		472,198		7,248	106,964		
2007		624,648		499,029		9,664	115,955		
2008		665,722		527,512		12,080	126,130		
2009		709,872		557,768		21,744	130,360		
2010		757,364		589,912		31,408	136;043		
2011		793,086		580,593		641,327	-428,834	**IRR**	**0%**
2012		842,384		601,494		2,416	238,475	**NPV**	**-$ 324,576**
2013		883,124		623,282		4,832	255,010	**NPV/COST**	**-35%**
Interest rate	**10%**			Discounted INV in period:		**933,535**			

District	Road No.:	Name:				Lane	Chainage:	Area in m²	
001	M313010	M3 Vanadror - Tashir - Georgian B S				0	0 - 10.400	83,200	
Years	VOC - Do Nothing:		VOC - Forced:			Investment	Cashflow		
1999		293,566		285,128		284,877	-276,439		
2000		312,950		303,616		1,664	7,670		
2001		333,791		323,461		3,328	7,002		
2002		356,216		344,776		4,992	6,448		
2003		380,362		285,501		349,607	-254,746		
2004		406,381		301,902		1,664	102,815		
2005		434,440		319,329		3,328	111,783		
2006		464,723		337,853		4,992	121,878		
2007		497,431		357,551		6,656	133,223		
2008		532,788		378,509		8,320	145,959		
2009		571,040		400,822		14,976	155,242		
2010		612,459		424,582		21,632	166,245		
2011		644,822		399,879		441,709	-196,765	**IRR**	**13%**
2012		688,429		414,274		1,664	272,491	**NPV**	**$ 83,880**
2013		725,812		429,280		3,328	293,204	**NPV/COST**	**14%**
Interest rate	**10%**			Discounted INV in period:		**608,770**			
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ANNEX 21

KAZAKHSTAN – FEASIBILITY STUDY OUTPUTS

ANNEX 21.1

KAZAKHSTAN

Itinerary for Feasibility Study Training Session

PROPOSED ITINERARY
FOR PARKMAN/CARL BRO VISIT KAZAKSTAN. 17th TO 23rd OCTOBER

Sunday 17 October	**Parkman/Carl Bro Team arrive in Almaty**
Monday 18 October	**Introductions*** **Visit Overview and Objectives*** **Pavement Management Systems Overview***
Monday 18 and Tuesday 19 October	**Workshops: -** **Review of PMS input data** Objective: To reinforce the understanding of the elements of data input e.g. condition surveys, traffic data and network description. Verify with beneficiary that data input is complete and best quality available. **System Parameters and Intervention Levels** Objective: To increase the quality of the input data through discussion and "hands on" approach with beneficiaries. **Maintenance standards** Objective: To ensure that beneficiaries understand the inter relationship between the standards defined and the budget constraints. Several iterations of process to be carried out jointly to achieve this. **Treatment methods and costs** Objective: to discuss and input appropriate data and to demonstrate the effects of change on constrained budget. Several iterations jointly carried out.
Wednesday 20 October And Thursday 21 October	**Workshops: -** **Scheme Prioritisation using PMS** Objective: To take PMS input collected in project and process using PMS. Use Rosy reporting system to produce appropriate style of output and manipulate into acceptable format for external funding organisations. Extremely important objective –must be achievable by beneficiary independent of visiting specialists.

	Scheme design and Cost estimates Objective: Progress from prioritised scheme assessment to basic principles of design and bill of quantities preparation (exact scope depends on current level of knowledge of beneficiary. Best approach, probably is to review an existing design with beneficiary and offer improvements.
Friday 22 October	**Presentation of Results to Senior Management**** Objective: to appraise senior management of the results of the workshops i.e. the production of the technical and economic aspects of the feasibility study. Ideally this should be "around the desk" with the technical staff performing the PMS processing, reporting etc
	Discussions** Objective: - question and answer session anticipated to be led by senior management, ideally answered by technical beneficiary staff initially. (Specialists present to supplement answers if necessary) The issue of the future autonomous training programme can be agreed at this time, which should concentrate, on perceived weaknesses discovered during visit.
Saturday 23 October	**Parkman/ Carl Bro Team leaves Almaty**

Items marked * are only if required and depend on level of local knowledge.
Items marked ** are intended to include senior management of the beneficiaries

ANNEX 21.2

KAZAKHSTAN

Traffic Data

Зарегистрированная транспортная нагрузка

AADT/ESA (8,16 t)

Авто колея	Обновлено	От пункта.	До пункта	Вид рег.	AADT	ESA	Примечание
No. дороги: A35102010 Класс: 1 Назв.: A-35 Алматы-Кокпек 12,9к Инсет:							
0	10-18-1999	0	14.900	Автомобиль	4.396	0,44	
		0	14.900	Мини автобус/пикап	798	1,12	
		0	14.900	Большой автобус	813	894,06	
		0	14.900	Грузовик, 2-хосевый	1.335	257,66	
		0	14.900	Грузовик, 3-хосевый	637	119,69	
		0	14.900	Грузовик > 3 осей	221	223,54	
	09-01-1999	0	14.900	Мотоциклы	66	0,00	
		0	14.900	Тракторы	97	0,00	
No. дороги: A35102020 Класс: 1 Назв.: A-35 [illegible]							
0	10-18-1999	0	15.500	Автомобиль	4.396	0,44	
		0	15.500	Мини автобус/пикап	798	1,12	
		0	15.500	Большой автобус	813	894,06	
		0	15.500	Грузовик, 2-хосевый	1.335	257,66	
		0	15.500	Грузовик, 3-хосевый	637	119,69	
		0	15.500	Грузовик > 3 осей	221	223,54	
	09-01-1999	0	15.500	Мотоциклы	66	0,00	
		0	15.500	Тракторы	97	0,00	
No. дороги: A35102030 [illegible]							
0	09-01-1999	0	10.400	Автомобиль	4.396	0,44	
		0	10.400	Мини автобус/пикап	798	1,12	
		0	10.400	Большой автобус	813	894,06	
	10-18-1999	0	10.400	Грузовик, 2-хосевый	1.335	257,66	
		0	10.400	Грузовик, 3-хосевый	637	119,69	
		0	10.400	Грузовик > 3 осей	221	223,54	
	09-01-1999	0	10.400	Мотоциклы	66	0,00	
		0	10.400	Тракторы	97	0,00	
No. дороги: A35102040 [illegible]							
0	09-01-1999	0	11.500	Автомобиль	4.396	0,44	
	10-18-1999	0	11.500	Большой автобус	813	894,06	
	09-01-1999	0	11.500	Мини автобус/пикап	798	1,12	
	10-18-1999	0	11.500	Грузовик, 2-хосевый	1.335	257,66	
		0	11.500	Грузовик, 3-хосевый	637	119,69	
		0	11.500	Грузовик > 3 осей	221	223,54	
	09-01-1999	0	11.500	Мотоциклы	66	0,00	
		0	11.500	Тракторы	97	0,00	

ANNEX 21.3

KAZAKHSTAN

RoSy Base – Cost Schedule

Product and Treatment Costs

Defect	Unit	Price (US$)		Product	unit	Price (US$)
cracks <5mm	m2	2		30mm asphalt overlay	m2	17
cracks>5mm	m2	0.2		40mm asphalt overlay	m2	20
Alligator cracking	m2	30		50mm asphalt overlay	m2	24
edge deterioration	m	16		60mm asphalt overlay	m2	27
potholes	m2	30		60mm bound base	m2	22
settlement	m2	65		80mm bound base	m2	27
rutting	m2	20		surface dressing	m2	7.72
safety measures	m2	30		reconstruction	m2	65

ANNEX 21.4

KAZAKHSTAN

Prioritised Benefit Cost List (Optimal Solution)

Benefit Cost Prioritisation

District	Section No.	From (m)	To (m)	Length (m)	Accu. Length (m)	Area (m2)	IRI (m/km)	AADT	ESA (8,16)	SumOfInvestment (USD)	Accu. Investment (USD)	Treatment	BC	BCR
3	M3203030	0	13,000	13,000	13,000	91,000	6.10	4,727	388	2,482,610	2,482,610	60 mm Overlay	921	2.371
3	A35102010	0	14,900	14,900	27,900	242,260	5.04	8,363	1,497	2,016,874	4,499,484	Surface Dressing	2,316	1.547
3	A35102030	0	10,400	10,400	38,300	133,085	4.79	8,363	1,497	3,596,610	8,096,094	60 mm Overlay	2,281	1.524
3	M3203020	6,000	15,000	9,000	47,300	63,000	5.25	4,727	388	1,856,835	9,952,929	60 mm Overlay	590	1.519
3	M3203020	0	6,000	6,000	53,300	42,000	5.25	4,727	388	1,237,890	11,190,819	60 mm Overlay	559	1.439
3	A35103010	0	13,900	13,900	67,200	168,906	4.71	8,363	1,497	4,560,462	15,751,281	60 mm Overlay	1,676	1.120
3	A35102040	500	11,500	11,000	78,200	157,919	4.61	8,363	1,497	4,263,813	20,015,094	60 mm Overlay	1,584	1.058
3	M3203040	0	10,000	10,000	88,200	92,186	5.53	4,727	388	2,995,939	23,011,033	60 mm Overlay	353	0.909
3	A35102040	0	500	500	88,700	7,500	4.61	8,363	1,497	202,500	23,213,533	60 mm Overlay	1,290	0.862
3	A35102020	0	15,500	15,500	104,200	210,453	4.38	8,363	1,497	5,689,671	28,903,204	60 mm Overlay	1,175	0.785
3	M3908040	0	9,000	9,000	113,200	81,000	6.20	3,362	674	2,505,832	31,409,036	30 mm Overlay + 38 mm Bound Base	485	0.721
3	M3203040	10,000	12,000	2,000	115,200	16,000	5.53	4,727	388	735,379	32,144,415	40 mm Overlay + 76 mm Bound Base	262	0.674
3	M3203010	6,000	15,000	9,000	124,200	63,000	5.14	4,727	388	2,236,230	34,380,645	60 mm Overlay	260	0.669
3	M3203010	2,000	6,000	4,000	128,200	34,192	5.14	4,727	388	1,213,386	35,594,031	60 mm Overlay	210	0.542
3	M3208030	7,000	9,000	2,000	130,200	16,000	5.59	1,670	246	129,440	35,723,471	Surface Dressing	111	0.453
3	M3907010	8,000	14,000	6,000	136,200	56,118	5.07	3,362	674	1,211,337	36,934,808	40 mm Overlay	305	0.453
3	M3207010	5,000	13,000	8,000	144,200	56,000	5.54	1,670	246	573,240	37,508,048	Surface Dressing	107	0.437
3	M3204030	0	10,000	10,000	154,200	70,000	4.88	4,727	388	3,217,284	40,725,332	40 mm Overlay + 76 mm Bound Base	162	0.417
3	M3207020	0	3,000	3,000	157,200	18,000	5.50	1,670	246	549,900	41,275,232	60 mm Overlay	91	0.368
3	M3204030	10,000	15,000	5,000	162,200	38,752	4.88	4,727	388	1,198,840	42,474,072	30 mm Overlay + 38 mm Bound Base	142	0.367
3	M3208030	12,000	14,000	2,000	164,200	16,000	5.59	1,670	246	129,440	42,603,512	Surface Dressing	84	0.343
3	A35103020	0	10,800	10,800	175,000	130,674	5.10	3,289	491	2,221,458	44,824,970	30 mm Overlay	158	0.322
3	M3207030	0	13,000	13,000	188,000	91,000	5.78	1,670	246	2,720,185	47,545,155	60 mm Overlay	79	0.319
3	M3207010	0	5,000	5,000	193,000	35,000	5.54	1,670	246	797,175	48,342,330	40 mm Overlay	78	0.317
3	M3207020	3,000	6,000	3,000	196,000	18,000	5.50	1,670	246	549,900	48,892,230	60 mm Overlay	71	0.287
3	M3208010	7,000	11,000	4,000	200,000	28,585	5.59	1,670	246	696,243	49,588,473	40 mm Overlay	64	0.259
3	M3907010	0	8,000	8,000	208,000	69,156	5.07	3,362	674	1,956,600	51,545,073	60 mm Overlay	173	0.257
3	M3210030	0	3,000	3,000	211,000	24,000	5.48	1,670	246	266,520	51,811,593	Surface Dressing	62	0.251
3	M3204020	0	15,000	15,000	226,000	112,351	4.69	4,727	388	3,475,713	55,287,306	30 mm Overlay + 38 mm Bound Base	94	0.242
3	M3207040	0	7,000	7,000	233,000	47,704	5.78	1,670	246	1,556,021	56,843,327	60 mm Overlay	57	0.233
3	M3208020	0	12,000	12,000	245,000	84,000	6.20	1,670	246	2,598,641	59,441,968	30 mm Overlay + 38 mm Bound Base	57	0.232
3	M3207020	6,000	13,000	7,000	252,000	48,631	5.50	1,670	246	1,483,025	60,924,993	60 mm Overlay	55	0.225
3	M3207040	7,000	12,000	5,000	257,000	35,000	5.78	1,670	246	1,141,400	62,066,393	60 mm Overlay	50	0.205
3	M3210040	0	5,000	5,000	262,000	35,000	5.39	1,670	246	719,700	62,786,093	30 mm Overlay	46	0.186
3	M3208030	0	7,000	7,000	269,000	56,000	5.59	1,670	246	1,517,040	64,303,133	60 mm Overlay	44	0.178
3	M3209010	1,000	5,000	4,000	273,000	32,000	5.26	1,670	246	356,320	64,659,453	Surface Dressing	40	0.161
3	M3210040	5,000	12,000	7,000	280,000	49,000	5.39	1,670	246	1,350,580	66,010,033	50 mm Overlay	31	0.127
3	M3214010	0	16,000	16,000	296,000	113,286	5.31	1,670	246	3,144,907	69,154,940	50 mm Overlay	21	0.083
3	M3214030	0	9,000	9,000	305,000	63,000	5.17	1,670	246	1,868,355	71,023,295	60 mm Overlay	20	0.080
3	M3909010	0	12,000	12,000	317,000	96,000	5.26	3,362	674	4,603,204	75,626,499	50 mm Overlay + 70 mm Bound Base	46	0.068

Benefit Cost Prioritisation

District	Section No.	From (m)	To (m)	Length (m)	Accu. Length (m)	Area (m2)	IRI (m/km)	AADT	ESA (8,16)	SumOfInvestment (USD)	Accu. Investment (USD)	Treatment	BC	BCR
3	M3907020	0	17,000	17,000	334,000	153,000	4.69	3,362	674	4,968,250	80,594,749	60 mm Overlay	39	0.058
3	A35104030	0	11,800	11,800	345,800	108,414	4.45	2,872	467	2,944,524	83,539,273	60 mm Overlay	10	0.022
3	M3209020	0	6,000	6,000	351,800	48,000	5.03	1,670	246	524,880	84,064,153	Surface Dressing	2	0.007
3	M3209010	5,000	14,000	9,000	360,800	72,000	5.26	1,670	246	1,953,720	86,017,873	50 mm Overlay	0	-0.001
3	M3214020	0	10,000	10,000	370,800	70,000	4.95	1,670	246	2,071,150	88,089,023	60 mm Overlay	-1	-0.002
3	M3908030	0	9,000	9,000	379,800	81,000	4.95	3,362	674	2,505,832	90,594,855	30 mm Overlay + 38 mm Bound Base	-9	-0.014
3	M3208040	3,000	12,000	9,000	388,800	72,000	4.88	1,670	246	792,360	91,387,215	Surface Dressing	-4	-0.017
3	M3214040	0	15,000	15,000	403,800	105,000	4.96	1,670	246	3,106,725	94,493,940	60 mm Overlay	-5	-0.019
3	M3909030	0	11,000	11,000	414,800	94,170	4.89	3,362	674	2,913,262	97,407,202	30 mm Overlay + 38 mm Bound Base	-19	-0.029
3	M3909020	0	15,000	15,000	429,800	128,928	4.86	3,362	674	4,480,111	101,887,313	40 mm Overlay + 40 mm Bound Base	-22	-0.033
3	M3209040	6,000	11,000	5,000	434,800	40,000	5.00	1,670	246	927,800	102,815,113	40 mm Overlay	-12	-0.051
3	M3908020	0	18,000	18,000	452,800	180,000	5.17	3,362	674	6,560,307	109,375,420	40 mm Overlay + 44 mm Bound Base	-34	-0.051
3	A35104020	0	14,900	14,900	467,700	132,616	4.54	2,872	467	2,729,900	112,105,320	40 mm Overlay	-30	-0.064
3	M3204010	0	15,000	15,000	482,700	113,142	4.28	4,727	388	4,123,591	116,228,911	40 mm Overlay + 44 mm Bound Base	-26	-0.068
3	M3208040	0	3,000	3,000	485,700	24,000	4.88	1,670	246	552,120	116,781,031	40 mm Overlay	-23	-0.094
3	M3908010	5,000	10,000	5,000	490,700	45,680	4.73	3,362	674	1,379,882	118,160,913	60 mm Overlay	-68	-0.101
3	A35104010	0	5,000	5,000	495,700	57,885	4.38	3,289	491	1,197,862	119,358,775	40 mm Overlay	-50	-0.102
3	M3908010	0	5,000	5,000	500,700	41,738	4.73	3,362	674	1,450,351	120,809,126	40 mm Overlay + 40 mm Bound Base	-87	-0.129
3	M3208010	0	7,000	7,000	507,700	53,150	5.59	1,670	246	1,937,113	122,746,239	40 mm Overlay + 44 mm Bound Base	-38	-0.154
3	A35104010	5,000	18,400	13,400	521,100	146,340	4.38	3,289	491	3,028,459	125,774,698	40 mm Overlay	-77	-0.157
3	M3907030	0	11,000	11,000	532,100	99,000	4.70	3,362	674	3,608,169	129,382,867	40 mm Overlay + 44 mm Bound Base	-125	-0.185
3	M3210020	0	12,000	12,000	544,100	84,000	5.05	1,670	246	2,598,641	131,981,508	30 mm Overlay + 38 mm Bound Base	-56	-0.227
3	M3209010	0	1,000	1,000	545,100	8,000	5.26	1,670	246	247,490	132,228,998	30 mm Overlay + 38 mm Bound Base	-59	-0.238
3	A35104040	0	15,000	15,000	560,100	134,831	4.67	2,872	467	4,171,159	136,400,157	30 mm Overlay + 38 mm Bound Base	-114	-0.244
3	M3209030	0	10,000	10,000	570,100	70,000	5.11	1,670	246	2,551,231	138,951,388	40 mm Overlay + 44 mm Bound Base	-65	-0.263
3	M3908010	10,000	18,000	8,000	578,100	72,000	4.73	3,362	674	3,452,403	142,403,791	50 mm Overlay + 70 mm Bound Base	-186	-0.276
3	M3208030	9,000	12,000	3,000	581,100	24,000	5.59	1,670	246	1,073,638	143,477,429	40 mm Overlay + 73 mm Bound Base	-69	-0.281
3	M3210030	3,000	11,000	8,000	589,100	64,000	5.48	1,670	246	2,863,036	146,340,465	40 mm Overlay + 73 mm Bound Base	-70	-0.284
3	A35103030	8,000	16,800	8,800	597,900	94,775	4.05	3,289	491	1,895,500	148,235,965	40 mm Overlay	-150	-0.306
3	M3209020	6,000	15,000	9,000	606,900	72,000	5.03	1,670	246	2,227,406	150,463,371	30 mm Overlay + 38 mm Bound Base	-77	-0.313
3	A35103030	0	2,000	2,000	608,900	22,000	4.05	3,289	491	440,000	150,903,371	40 mm Overlay	-155	-0.315
3	M3203010	0	2,000	2,000	610,900	32,000	5.14	4,727	388	871,680	151,775,051	30 mm Overlay	-125	-0.322
3	M3209040	0	6,000	6,000	616,900	48,000	5.00	1,670	246	1,484,938	153,259,989	30 mm Overlay + 38 mm Bound Base	-79	-0.322
3	A35103030	2,000	8,000	6,000	622,900	65,560	4.05	3,289	491	524,480	153,784,469	Surface Dressing	-163	-0.332
3	M3918010	0	10,000	10,000	632,900	100,656	4.04	3,314	798	1,859,117	155,643,586	30 mm Overlay	-313	-0.392
3	M3918020	0	8,000	8,000	640,900	69,578	3.96	3,314	798	1,232,867	156,876,453	30 mm Overlay	-320	-0.401
3	M3210010	0	15,000	15,000	655,900	120,000	4.92	1,670	246	5,368,192	162,244,645	40 mm Overlay + 73 mm Bound Base	-102	-0.414

ANNEX 21.5

KAZAKHSTAN

15 year Detailed Work Plans – Optimal Solution

15 -летний план технического обслуживания

Финансовый план **Дата** 7 дек 1999

Секция: A-S102010 Название: A-351 Алматы-Коктал(12-9км)

Рядность: 0 Расположение, м: 0 - 14 900 Площадь, м2: 242 260 ВС: 2,670.4

Начальные знач. Год	ESA	Капиталь-ные знач.	VO	IRI	Долговечн. Визуальн./ реальн. (лет)	Усиливающий слой, мм	Повреждения, % Малые трещ.	Сетка треш.	Выбоины	Просадка	Колея	Площадь с выбоинами
1999	1496,5	14 507 210	10 775 019	5,2	7/16лет	0	0			0,5		8,1
2000	1511,5	14 308 330	10 491 094	4,4	4/15лет	0						
									+++2. Битум,маст., Трещины	745	м	149$
									+++4. А/б м/з, Кромочность	75	м	1 192$
									+++5. А/б м/з, Выбоины	242	м2	7 268$
									+++6. А/б м/з, Просадка	2 423	м2	157 469$
									+++7. А/б м/з, Колея	1 211	м2	24 226$
									ШПО	242 260	м2	1 938 080$
2004	1575,5	14 308 330	11 014 968	4,4	4/11лет	2						
									ШПО	242 260	м2	1 938 080$
2008	1646,0	14 534 713	11 035 465	3,3	12/16лет	0						
									60 а/б м/з	242 260	м2	6 541 020$

Действительные значения

VOC		Инвестиции		Прирост капитала		Общая стоимость	Общий размер капиталовложений
92 913 632$	+	4525 306 $	-	0 $	=	97438 938 $	5 912 322$

15 -летний план технического обслуживания

Финансовый план Дата 7 дек 1999

Рядность: 0 Расположение, м: 0 - 15 500 Площадь, м2: 210 453 ВС: 1,694.8

Год	Начальные знач. ESA	Капиталь-ные знач.	VO	IRI	Долговечн. Визуальн./ реальн. (лет)	Усиливающий слой, мм	Повреждения, % Малые трещ.	Сетка трещ.	Выбоины	Просадка	Колея	Площадь с выбоинами
1999	1496,5	12 133 194	10 821 046	4,5	8/5лет	30	1					3,6
2000	1511,5	12 001 043	11 040 062	4,7	7/4лет	41						
							1. Битум,маст., Трещины <5мм			4 209	м2	8 418$
							2. Битум,маст., Трещины >5мм			1 240	м	248$
							4. А/б м/з, Кромочность			775	м	12 400$
							5. А/б м/з, Выбоины			210	м2	6 314$
							6. А/б м/з, Просадка			421	м2	27 359$
2001	1526,9	12 626 409	10 509 067	3,3	12/16лет	0						
							60 а/б м/з			210 453	м2	5 682 231$
2009	1664,8	12 429 748	12 262 344	4,5	4/8лет	11						
							9.А/б м/з, Выбоины			210	м2	6 314$
2010	1684,0	12 231 266	12 525 709	4,7	3/7лет	16						
							9.А/б м/з, Выбоины			421	м2	12 627$
2011	1703,7	11 824 828	12 801 014	4,8	2/6лет	22						
							9.А/б м/з, Выбоины			842	м2	25 254$
2012	1723,9	12 626 409	12 114 757	3,3	12/16лет	0						
							+++4. А/б м/з, Кромочность			775	м	12 400$
							+++5. А/б м/з, Выбоины			1 473	м2	44 195$
							+++6. А/б м/з, Просадка			5 682	м2	369 345$
							60 а/б м/з			210 453	м2	5 682 231$

Действительные значения

VOC		Инвестиции		Прирост капитала		Общая стоимость	Общий размер капиталовложений
94 764 920$	+	5055 614 $	-	129 676 $	=	99690 858$	6 .530 .048$

15 -летний план технического обслуживания

Финансовый план Дата 7 дек 1999

[redacted] Трасса: A35102030 Название: A-351 Алматы-Коктал (43.3км - [redacted] Метод: опыт

Рядность: 0 Расположение, м: 0 - 10 400 Площадь, м2: 133 085 ВС: 2,280.9

Год	ESA	Начальные знач. Капитальные знач.	VO	IRI	Долговечн. Визуальн./ реальн. (лет)	Усиливающий слой, мм	Повреждения, % Малые трещ.	Сетка трещ.	Выбоины	Просадка	Колея	Площадь с выбоинами
1999	1496,5	6 616 428	7 421 991	5,0	8/2лет	70	0					1,6
1999	1496,5	7 984 581	6 884 907	3,3	12/16лет	0						
							+++4. А/б м/з, Кромочность			208	м	3 328$
							60 а/б м/з			133 085	м2	3 593 282$
2007	1627,7	7 860 219	8 014 417	4,5	4/8лет	7						
							9.А/б м/з, Выбоины			133	м2	3 993$
2008	1646,0	7 734 704	8 184 100	4,7	3/7лет	10						
							9.А/б м/з, Выбоины			266	м2	7 985$
2009	1664,8	7 477 685	8 361 479	4,8	2/6лет	15						
							9.А/б м/з, Выбоины			532	м2	15 970$
2010	1684,0	7 984 581	7 910 350	3,3	12/16лет	0						
							+++4. А/б м/з, Кромочность			520	м	8 320$
							+++5. А/б м/з, Выбоины			932	м2	27 948$
							+++6. А/б м/з, Просадка			3 593	м2	233 563$
							60 а/б м/з			133 085	м2	3 593 282$

Действительные значения

VOC		Инвестиции		Прирост капитала		Общая стоимость	Общий размер капиталовложений
63 093 088$	+	4059 349 $	-	359 379 $	=	66793 058 $	4 962 014$

[redacted] Трасса: A35102040 Название: A-351 Алматы-Коктал (43.3км - [redacted] Метод: опыт

Рядность: 0 Расположение, м: 0 - 500 Площадь, м2: 7 500 ВС: 2,436.1

Год	ESA	Начальные знач. Капитальные знач.	VO	IRI	Долговечн. Визуальн./ реальн. (лет)	Усиливающий слой, мм	Повреждения, % Малые трещ.	Сетка трещ.	Выбоины	Просадка	Колея	Площадь с выбоинами
1999	1496,5	442 984	353 428	4,8	9/7лет	40	0					1,3
2002	1542,7	427 686	376 536	5,4	6/4лет	71						
							4. А/б м/з, Кромочность			10	м	160$
							6. А/б м/з, Просадка			75	м2	4 875$
2003	1558,9	449 973	347 404	3,3	12/13лет	12						
							60 а/б м/з			7 500	м2	202 500$
2011	1703,7	442 964	406 331	4,5	4/5лет	57						
							9.А/б м/з, Выбоины			8	м2	225$
2012	1723,9	449 973	390 799	3,3	12/16лет	0						
							+++4. А/б м/з, Кромочность			10	м	160$
							+++5. А/б м/з, Выбоины			15	м2	450$
							+++6. А/б м/з, Просадка			75	м2	4 875$
							60 а/б м/з			7 500	м2	202 500$

Действительные значения

VOC		Инвестиции		Прирост капитала		Общая стоимость	Общий размер капиталовложений
3 091 665$	+	140 680 $	-	1 833 $	=	3230 512 $	202 411$

15 -летний план технического обслуживания

Финансовый план Дата 7 дек 1999

Работа: [illegible] A-351102040 - Название: A-351 Алматы-Коктал (км 55 - км [illegible]

Рядность: 0 Расположение, м: 500 - 11 500 Площадь, м2: 157 919 ВС: 1,583.7

Начальные знач. Год	ESA	Капитальные знач.	VO	IRI	Долговечн. Визуальн./ реальн. (лет)	Усиливающий слой, мм	Повреждения, % Малые трещ.	Сетка трещ.	Выбоины	Просадка	Колея	Площадь с выбоинами
1999	1496,5	7 851 101	7 775 415	4,8	9/2лет	70	0					1,3
1999	1496,5	9 474 562	7 282 113	3,3	12/16лет	0						
							60 а/б м/з			157 919	м2	4 263 813$
2007	1627,7	9 326 992	8 476 787	4,5	4/8лет	7						
							9.А/б м/з, Выбоины			158	м2	4 738$
2008	1646,0	9 178 055	8 656 260	4,7	3/7лет	10						
							9.А/б м/з, Выбоины			316	м2	9 475$
2009	1664,8	8 873 074	8 843 871	4,8	2/6лет	15						
							9.А/б м/з, Выбоины			632	м2	18 950$
2010	1684,0	9 474 562	8 366 717	3,3	12/16лет	0						
							+++4. А/б м/з, Кромочность			550	м	8 800$
							+++5. А/б м/з, Выбоины			1 105	м2	33 163$
							+++6. А/б м/з, Просадка			4 264	м2	277 148$
							60 а/б м/з			157 919	м2	4 263 813$

Действительные значения

VOC		Инвестиции		Прирост капитала		Общая стоимость	Общий размер капиталовложений
66 733 076$	+	4812 777 $	-	426 442 $	=	71119 411 $	5 .883 .635$

Работа: [illegible] 103010 - Название: A-351 Алматы-Коктал (км 55 - км [illegible]

Рядность: 0 Расположение, м: 0 - 13 900 Площадь, м2: 168 906 ВС: 4,059.0

Начальные знач. Год	ESA	Капитальные знач.	VO	IRI	Долговечн. Визуальн./ реальн. (лет)	Усиливающий слой, мм	Повреждения, % Малые трещ.	Сетка трещ.	Выбоины	Просадка	Колея	Площадь с выбоинами
1999	1496,5	10 114 566	9 874 268	4,9	7/16лет	0	3					1,7
2002	1542,7	10 022 357	10 528 732	5,5	4/13лет	1						
							1. Битум,маст., Трещины <5мм			13 512	м2	27 025$
							4. А/б м/з, Кромочность			278	м	4 448$
2003	1558,9	9 975 905	10 177 625	4,5	4/12лет	2						
							ШПО			168 906	м2	1 351 248$
2007	1627,7	10 133 741	10 161 062	3,3	12/16лет	0						
							60 а/б м/з			168 906	м2	4 560 462$

Действительные значения

VOC		Инвестиции		Прирост капитала		Общая стоимость	Общий размер капиталовложений
87 122 624$	+	2187 602 $	-	-5 212 $	=	89315 438 $	3 .074 .056$

15 -летний план технического обслуживания

Финансовый план **Дата** 7 дек 1999

[redacted] A3510302[redacted] Название: A-351 Алматы-Коктал (км 79[redacted] Категория: Магистральная

Рядность: 0 Расположение, м: 0 - 10 800 Площадь, м2: 130 674 ВС: 482.8

Год	Начальные знач. ESA	Капитальные знач.	VO	IRI	Долговечн. Визуальн./ реальн. (лет)	Усиливающий слой, мм	Повреждения, % Малые трещ.	Сетка трещ.	Выбоины	Просадка	Колея	Площадь с выбоинами
1999	490,7	7 762 211	2 892 490	5,2	11/8лет	40	0					0,8
2003	525,2	7 451 661	3 173 302	6,0	7/4лет	73						
									4. А/б м/з, Кромочность	324	м	5 184$
2004	534,3	7 839 961	2 829 655	3,3	12/15лет	12						
									60 а/б м/з	130 674	м2	3 528 198$
2012	616,4	7 717 851	3 351 057	4,4	4/7лет	45						
									9.А/б м/з, Выбоины	131	м2	3 920$
2013	627,8	7 594 609	3 428 328	4,6	3/6лет	53						
									9.А/б м/з, Выбоины	261	м2	7 840$

Действительные значения

VOC		Инвестиции		Прирост капитала		Общая стоимость	Общий размер капиталовложений
25 431 808$	+	1832 353 $	-	-44 135 $	=	27308 296 $	2 .197 .475$

[redacted] A3510303[redacted] Название: A-351 Алматы-Коктал (км 90[redacted] Категория: Магистральная

Рядность: 0 Расположение, м: 0 - 2 000 Площадь, м2: 22 000 ВС: 10.6

Год	Начальные знач. ESA	Капитальные знач.	VO	IRI	Долговечн. Визуальн./ реальн. (лет)	Усиливающий слой, мм	Повреждения, % Малые трещ.	Сетка трещ.	Выбоины	Просадка	Колея	Площадь с выбоинами
1999	490,7	1 268 361	507 431	4,1	8/5лет	50	2					2,7
2000	499,0	1 236 758	517 959	4,2	7/4лет	61						
									9.А/б м/з, Выбоины	22	м2	660$
2001	507,5	1 183 876	528 913	4,4	6/3лет	75						
									9.А/б м/з, Выбоины	44	м2	1 320$
2002	516,2	1 093 752	540 318	4,5	5/2лет	92						
									9.А/б м/з, Выбоины	88	м2	2 640$
2003	525,2	937 200	552 196	4,7	4/1лет	113						
									9.А/б м/з, Выбоины	154	м2	4 620$
2004	534,3	660 000	564 601	4,9	3/0лет	139						
									9.А/б м/з, Выбоины	462	м2	13 860$
2005	543,7	1 319 995	521 354	2,9	16/30лет	0						
									Реконстр	22 000	м2	1 430 000$

Действительные значения

VOC		Инвестиции		Прирост капитала		Общая стоимость	Общий размер капиталовложений
4 547 100$	+	469 485 $	-	13 259 $	=	5003 326 $	822 .634$

ANNEX 21.6

KAZAKHSTAN

Prioritised Benefit Cost Scheme List

- Sensitivity Analysis

Benefit Cost list, -20% traffic (Kazakhstan)

Section No.	From (m)	To (m)	Length (m)	Accu. Length (m)	Area (m2)	IRI (m/km)	AADT	ESA (8,16)	Investment (USD)	Accu. Investment (USD)	Treatment	BC	BCR (BC/ESA)
M3203030	0	13.000	13.000	13.000	91.000	6,10	3.782	311	2.482.610	2.482.610	60 mm Overlay	522	1,680
M3203020	6.000	15.000	9.000	22.000	63.000	5,25	3.782	311	1.856.835	4.339.445	60 mm Overlay	319	1,028
A35102030	0	10.400	10.400	32.400	133.085	4,79	6.690	1.197	3.596.610	7.936.055	60 mm Overlay	1.193	0,997
A35102010	0	14.900	14.900	47.300	242.260	5,04	6.690	1.197	2.016.874	9.952.929	Surface Dressing	1.188	0,993
A35103010	0	13.900	13.900	61.200	168.906	4,71	6.690	1.197	1.351.248	11.304.177	Surface Dressing	1.187	0,992
M3203020	0	6.000	6.000	67.200	42.000	5,25	3.782	311	1.237.890	12.542.067	60 mm Overlay	295	0,948
A35102040	500	11.500	11.000	78.200	157.919	4,61	6.690	1.197	4.263.813	16.805.880	60 mm Overlay	765	0,639
M3203040	0	10.000	10.000	88.200	92.186	5,53	3.782	311	2.995.939	19.801.819	60 mm Overlay	163	0,524
A35102040	0	500	500	88.700	7.500	4,61	6.690	1.197	202.500	20.004.319	60 mm Overlay	580	0,484
A35102020	0	15.500	15.500	104.200	210.453	4,38	6.690	1.197	5.689.671	25.693.990	60 mm Overlay	513	0,429
M3908040	0	9.000	9.000	113.200	81.000	6,20	2.690	539	2.505.832	28.199.822	30 mm Overlay + 38 mm Bound Base	205	0,381
M3203040	10.000	12.000	2.000	115.200	16.000	5,53	3.782	311	725.666	28.925.488	40 mm Overlay + 75 mm Bound Base	111	0,357
M3203010	6.000	15.000	9.000	124.200	63.000	5,14	3.782	311	2.236.230	31.161.718	60 mm Overlay	107	0,344
M3208030	7.000	9.000	2.000	126.200	16.000	5,59	1.336	197	129.440	31.291.158	Surface Dressing	55	0,281
M3203010	2.000	6.000	4.000	130.200	34.192	5,14	3.782	311	1.213.386	32.504.544	60 mm Overlay	76	0,244
M3207010	5.000	13.000	8.000	138.200	56.000	5,54	1.336	197	573.240	33.077.784	Surface Dressing	46	0,231
M3907010	8.000	14.000	6.000	144.200	56.118	5,07	2.690	539	1.211.337	34.289.121	40 mm Overlay	107	0,198
M3204030	0	10.000	10.000	154.200	70.000	4,88	3.782	311	3.174.787	37.463.908	40 mm Overlay + 75 mm Bound Base	48	0,153
M3207020	0	3.000	3.000	157.200	18.000	5,50	1.336	197	549.900	38.013.808	60 mm Overlay	25	0,126
M3208030	12.000	14.000	2.000	159.200	16.000	5,59	1.336	197	129.440	38.143.248	Surface Dressing	25	0,126
M3204030	10.000	15.000	5.000	164.200	38.752	4,88	3.782	311	1.198.840	39.342.088	30 mm Overlay + 38 mm Bound Base	34	0,110
A35103020	0	10.800	10.800	175.000	130.674	5,10	2.631	393	2.221.458	41.563.546	30 mm Overlay	40	0,102
M3207010	0	5.000	5.000	180.000	35.000	5,54	1.336	197	797.175	42.360.721	40 mm Overlay	20	0,101
M3207030	0	13.000	13.000	193.000	91.000	5,78	1.336	197	2.720.185	45.080.906	60 mm Overlay	17	0,088
M3907010	0	8.000	8.000	201.000	69.156	5,07	2.690	539	1.285.787	46.366.693	30 mm Overlay	46	0,085
M3210030	0	3.000	3.000	204.000	24.000	5,48	1.336	197	266.520	46.633.213	Surface Dressing	15	0,077
M3208010	7.000	11.000	4.000	208.000	28.585	5,59	1.336	197	696.243	47.329.456	40 mm Overlay	10	0,051
M3207020	3.000	6.000	3.000	211.000	18.000	5,50	1.336	197	549.900	47.879.356	60 mm Overlay	9	0,045
M3207040	0	7.000	7.000	218.000	47.704	5,78	1.336	197	1.556.021	49.435.377	60 mm Overlay	3	0,015
M3208020	0	12.000	12.000	230.000	84.000	6,20	1.336	197	2.598.641	52.034.018	30 mm Overlay + 38 mm Bound Base	3	0,014
M3204020	0	15.000	15.000	245.000	112.351	4,69	3.782	311	3.475.713	55.509.731	30 mm Overlay + 38 mm Bound Base	4	0,012
M3207020	6.000	13.000	7.000	252.000	48.631	5,50	1.336	197	1.483.025	56.992.756	60 mm Overlay	2	0,012
M3210040	0	5.000	5.000	257.000	35.000	5,39	1.336	197	719.700	57.712.456	30 mm Overlay	1	0,003
M3207040	7.000	12.000	5.000	262.000	35.000	5,78	1.336	197	1.141.400	58.853.856	60 mm Overlay	-1	-0,008
M3209010	1.000	5.000	4.000	266.000	32.000	5,26	1.336	197	356.320	59.210.176	Surface Dressing	-2	-0,012
M3208030	0	7.000	7.000	273.000	56.000	5,59	1.336	197	1.517.040	60.727.216	60 mm Overlay	-3	-0,017
M3210040	5.000	12.000	7.000	280.000	49.000	5,39	1.336	197	1.350.580	62.077.796	50 mm Overlay	-12	-0,061
M3214010	0	16.000	16.000	296.000	113.286	5,31	1.336	197	3.144.907	65.222.703	50 mm Overlay	-19	-0,096
M3214030	0	9.000	9.000	305.000	63.000	5,17	1.336	197	1.868.355	67.091.058	60 mm Overlay	-20	-0,101
M3909010	0	12.000	12.000	317.000	96.000	5,26	2.690	539	4.539.618	71.630.676	50 mm Overlay + 69 mm Bound Base	-67	-0,125

Benefit Cost list, -20% traffic (Kazakhstan)

Section No.	From (m)	To (m)	Length (m)	Accu. Length (m)	Area (m2)	IRI (m/km)	AADT	ESA (8,16)	Investment (USD)	Accu. Investment (USD)	Treatment	BC	BCR (BC/ESA)
M3907020	0	17.000	17.000	334.000	153.000	4,69	2.690	539	4.968.250	76.598.926	60 mm Overlay	-70	-0,129
M3209020	0	6.000	6.000	340.000	48.000	5,03	1.336	197	524.880	77.123.806	Surface Dressing	-28	-0,143
M3208040	3.000	12.000	9.000	349.000	72.000	4,88	1.336	197	792.360	77.916.166	Surface Dressing	-30	-0,152
A35104030	0	11.800	11.800	360.800	108.414	4,45	2.298	374	2.944.524	80.860.690	60 mm Overlay	-59	-0,158
M3209010	5.000	14.000	9.000	369.800	72.000	5,26	1.336	197	1.953.720	82.814.410	50 mm Overlay	-32	-0,163
M3214020	0	10.000	10.000	379.800	70.000	4,95	1.336	197	2.071.150	84.885.560	60 mm Overlay	-33	-0,166
M3214040	0	15.000	15.000	394.800	105.000	4,96	1.336	197	2.871.525	87.757.085	50 mm Overlay	-35	-0,178
M3908030	0	9.000	9.000	403.800	81.000	4,95	2.690	539	2.505.832	90.262.917	30 mm Overlay + 38 mm Bound Base	-101	-0,188
M3209040	6.000	11.000	5.000	408.800	40.000	5,00	1.336	197	927.800	91.190.717	40 mm Overlay	-38	-0,194
M3909020	0	15.000	15.000	423.800	128.928	4,86	2.690	539	4.418.261	95.608.978	40 mm Overlay + 39 mm Bound Base	-105	-0,196
M3909030	0	11.000	11.000	434.800	94.170	4,89	2.690	539	2.913.262	98.522.240	30 mm Overlay + 38 mm Bound Base	-108	-0,200
M3908020	0	18.000	18.000	452.800	180.000	5,17	2.690	539	6.560.307	105.082.547	40 mm Overlay + 45 mm Bound Base	-120	-0,223
M3208040	0	3.000	3.000	455.800	24.000	4,88	1.336	197	552.120	105.634.667	40 mm Overlay	-45	-0,228
M3204010	0	15.000	15.000	470.800	113.142	4,28	3.782	311	4.123.591	109.758.258	40 mm Overlay + 45 mm Bound Base	-74	-0,238
A35104010	0	5.000	5.000	475.800	57.885	4,38	2.631	393	1.197.862	110.956.120	40 mm Overlay	-95	-0,242
A35104020	0	14.900	14.900	490.700	132.616	4,54	2.298	374	2.332.052	113.288.172	30 mm Overlay	-94	-0,251
M3908010	0	5.000	5.000	495.700	41.738	4,73	2.690	539	1.430.328	114.718.500	40 mm Overlay + 39 mm Bound Base	-146	-0,272
A35104010	5.000	18.400	13.400	509.100	146.340	4,38	2.631	393	2.589.438	117.307.938	30 mm Overlay	-116	-0,296
M3208010	0	7.000	7.000	516.100	53.150	5,59	1.336	197	1.937.113	119.245.051	40 mm Overlay + 45 mm Bound Base	-59	-0,302
M3908010	5.000	10.000	5.000	521.100	45.680	4,73	2.690	539	947.749	120.192.800	30 mm Overlay	-164	-0,305
M3907030	0	11.000	11.000	532.100	99.000	4,70	2.690	539	3.608.169	123.800.969	40 mm Overlay + 45 mm Bound Base	-176	-0,327
M3210020	0	12.000	12.000	544.100	84.000	5,05	1.336	197	2.598.641	126.399.610	30 mm Overlay + 38 mm Bound Base	-68	-0,348
M3209010	0	1.000	1.000	545.100	8.000	5,26	1.336	197	247.490	126.647.100	30 mm Overlay + 38 mm Bound Base	-72	-0,365
A35104040	0	15.000	15.000	560.100	134.831	4,67	2.298	374	4.171.159	130.818.259	30 mm Overlay + 38 mm Bound Base	-141	-0,378
M3209030	0	10.000	10.000	570.100	70.000	5,11	1.336	197	2.551.231	133.369.490	40 mm Overlay + 45 mm Bound Base	-76	-0,384
M3908010	10.000	18.000	8.000	578.100	72.000	4,73	2.690	539	3.404.714	136.774.204	50 mm Overlay + 69 mm Bound Base	-215	-0,398
A35103030	8.000	16.800	8.800	586.900	94.775	4,05	2.631	393	1.895.500	138.669.704	40 mm Overlay	-158	-0,401
M3208030	9.000	12.000	3.000	589.900	24.000	5,59	1.336	197	1.060.100	139.729.804	40 mm Overlay + 72 mm Bound Base	-79	-0,403
M3210030	3.000	11.000	8.000	597.900	64.000	5,48	1.336	197	2.826.934	142.556.738	40 mm Overlay + 72 mm Bound Base	-80	-0,405
A35103030	0	2.000	2.000	599.900	22.000	4,05	2.631	393	440.000	142.996.738	40 mm Overlay	-160	-0,409
M3209020	6.000	15.000	9.000	608.900	72.000	5,03	1.336	197	2.227.406	145.224.144	30 mm Overlay + 38 mm Bound Base	-84	-0,425
M3209040	0	6.000	6.000	614.900	48.000	5,00	1.336	197	1.484.938	146.709.082	30 mm Overlay + 38 mm Bound Base	-85	-0,433
M3203010	0	2.000	2.000	616.900	32.000	5,14	3.782	311	871.680	147.580.762	30 mm Overlay	-139	-0,447
A35103030	2.000	8.000	6.000	622.900	65.560	4,05	2.631	393	524.480	148.105.242	Surface Dressing	-184	-0,468
M3918010	0	10.000	10.000	632.900	100.656	4,04	2.651	638	1.859.117	149.964.359	30 mm Overlay	-306	-0,479
M3918020	0	8.000	8.000	640.900	69.578	3,96	2.651	638	1.232.867	151.197.226	30 mm Overlay	-310	-0,485
M3210010	0	15.000	15.000	655.900	120.000	4,92	1.336	197	5.300.501	156.497.727	40 mm Overlay + 72 mm Bound Base	-100	-0,511

ANNEX 21.7

KAZAKHSTAN

Calculation of Net Present Value (NPV)

and Internal Rate of Return (IRR)

Road No.:	Chainage:	Area in m²				
A35102010	**0 - 14.900**	**242 260**				
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	10 775 019	10 368 014	2 016 874	-1 609 869		
2000	11 010 030	10 570 141	0	439 889		
2001	11 256 926	10 780 854	0	476 072		
2002	11 516 575	11 000 639	0	515 936		
2003	11 789 921	10 879 108	1 938 080	-1 027 267		
2004	12 078 060	11 097 637	0	980 423		
2005	12 382 093	11 325 428	0	1 056 665		
2006	12 703 300	11 563 008	0	1 140 292		
2007	13 043 133	10 892 074	6 541 020	-4 389 961		
2008	13 576 988	11 098 520	0	2 478 468		
2009	13 963 066	11 313 148	0	2 649 918		
2010	14 373 101	11 536 401	0	2 836 700		
2011	14 809 299	11 768 758	0	3 040 541	IRR:	29%
2012	15 663 826	12 010 738	0	3 653 088	NPV:	$4 304 34
2013	16 170 141	12 262 934	0	3 907 207	NPV/COST:	0,8
Interest rate	10%	Discounted INV in period:	**5 120 613**			

Road No.:	Chainage:	Area in m²				
A35102020	**0 - 15.500**	**210 453**				
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	10 821 046	10 261 158	5 689 671	-5 129 783		
2000	11 039 486	10 443 199	0	596 287		
2001	11 268 117	10 632 481	0	635 636		
2002	11 507 620	10 829 397	0	678 223		
2003	11 758 781	11 034 365	0	724 416		
2004	12 022 608	11 247 841	0	774 767		
2005	12 300 029	11 470 350	0	829 679		
2006	12 592 206	11 702 392	0	889 814		
2007	13 069 155	11 944 563	6 314	1 118 278		
2008	13 749 768	12 197 457	12 627	1 539 684		
2009	14 103 108	12 461 819	25 254	1 616 035		
2010	14 476 643	11 789 464	6 108 171	-3 420 992		
2011	14 872 194	12 018 272	0	2 853 922	IRR:	14%
2012	15 291 148	12 256 138	0	3 035 010	NPV:	$1 441 64
2013	15 733 984	12 503 557	0	3 230 427	NPV/COST:	0,2
Interest rate	10%	Discounted INV in period:	**6 421 334**			

Road No.:	Chainage:	Area in m²				
A35102030	**0 - 10.400**	**133 085**				
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	7 421 991	6 884 907	3 596 610	-3 059 526		
2000	7 579 398	7 007 050	0	572 348		
2001	7 744 598	7 134 051	0	610 547		
2002	7 918 185	7 266 176	0	652 010		
2003	8 100 839	7 403 703	0	697 136		
2004	8 293 247	7 546 939	0	746 308		
2005	8 607 855	7 696 235	0	911 621		
2006	9 057 127	7 851 928	0	1 205 200		
2007	9 290 938	8 014 417	3 993	1 272 529		
2008	9 537 822	8 184 100	7 985	1 345 737		
2009	9 799 467	8 361 479	15 970	1 422 019		
2010	10 076 824	7 910 350	3 863 113	-1 696 639		
2011	10 370 221	8 063 873	0	2 306 349	IRR:	25%
2012	10 682 054	8 223 473	0	2 458 581	NPV:	$3 439 94
2013	11 013 986	8 389 482	0	2 624 504	NPV/COST:	0,8
Interest rate	10%	Discounted INV in period:	**4 059 349**			

Road No.:	Chainage:	Area in m²
A35102040	0 - 500	7 500

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	353 428	331 005	202 500	-180 077		
2000	360 766	336 877	0	23 889		
2001	368 457	342 983	0	25 474		
2002	376 526	349 335	0	27 191		
2003	384 998	355 947	0	29 051		
2004	393 904	362 834	0	31 070		
2005	403 276	370 011	0	33 265		
2006	413 154	377 497	0	35 657		
2007	423 580	385 309	225	38 046		
2008	440 262	393 466	450	46 346		
2009	463 840	401 994	900	60 946		
2010	476 620	380 305	217 637	-121 323		
2011	490 204	387 686	0	102 518	IRR:	16%
2012	504 591	395 359	0	109 231	NPV:	$66 095
2013	519 884	403 341	0	116 543	NPV/COST:	0,29
Interest rate	10%	Discounted INV in period:	**228 569**			

Road No.:	Chainage:	Area in m²
A35102040	500 - 11.500	157 919

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	7 775 415	7 282 113	4 263 813	-3 770 511		
2000	7 936 858	7 411 303	0	525 555		
2001	8 106 064	7 545 632	0	560 433		
2002	8 283 638	7 685 378	0	598 260		
2003	8 470 213	7 830 840	0	639 374		
2004	8 666 481	7 982 339	0	684 142		
2005	8 989 885	8 140 249	0	849 637		
2006	9 453 182	8 304 923	0	1 148 259		
2007	9 691 502	8 476 787	4 738	1 209 977		
2008	9 943 857	8 656 260	9 475	1 278 122		
2009	10 209 434	8 843 871	18 950	1 346 613		
2010	10 490 552	8 366 717	4 582 924	-2 459 089		
2011	10 787 496	8 529 096	0	2 258 400	IRR:	18%
2012	11 102 619	8 697 905	0	2 404 714	NPV:	$2 186 718
2013	11 437 523	8 873 492	0	2 564 031	NPV/COST:	0,45
Interest rate	10%	Discounted INV in period:	**4 812 777**			

Road No.:	Chainage:	Area in m²
A35103010	0 - 13.900	168 906

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	9 874 268	9 201 942	4 560 462	-3 888 136		
2000	10 081 473	9 365 191	0	716 282		
2001	10 298 785	9 534 934	0	763 851		
2002	10 526 875	9 711 523	0	815 352		
2003	10 766 510	9 895 333	0	871 177		
2004	11 018 580	10 086 773	0	931 807		
2005	11 283 972	10 286 313	0	997 659		
2006	11 563 762	10 494 402	0	1 069 360		
2007	11 859 027	10 711 576	5 067	1 142 384		
2008	12 171 065	10 938 365	10 134	1 222 566		
2009	12 501 208	11 175 437	20 269	1 305 502		
2010	12 851 145	10 572 487	4 903 482	-2 624 824		
2011	13 222 273	10 777 676	0	2 444 597	IRR:	21%
2012	13 616 648	10 990 988	0	2 625 660	NPV:	$2 961 184
2013	14 215 369	11 212 867	0	3 002 502	NPV/COST:	0,5
Interest rate	10%	Discounted INV in period:	**5 147 819**			

Road No.:	Chainage:	Area in m²				
M3203010	**2.000 - 6.000**	**34 192**				
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	1 238 712	1 118 916	1 213 386	-1 093 590		
2000	1 263 677	1 137 391	0	126 286		
2001	1 289 772	1 156 580	0	133 192		
2002	1 317 071	1 176 519	0	140 552		
2003	1 345 712	1 197 243	0	148 469		
2004	1 375 765	1 218 793	0	156 972		
2005	1 407 352	1 241 214	0	166 137		
2006	1 462 351	1 264 548	0	197 802		
2007	1 542 763	1 288 845	1 026	252 891		
2008	1 580 197	1 314 153	2 052	263 992		
2009	1 619 516	1 340 534	4 103	274 879		
2010	1 660 844	1 255 629	993 571	-588 356		
2011	1 704 320	1 278 229	0	426 091	IRR:	12%
2012	1 750 090	1 301 694	0	448 395	NPV:	$137 047
2013	1 798 316	1 326 068	0	472 248	NPV/COST:	0,10
Interest rate	10%	Discounted INV in period:	**1 332 397**			

Road No.:	Chainage:	Area in m²				
M3203010	**6.000 - 15.000**	**63 000**				
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	2 787 102	2 517 562	2 236 230	-1 966 689		
2000	2 843 272	2 559 130	0	284 143		
2001	2 901 987	2 602 305	0	299 682		
2002	2 963 409	2 647 167	0	316 242		
2003	3 027 688	2 693 797	0	333 891		
2004	3 095 011	2 742 284	0	352 727		
2005	3 165 554	2 792 732	0	372 821		
2006	3 239 568	2 845 234	0	394 334		
2007	3 317 197	2 899 902	1 890	415 405		
2008	3 398 723	2 956 844	3 780	438 100		
2009	3 484 442	3 016 201	7 560	460 681		
2010	3 574 600	2 825 166	1 831 995	-1 082 561		
2011	3 669 496	2 876 015	0	793 481	IRR:	15%
2012	3 769 477	2 928 812	0	840 664	NPV:	$509 505
2013	3 931 466	2 983 653	0	947 813	NPV/COST:	0,21
Interest rate	10%	Discounted INV in period:	**2 455 664**			

Road No.:	Chainage:	Area in m²				
M3203020	**0 - 6.000**	**42 000**				
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	1 869 553	1 678 374	1 237 890	-1 046 711		
2000	1 937 536	1 706 086	0	231 449		
2001	1 977 824	1 734 870	0	242 953		
2002	2 019 977	1 764 778	0	255 199		
2003	2 064 100	1 795 865	0	268 235		
2004	2 175 420	1 828 189	0	347 231		
2005	2 224 991	1 861 822	0	363 169		
2006	2 276 967	1 896 822	0	380 145		
2007	2 331 513	1 933 268	1 260	396 985		
2008	2 388 787	1 971 229	2 520	415 037		
2009	2 448 986	2 010 801	5 040	433 145		
2010	2 512 288	1 883 444	1 221 330	-592 486		
2011	2 578 944	1 917 343	0	661 601	IRR:	26%
2012	2 649 138	1 952 542	0	696 597	NPV:	$1 165 032
2013	2 723 152	1 989 102	0	734 050	NPV/COST:	0,84
Interest rate	10%	Discounted INV in period:	**1 384 179**			

Road No.:	Chainage:	Area in m²
M3203020	6.000 - 15.000	63 000

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	2 804 330	2 517 562	1 856 835	-1 570 066		
2000	2 906 303	2 559 130	0	347 174		
2001	2 966 735	2 602 305	0	364 430		
2002	3 029 965	2 647 167	0	382 799		
2003	3 096 150	2 693 797	0	402 353		
2004	3 263 246	2 742 284	0	520 962		
2005	3 337 810	2 792 732	0	545 077		
2006	3 416 134	2 845 234	0	570 900		
2007	3 498 532	2 899 902	1 890	596 740		
2008	3 585 164	2 956 844	3 780	624 540		
2009	3 675 421	3 016 201	7 560	651 660		
2010	3 770 332	2 825 166	1 831 995	-886 829		
2011	3 870 216	2 876 015	0	994 202	IRR:	26%
2012	3 975 420	2 928 812	0	1 046 607	NPV:	$1 752 038
2013	4 086 320	2 983 653	0	1 102 667	NPV/COST:	0,84
Interest rate	10%	Discounted INV in period:	**2 076 269**			

Road No.:	Chainage:	Area in m²
M3203030	0 - 13.000	91 000

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	4 254 564	3 636 478	2 482 610	-1 864 524		
2000	4 348 722	3 696 521	0	652 201		
2001	4 447 444	3 758 886	0	688 559		
2002	4 551 021	3 823 685	0	727 336		
2003	4 659 786	3 891 040	0	768 746		
2004	4 846 591	3 961 077	0	885 514		
2005	4 968 106	4 033 947	0	934 159		
2006	5 095 974	4 109 782	0	986 192		
2007	5 230 610	4 188 747	2 730	1 039 132		
2008	5 531 757	4 270 997	5 460	1 255 300		
2009	5 684 640	4 356 735	10 920	1 316 985		
2010	5 846 015	4 080 795	2 646 215	-880 996		
2011	6 016 494	4 154 244	0	1 862 251	IRR:	41%
2012	6 196 836	4 230 507	0	1 966 330	NPV:	$4 434 916
2013	6 387 631	4 309 721	0	2 077 910	NPV/COST:	1,58
Interest rate	10%	Discounted INV in period:	**2 799 570**			

Road No.:	Chainage:	Area in m²
M3203040	0 - 10.000	92 186

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	3 166 756	2 797 291	2 995 939	-2 626 474		
2000	3 283 649	2 843 477	0	440 172		
2001	3 353 914	2 891 450	0	462 464		
2002	3 427 503	2 941 296	0	486 207		
2003	3 504 607	2 993 108	0	511 500		
2004	3 695 626	3 046 982	0	648 643		
2005	3 782 403	3 103 036	0	679 367		
2006	3 873 505	3 161 371	0	712 135		
2007	3 969 200	3 222 113	2 766	744 321		
2008	4 069 845	3 285 382	5 531	778 932		
2009	4 175 689	3 351 334	11 062	813 293		
2010	4 287 161	3 139 073	2 678 167	-1 530 079		
2011	4 404 677	3 195 572	0	1 209 105	IRR:	19%
2012	4 528 643	3 254 236	0	1 274 407	NPV:	$1 441 356
2013	4 659 543	3 315 170	0	1 344 373	NPV/COST:	0,43
Interest rate	10%	Discounted INV in period:	**3 316 734**			

Road No.:	Chainage:	Area in m²
M3203040	**10.000 - 12.000**	**16 000**

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	633 351	560 407	735 379	-662 435		
2000	656 748	569 691	0	87 057		
2001	691 780	579 336	0	112 445		
2002	706 900	589 357	0	117 543		
2003	722 763	599 775	0	122 989		
2004	739 443	610 608	0	128 835		
2005	756 854	621 880	0	134 974		
2006	775 131	633 612	0	141 519		
2007	794 265	645 830	480	147 956		
2008	814 379	658 556	960	154 863		
2009	835 538	671 824	1 920	161 794		
2010	857 815	627 815	465 040	-235 040		
2011	881 288	639 114	0	242 174	IRR:	16%
2012	906 043	650 847	0	255 196	NPV:	$224 923
2013	932 173	663 034	0	269 139	NPV/COST:	0,28
Interest rate	10%	Discounted INV in period:	**791 082**			

Road No.:	Chainage:	Area in m²
M3204030	**0 - 10.000**	**70 000**

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	3 050 813	2 802 035	3 217 284	-2 968 507		
2000	3 110 651	2 848 457	0	262 195		
2001	3 222 892	2 896 678	0	326 214		
2002	3 392 059	2 946 785	0	445 274		
2003	3 462 990	2 998 873	0	464 117		
2004	3 537 262	3 053 039	0	484 223		
2005	3 615 125	3 109 401	0	505 724		
2006	3 696 638	3 168 061	0	528 577		
2007	3 781 753	3 229 149	2 100	550 504		
2008	3 871 088	3 292 782	4 200	574 106		
2009	3 964 995	3 359 120	8 400	597 476		
2010	4 063 140	3 139 073	2 035 550	-1 111 484		
2011	4 166 261	3 195 572	0	970 689	IRR:	11%
2012	4 274 695	3 254 236	0	1 020 459	NPV:	$251 859
2013	4 388 807	3 315 170	0	1 073 637	NPV/COST:	0,07
Interest rate	10%	Discounted INV in period:	**3 461 100**			

Road No.:	Chainage:	Area in m²
M3207010	**5.000 - 13.000**	**56 000**

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	1 040 505	983 792	573 240	-516 527		
2000	1 061 953	1 001 979	0	59 974		
2001	1 084 361	1 020 904	0	63 457		
2002	1 107 786	1 040 606	0	67 180		
2003	1 132 288	1 027 544	448 000	-343 255		
2004	1 157 929	1 047 106	0	110 823		
2005	1 184 776	1 067 460	0	117 316		
2006	1 229 424	1 088 646	0	140 779		
2007	1 259 242	1 021 726	1 512 000	-1 274 484		
2008	1 290 519	1 039 954	0	250 565		
2009	1 323 344	1 058 867	0	264 477		
2010	1 394 228	1 078 497	0	315 730		
2011	1 431 228	1 098 879	0	332 350	IRR:	3%
2012	1 470 147	1 120 048	0	350 100	NPV:	-$324 903
2013	1 511 243	1 142 042	0	369 201	NPV/COST:	-0,27
Interest rate	10%	Discounted INV in period:	**1 187 824**			

Road No.:	Chainage:	Area in m²
M3207020	0 - 3.000	18 000

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	394 859	350 082	549 900	-505 124		
2000	402 957	355 926	0	47 031		
2001	411 416	361 991	0	49 425		
2002	420 258	368 287	0	51 971		
2003	441 422	374 826	0	66 596		
2004	451 363	381 620	0	69 743		
2005	461 802	388 679	0	73 123		
2006	472 678	396 019	0	76 659		
2007	484 036	403 654	0	80 382		
2008	495 943	411 598	0	84 346		
2009	508 436	419 867	540	88 028		
2010	521 550	397 330	499 740	-375 520		
2011	535 326	404 592	0	130 735	IRR:	5%
2012	549 807	412 125	0	137 683	NPV:	-$107 030
2013	565 041	419 943	0	145 098	NPV/COST:	-0,19
Interest rate	10%	Discounted INV in period:	**559 528**			

Road No.:	Chainage:	Area in m²
M3208030	7.000 - 9.000	16 000

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	260 768	245 948	129 440	-114 620		
2000	266 164	250 495	0	15 670		
2001	271 803	255 226	0	16 577		
2002	277 699	260 151	0	17 547		
2003	283 866	256 886	128 000	-101 020		
2004	290 321	261 776	0	28 545		
2005	297 080	266 865	0	30 215		
2006	304 164	272 161	0	32 002		
2007	311 590	255 431	432 000	-375 841		
2008	323 691	259 989	0	63 703		
2009	331 960	264 717	0	67 243		
2010	340 647	269 624	0	71 022		
2011	359 117	274 720	0	84 397	IRR:	1%
2012	368 955	280 012	0	88 943	NPV:	-$101 301
2013	379 306	285 511	0	93 795	NPV/COST:	-0,33
Interest rate	10%	Discounted INV in period:	**305 036**			

Road No.:	Chainage:	Area in m²
M3907010	8.000 - 14.000	56 118

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	1 624 384	1 535 902	1 211 337	-1 122 855		
2000	1 652 187	1 558 409	0	93 778		
2001	1 681 302	1 581 831	0	99 470		
2002	1 711 805	1 606 217	0	105 588		
2003	1 743 792	1 631 616	0	112 176		
2004	1 777 430	1 658 082	0	119 348		
2005	1 836 587	1 685 678	0	150 909		
2006	1 923 713	1 714 462	0	209 251		
2007	1 964 218	1 744 503	1 684	218 031		
2008	2 006 806	1 775 868	3 367	227 570		
2009	2 051 663	1 808 644	6 734	236 286		
2010	2 098 788	1 647 730	1 630 258	-1 179 200		
2011	2 148 510	1 672 770	0	475 740	IRR:	7%
2012	2 201 025	1 698 777	0	502 248	NPV:	-$199 934
2013	2 256 546	1 725 800	0	530 745	NPV/COST:	-0,14
Interest rate	10%	Discounted INV in period:	**1 406 612**			

Road No.:	Chainage:	Area in m².				
M3908040	0 - 9.000	81 000				
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	2 579 826	2 334 893	2 505 832	-2 260 899		
2000	2 630 275	2 370 234	0	260 041		
2001	2 683 416	2 407 040	0	276 376		
2002	2 775 539	2 445 386	0	330 154		
2003	2 910 352	2 485 353	0	424 999		
2004	2 975 040	2 527 031	0	448 009		
2005	3 042 874	2 570 520	0	472 354		
2006	3 114 531	2 615 913	0	498 618		
2007	3 190 329	2 663 324	2 430	524 575		
2008	3 270 617	2 712 861	4 860	552 896		
2009	3 355 789	2 764 663	9 720	581 405		
2010	3 446 132	2 471 596	2 353 365	-1 378 828		
2011	3 541 714	2 509 155	0	1 032 559	IRR:	15%
2012	3 643 309	2 548 166	0	1 095 143	NPV:	$650 378
2013	3 751 423	2 588 701	0	1 162 723	NPV/COST:	0,23
Interest rate	10%	Discounted INV in period:	2 787 721			

Road No.:	Chainage:	Area in m²
A35102010	0 - 14.900	242.260

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	8.601.217	8.294.054	2.016.874	-1.709.711		
2000	8.786.048	8.455.325	0	330.723		
2001	8.979.919	8.623.377	0	356.542		
2002	9.183.453	8.798.586	0	384.867		
2003	9.397.336	8.702.899	1.938.080	-1.243.643		
2004	9.622.349	8.877.252	0	745.097		
2005	9.859.281	9.058.920	0	800.361		
2006	10.109.038	9.248.309	0	860.729		
2007	10.372.648	8.713.256	6.541.020	-4.881.628		
2008	10.789.490	8.877.924	0	1.911.566		
2009	11.087.428	9.049.040	0	2.038.388		
2010	11.402.954	9.226.941	0	2.176.013		
2011	11.737.603	9.411.994	0	2.325.609	IRR:	19%
2012	12.402.272	9.604.591	0	2.797.681	NPV:	1909390,185
2013	12.788.229	9.805.185	0	2.983.044	NPV/COST:	0,37
Interest rate	10%	Discounted INV in period:	**5.120.613**			

Road No.:	Chainage:	Area in m²
A35102020	0 - 15.500	210.453

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	8.646.357	8.208.574	5.689.671	-5.251.888		
2000	8.819.105	8.353.782	0	465.323		
2001	8.999.697	8.504.698	0	494.999		
2002	9.188.633	8.661.622	0	527.011		
2003	9.386.489	8.824.877	0	561.612		
2004	9.594.012	8.994.807	0	599.205		
2005	9.811.871	9.171.812	0	640.059		
2006	10.040.910	9.356.270	0	684.640		
2007	10.416.604	9.548.632	6.314	861.658		
2008	10.953.743	9.749.340	12.627	1.191.776		
2009	11.229.092	9.958.958	25.254	1.244.880		
2010	11.519.511	9.431.120	6.108.171	-4.019.780		
2011	11.826.286	9.613.621	0	2.212.665	IRR:	8%
2012	12.150.368	9.803.258	0	2.347.110	NPV:	-487351,4306
2013	12.492.034	10.000.408	0	2.491.626	NPV/COST:	-0,08
Interest rate	10%	Discounted INV in period:	**6.421.334**			

Road No.:	Chainage:	Area in m²
A35102030	0 - 10.400	133.085

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow		
1999	5.926.692	5.507.688	3.596.610	-3.177.607		
2000	6.050.727	5.605.118	0	445.609		
2001	6.180.716	5.706.378	0	474.339		
2002	6.317.088	5.811.669	0	505.420		
2003	6.460.340	5.921.208	0	539.133		
2004	6.610.964	6.035.225	0	575.739		
2005	6.858.530	6.153.990	0	704.540		
2006	7.212.781	6.277.755	0	935.026		
2007	7.394.685	6.406.824	3.993	983.869		
2008	7.586.316	6.541.493	7.985	1.036.838		
2009	7.788.884	6.682.140	15.970	1.090.775		
2010	8.003.044	6.327.977	3.863.113	-2.188.047		
2011	8.228.983	6.450.430	0	1.778.554	IRR:	18%
2012	8.468.412	6.577.670	0	1.890.742	NPV:	1635600,122
2013	8.722.476	6.709.951	0	2.012.525	NPV/COST:	0,40
Interest rate	10%	Discounted INV in period:	**4.059.349**			

Road No.:	Chainage:	Area in m²			
A35102040	**0 - 500**	**7.500**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	282.296	264.793	202.500	-184.997	
2000	288.087	269.477	0	18.610	
2001	294.149	274.345	0	19.804	
2002	300.498	279.407	0	21.091	
2003	307.155	284.673	0	22.482	
2004	314.141	290.155	0	23.986	
2005	321.480	295.865	0	25.615	
2006	329.200	301.815	0	27.384	
2007	337.330	308.020	225	29.085	
2008	350.416	314.495	450	35.471	
2009	368.953	321.257	900	46.796	
2010	378.849	304.230	217.637	-143.017	
2011	389.340	310.117	0	79.223	IRR: 9%
2012	400.418	316.234	0	84.184	NPV: -6695,033913
2013	412.160	322.594	0	89.566	NPV/COST: -0,03
Interest rate	10%	Discounted INV in period:	**228.569**		

Road No.:	Chainage:	Area in m²			
A35102040	**500 - 11.500**	**157.919**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	6.210.516	5.825.440	4.263.813	-3.878.737	
2000	6.337.919	5.928.490	0	409.429	
2001	6.471.271	6.035.592	0	435.679	
2002	6.611.014	6.146.958	0	464.057	
2003	6.757.610	6.262.816	0	494.795	
2004	6.911.563	6.383.411	0	528.152	
2005	7.166.465	6.509.028	0	657.437	
2006	7.532.318	6.639.934	0	892.385	
2007	7.718.165	6.776.448	4.738	936.979	
2008	7.914.500	6.918.887	9.475	986.139	
2009	8.120.660	7.067.648	18.950	1.034.062	
2010	8.338.333	6.693.054	4.582.924	-2.937.645	
2011	8.567.683	6.822.570	0	1.745.113	IRR: 12%
2012	8.810.393	6.957.151	0	1.853.243	NPV: 484782,0848
2013	9.067.576	7.097.063	0	1.970.513	NPV/COST: 0,10
Interest rate	10%	Discounted INV in period:	**4.812.777**		

Road No.:	Chainage:	Area in m²			
A35103010	**0 - 13.900**	**168.906**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	7.886.360	7.737.407	1.351.248	-1.202.295	
2000	8.049.793	7.887.854	0	161.940	
2001	8.220.961	8.044.627	0	176.334	
2002	8.400.349	8.208.077	0	192.272	
2003	8.588.516	8.118.812	1.351.248	-881.544	
2004	8.786.104	8.281.463	0	504.641	
2005	8.993.751	8.450.939	0	542.812	
2006	9.212.228	8.627.617	0	584.611	
2007	9.442.303	8.128.474	4.560.462	-3.246.633	
2008	9.684.898	8.282.091	0	1.402.807	
2009	9.940.949	8.441.722	0	1.499.227	
2010	10.211.651	8.607.683	0	1.603.968	
2011	10.497.967	8.780.316	0	1.717.651	IRR: 18%
2012	10.801.337	8.959.987	0	1.841.350	NPV: 1283407,495
2013	11.265.302	9.147.118	0	2.118.184	NPV/COST: 0,37
Interest rate	10%	Discounted INV in period:	**3.515.204**		

Road No.:	Chainage:	Area in m²			
M3203010	**2.000 - 6.000**	**34.192**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	990.231	895.121	1.213.386	-1.118.276	
2000	1.010.084	909.886	0	100.198	
2001	1.030.825	925.221	0	105.604	
2002	1.052.509	941.151	0	111.358	
2003	1.075.245	957.706	0	117.539	
2004	1.099.084	974.918	0	124.166	
2005	1.124.119	992.821	0	131.298	
2006	1.167.828	1.011.449	0	156.378	
2007	1.231.798	1.030.841	1.026	199.931	
2008	1.261.394	1.051.034	2.052	208.308	
2009	1.292.449	1.072.077	4.103	216.269	
2010	1.325.058	1.004.488	993.571	-673.002	
2011	1.359.321	1.022.549	0	336.771	IRR: 7%
2012	1.395.349	1.041.300	0	354.049	NPV: -188588,8321
2013	1.433.262	1.060.773	0	372.489	NPV/COST: -0,14
Interest rate	10%	Discounted INV in period:	**1.332.397**		

Road No.:	Chainage:	Area in m²			
M3203010	**6.000 - 15.000**	**63.000**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	2.228.020	2.014.022	2.236.230	-2.022.232	
2000	2.272.689	2.047.244	0	225.445	
2001	2.319.356	2.081.746	0	237.610	
2002	2.368.145	2.117.589	0	250.556	
2003	2.419.171	2.154.839	0	264.332	
2004	2.472.576	2.193.565	0	279.011	
2005	2.528.493	2.233.848	0	294.645	
2006	2.587.115	2.275.761	0	311.354	
2007	2.648.546	2.319.394	1.890	327.263	
2008	2.713.002	2.364.827	3.780	344.395	
2009	2.780.704	2.412.174	7.560	360.970	
2010	2.851.836	2.260.098	1.831.995	-1.240.258	
2011	2.926.619	2.300.736	0	625.883	IRR: 9%
2012	3.005.313	2.342.925	0	662.388	NPV: -147001,3904
2013	3.133.300	2.386.738	0	746.562	NPV/COST: -0,06
Interest rate	10%	Discounted INV in period:	**2.455.664**		

Road No.:	Chainage:	Area in m²			
M3203020	**0 - 6.000**	**42.000**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	1.494.478	1.342.682	1.237.890	-1.086.094	
2000	1.548.659	1.364.830	0	183.829	
2001	1.580.672	1.387.831	0	192.842	
2002	1.614.148	1.411.726	0	202.422	
2003	1.649.165	1.436.559	0	212.605	
2004	1.737.840	1.462.377	0	275.463	
2005	1.777.122	1.489.232	0	287.890	
2006	1.818.277	1.517.174	0	301.103	
2007	1.861.428	1.546.262	1.260	313.906	
2008	1.906.694	1.576.552	2.520	327.623	
2009	1.954.224	1.608.116	5.040	341.068	
2010	2.004.150	1.506.732	1.221.330	-723.913	
2011	2.056.659	1.533.824	0	522.835	IRR: 19%
2012	2.111.886	1.561.950	0	549.937	NPV: 606574,2754
2013	2.170.041	1.591.159	0	578.883	NPV/COST: 0,44
Interest rate	10%	Discounted INV in period:	**1.384.179**		

Road No.:	Chainage:	Area in m²			
M3203020	**6.000 - 15.000**	**63.000**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	2.241.716	2.014.022	1.856.835	-1.629.141	
2000	2.322.988	2.047.244	0	275.744	
2001	2.371.009	2.081.746	0	289.262	
2002	2.421.222	2.117.589	0	303.633	
2003	2.473.747	2.154.839	0	318.908	
2004	2.606.851	2.193.565	0	413.286	
2005	2.665.937	2.233.848	0	432.089	
2006	2.727.949	2.275.761	0	452.188	
2007	2.793.126	2.319.394	1.890	471.842	
2008	2.861.582	2.364.827	3.780	492.975	
2009	2.932.840	2.412.174	7.560	513.105	
2010	3.007.690	2.260.098	1.831.995	-1.084.403	
2011	3.086.371	2.300.736	0	785.635	IRR: 19%
2012	3.169.139	2.342.925	0	826.215	NPV: 913331,4763
2013	3.256.274	2.386.738	0	869.536	NPV/COST: 0,44
Interest rate	10%	Discounted INV in period:	**2.076.269**		

Road No.:	Chainage:	Area in m²			
M3203030	**0 - 13.000**	**91.000**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	3.398.957	2.909.144	2.482.610	-1.992.797	
2000	3.473.594	2.957.131	0	516.464	
2001	3.551.790	3.006.967	0	544.823	
2002	3.633.762	3.058.740	0	575.022	
2003	3.719.762	3.112.546	0	607.217	
2004	3.867.948	3.168.482	0	699.466	
2005	3.963.842	3.226.670	0	737.173	
2006	4.064.639	3.287.211	0	777.428	
2007	4.170.647	3.350.235	2.730	817.682	
2008	4.409.286	3.415.862	5.460	987.964	
2009	4.529.356	3.484.252	10.920	1.034.185	
2010	4.655.916	3.264.587	2.646.215	-1.254.886	
2011	4.789.415	3.323.285	0	1.466.130	IRR: 30%
2012	4.930.408	3.384.224	0	1.546.184	NPV: 2842899,275
2013	5.079.321	3.447.510	0	1.631.810	NPV/COST: 1,02
Interest rate	10%	Discounted INV in period:	**2.799.570**		

Road No.:	Chainage:	Area in m²			
M3203040	**0 - 10.000**	**92.186**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	2.530.945	2.237.803	2.995.939	-2.702.797	
2000	2.624.044	2.274.716	0	349.328	
2001	2.679.819	2.313.051	0	366.768	
2002	2.738.192	2.352.877	0	385.315	
2003	2.799.308	2.394.266	0	405.042	
2004	2.951.356	2.437.294	0	514.062	
2005	3.020.027	2.482.054	0	537.974	
2006	3.092.055	2.528.624	0	563.431	
2007	3.167.640	2.577.104	2.766	587.771	
2008	3.247.051	2.627.586	5.531	613.934	
2009	3.330.470	2.680.193	11.062	639.216	
2010	3.418.220	2.511.221	2.678.167	-1.771.168	
2011	3.510.607	2.556.374	0	954.234	IRR: 13%
2012	3.607.932	2.603.250	0	1.004.682	NPV: 390989,3277
2013	3.710.548	2.651.931	0	1.058.617	NPV/COST: 0,12
Interest rate	10%	Discounted INV in period:	**3.316.734**		

Road No.:	Chainage:	Area in m²
M3203040	10.000 - 12.000	16.000

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	506.189	448.314	725.666	-667.791	
2000	524.823	455.734	0	69.090	
2001	552.745	463.440	0	89.304	
2002	564.738	471.447	0	93.291	
2003	577.311	479.768	0	97.542	
2004	590.520	488.420	0	102.099	
2005	604.297	497.421	0	106.876	
2006	618.746	506.787	0	111.959	
2007	633.858	516.537	480	116.840	
2008	649.727	526.692	960	122.075	
2009	666.402	537.274	1.920	127.208	
2010	683.937	502.244	465.040	-283.347	
2011	702.391	511.275	0	191.116	IRR: 10%
2012	721.825	520.650	0	201.175	NPV: 16090,95692
2013	742.309	530.386	0	211.923	NPV/COST: 0,02
Interest rate	10%	Discounted INV in period:	**781.369**		

Road No.:	Chainage:	Area in m²
M3204030	0 - 10.000	70.000

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	2.439.212	2.241.569	3.174.787	-2.977.144	
2000	2.486.840	2.278.669	0	208.172	
2001	2.576.328	2.317.201	0	259.127	
2002	2.711.280	2.357.234	0	354.046	
2003	2.767.645	2.398.842	0	368.804	
2004	2.826.629	2.442.102	0	384.528	
2005	2.888.422	2.487.105	0	401.316	
2006	2.953.064	2.533.934	0	419.130	
2007	3.020.511	2.582.687	2.100	435.724	
2008	3.091.243	2.633.458	4.200	453.584	
2009	3.165.526	2.686.372	8.400	470.754	
2010	3.243.090	2.511.221	2.035.550	-1.303.681	
2011	3.324.504	2.556.374	0	768.130	IRR: 7%
2012	3.410.019	2.603.250	0	806.770	NPV: -503212,2394
2013	3.499.906	2.651.931	0	847.975	NPV/COST: -0,15
Interest rate	10%	Discounted INV in period:	**3.418.602**		

Road No.:	Chainage:	Area in m²
M3207010	5.000 - 13.000	56.000

Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	831.947	787.028	573.240	-528.321	
2000	849.034	801.570	0	47.464	
2001	866.880	816.702	0	50.178	
2002	885.528	832.453	0	53.074	
2003	905.025	822.029	448.000	-365.004	
2004	925.417	837.671	0	87.747	
2005	946.758	853.945	0	92.814	
2006	982.308	870.883	0	111.426	
2007	1.005.984	840.716	1.120.000	-954.732	
2008	1.030.804	856.514	0	174.290	
2009	1.056.834	872.929	0	183.904	
2010	1.113.233	889.992	0	223.241	
2011	1.142.530	907.733	0	234.797	IRR: -1%
2012	1.173.321	926.187	0	247.134	NPV: -451296,6682
2013	1.205.801	945.389	0	260.412	NPV/COST: -0,41
Interest rate	10%	Discounted INV in period:	**1.107.818**		

Road No.:	Chainage:	Area in m²			
M3207020	**0 - 3.000**	**18.000**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	315.716	280.064	549.900	-514.247	
2000	322.168	284.736	0	37.432	
2001	328.905	289.585	0	39.320	
2002	335.945	294.619	0	41.326	
2003	352.829	299.846	0	52.984	
2004	360.736	305.275	0	55.460	
2005	369.034	310.917	0	58.116	
2006	377.675	316.782	0	60.893	
2007	386.694	322.882	0	63.811	
2008	396.143	329.228	0	66.915	
2009	406.050	335.833	540	69.678	
2010	416.443	317.862	499.740	-401.159	
2011	427.352	323.667	0	103.684	IRR: -1%
2012	438.810	329.690	0	109.119	NPV: -220621,3814
2013	450.852	335.940	0	114.912	NPV/COST: -0,39
Interest rate	10%	Discounted INV in period:	**559.528**		

Road No.:	Chainage:	Area in m²			
M3208030	**7.000 - 9.000**	**16.000**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	208.497	196.757	129.440	-117.700	
2000	212.797	200.392	0	12.404	
2001	217.287	204.175	0	13.112	
2002	221.980	208.113	0	13.867	
2003	226.887	203.573	272.000	-248.686	
2004	232.020	207.382	0	24.639	
2005	237.393	211.342	0	26.051	
2006	243.020	215.463	0	27.558	
2007	248.917	219.750	0	29.166	
2008	258.542	224.214	0	34.327	
2009	265.098	228.864	0	36.234	
2010	271.980	233.707	0	38.273	
2011	286.667	238.757	0	47.910	IRR: 2%
2012	294.449	244.022	0	50.427	NPV: -101453,1255
2013	302.628	249.515	480	52.633	NPV/COST: -0,39
Interest rate	10%	Discounted INV in period:	**257.290**		

Road No.:	Chainage:	Area in m²			
M3907010	**8.000 - 14.000**	**56.118**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	1.298.223	1.228.698	1.211.337	-1.141.812	
2000	1.320.253	1.246.676	0	73.578	
2001	1.343.303	1.265.380	0	77.923	
2002	1.367.429	1.284.849	0	82.580	
2003	1.392.704	1.305.122	0	87.582	
2004	1.419.254	1.326.240	0	93.014	
2005	1.466.126	1.348.253	0	117.873	
2006	1.535.255	1.371.205	0	164.050	
2007	1.567.104	1.395.151	1.684	170.269	
2008	1.600.544	1.420.142	3.367	177.035	
2009	1.635.714	1.446.245	6.734	182.734	
2010	1.672.604	1.318.157	1.630.258	-1.275.811	
2011	1.711.464	1.338.157	0	373.307	IRR: 0%
2012	1.752.433	1.358.924	0	393.509	NPV: -509206,9431
2013	1.795.666	1.380.497	0	415.168	NPV/COST: -0,36
Interest rate	10%	Discounted INV in period:	**1.406.612**		

Kazakhstan (-20% traffic) **15 years cashflow** **RoSy® PM System**

Sensitivity solutions Date: 20-10-1999

Road No.:	**Chainage:**	**Area in m²**			
M3908040	**0 - 9.000**	**81.000**			
Years	VOC - Do Nothing	VOC - Optimum	Investment	Cashflow	
1999	2.059.528	1.867.878	2.505.832	-2.314.182	
2000	2.099.248	1.896.109	0	203.139	
2001	2.141.032	1.925.503	0	215.529	
2002	2.213.815	1.956.119	0	257.696	
2003	2.320.517	1.988.022	0	332.495	
2004	2.371.149	2.021.281	0	349.868	
2005	2.424.164	2.055.974	0	368.190	
2006	2.480.069	2.092.174	0	387.895	
2007	2.539.093	2.129.970	2.430	406.693	
2008	2.601.488	2.169.445	4.860	427.184	
2009	2.667.537	2.210.707	9.720	447.110	
2010	2.737.440	1.977.236	2.353.365	-1.593.161	
2011	2.811.238	2.007.235	0	804.002	IRR: 9%
2012	2.889.488	2.038.387	0	851.101	NPV: -164987,6566
2013	2.972.548	2.070.746	0	901.802	NPV/COST: -0,06
Interest rate	10%	Discounted INV in period:	**2.787.720**		