FINAL PROJECT - RC 141501

FEASIBILITY STUDY OF BULU ROAD WIDENING KM SBY 110+500 – 118+000 TUBAN DISTRICT EAST JAVA

ARIF ILMAWAN HS
NRP. 3111 106 023

SUPERVISORS
Ir.HERA WIDYASTUTI,MT.PhD
ISTIAR,ST.MT

CIVIL ENGINEERING DEPARTMENT
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TUGAS AKHIR - RC 141501

STUDI KELAYAKAN PELEBARAN JALAN BULU KM SBY 110+500 – 118+000 KABUPATEN TUBAN JAWA TIMUR

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DOSEN PEMBIMBING
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STUDI KELAYAKAN PELEBARAN JALAN BULU KM SBY 110+500 – 118+000 KABUPATEN TUBAN JAWA TIMUR

TUGAS AKHIR

Diajukan Untuk Memenuhi Salah Satu Syarat
Memperoleh Gelar Sarjana Teknik
pada
Program Studi S-1 Jurusan Teknik Sipil
Fakultas Teknik Sipil dan Perencanaan
Institut Teknologi Sepuluh Nopember

Oleh :
ARIF ILMAWAN HARYA S
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SURABAYA
JANUARI, 2015

FEASIBILITY STUDY OF BULU ROAD WIDENING KM SBY 110+500 - 118+000 TUBAN DISTRICT EAST JAVA

Name of Student : Arif Ilmawan Harya S
NRP : 3111 106 023
Department : Civil Engineering FTSP - ITS
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2. Istiar,ST.MT.

Tuban district is included in area that passed by the route of north coast of Java,which is the main route is national road that connect inter-provincial. So that the pantura road have a very high traffic.this matter makes Tuban district as a high attraction area and cause the traffic increasing.the increasing of traffic volume is caused by the increasing of the volume of vehicles that exceed the capacity of the road which exist and switching the function of the road.the dense flow of vehicles caused congestion in some segment of the road that occur at rush hour. This resulted in cost overruns which must be paid by the road users.

the purpose of this final project is to analyze whether it is feasible if the segment of the road perform widening.which is reviewed in term of traffic and economy highway.analysis that will be calculated among others is analysis of the performance level in the value of the degree of saturation ,analysis of the time value and vehicle operation cost,analytical calculation of the benefit cost ratio and net present value calculation analysis.

Which will be determined based on the value of the vehicle operating cost savings and time value.the vehicle

operating cost and the value of time and the value of the plan by using the method of Jasa Marga.the result of economic analysis obtained by value saving is Rp. 292.789.865.219,009 Value of BCR = 2,07 (BCR> 1) and value of NPV= Rp. 108.782.277.806,73 (NPV> 0) this project declare feasible.

Key Word : Bulu Road – Tuban, Feasibility study, BOK

STUDI KELAYAKAN PELEBARAN JALAN BULU KM SBY 110+500 – 118+000 KABUPATEN TUBAN JAWA TIMUR

Nama Mahasiswa : Arif Ilmawan Harya S
NRP : 3111 106 023
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ABSTRAK

Kabupaten Tuban termasuk daerah yang dilalui jalur pantai utara jawa (pantura) yang merupakan jalur utama perdagangan di pulau jawa. Jalur pantura merupakan jalan nasional yang menghubungkan antar provinsi sehingga jalur pantura memiliki lalu lintas yang sang at padat. Hal ini menjadikan kabupaten Tuban sebagai daerah tarikan yang tinggi dan mengakibatkan lalu lintas yang terjadi semakin meningkat. Meningkatnya volume lalu - lintas dipengaruhi oleh meningkatnya jumlah kendaraan sehingga melebihi kapasitas jalan yang ada dan beralihnya fungsi jalan. Arus kendaraan yang padat mengakibatkan kemacetan dibeberapa ruas jalan yang terjadi pada jam sibuk . Hal ini mengakibatkan pembengkakan biaya yang harus dikeluarkan oleh pengguna jalan.

Tujuan dari tugas Akhir ini untuk menganalisa apakah layak jika di ruas jalan tersebut dilakukan pelebaran yang ditinjau dari segi lalu lintas dan ekonomi jalan raya. Analisa yang akan dihitung antara lain analisa tingkat kinerja jalan berupa nilai Derajat Kejenuhan (DS), analisa perhitungan penghematan Nilai Waktu dan Biaya Operasional Kendaraan, analisa perhitungan Benefit Cost Ratio (BCR),dan analisa perhitungan Net Present Value (NPV).

Analisa kelayakan pelebaran jalan Bulu Tuban ditinjau dari segi ekonomi yang akan ditentukan berdasarkan nilai penghematan BOK dan nilai waktu. BOK dan nilai waktu dianalisa pada saat kondisi eksisiting dan kondisi rencana dengan menggunakan metode Jasa Marga. Hasil analisa dari segi ekonomi diperoleh nilai saving Rp. 292.789.865.219,009 nilai BCR = 2,07 (BCR>1) dan nilai NPV = Rp. 108.782.277.806,73 (NPV>0) proyek dikatakan layak dilaksanakan.

Kata kunci : jalan Bulu – Tuban, studi kelayakan, BOK

DAFTAR ISI

DAFTAR TABEL

DAFTAR GAMBAR

“Halaman ini sengaja dikosongkan”

BAB I
PENDAHULUAN

1.1 Latar Belakang

Kabupaten Tuban termasuk daerah yang dilalui jalur pantai utara jawa (pantura) yang merupakan jalur utama perdagangan di Pulau Jawa. Jalur pantura merupakan jalan nasional yang menghubungkan antar provinsi sehingga jalur pantura memiliki lalu lintas yang sangat padat. Hal ini menjadikan Kabupaten Tuban sebagai daerah tarikan yang tinggi dan mengakibatkan lalu lintas yang terjadi semakin meningkat. Meningkatnya volume lalu - lintas dipengaruhi oleh meningkatnya jumlah kendaraan sehingga melebihi kapasitas jalan yang ada dan beralihnya fungsi jalan, sehingga jalan tidak berfungsi sebagaimana mestinya. Arus kendaraan yang padat mengakibatkan kemacetan dibeberapa ruas jalan yang terjadi pada jam sibuk . Hal ini mengakibatkan pembengkakan biaya yang harus dikeluarkan oleh pengguna jalan.

Pemerintah provinsi melakukan berbagai macam alternatif untuk mengurangi kepadatan di Jalur Pantura Bulu Tuban. Untuk mengatasi masalah tersebut Direktorat Jendral Bina Marga sebagai salah satu instansi yang terkait sedang melaksanakan proyek pelebaran Jalan Bulu Tuban.

Pada tugas akhir ini penulis menganalisa kelayakan pelebaran jalan Bulu Tuban, apakah layak jika di ruas jalan tersebut dilakukan pelebaran yang ditinjau dari segi lalu lintas dan ekonomi jalan raya. Analisa yang akan dihitung antara lain analisa tingkat kinerja jalan berupa nilai derajat kejenuhan (DS), analisa perhitungan penghematan nilai waktu dan biaya operasional kendaraan, analisa perhitungan benefit cost ratio (BCR),dan analisa perhitungan net present value (NPV). Pelebaran jalan ini diharapkan memberikan kenyamanan bagi para pengguna jalan dilihat dari segi waktu dan biaya

Pelebaran Jalan Bulu Tuban yang mencakup Kecamatan Jenu,dan Kecamatan Tambakboyo ini bertujuan untuk mengurangi

kemacetan bagi pengguna jalan dari arah Kabupaten Tuban yang akan menuju Jawa Tengah atau sebaliknya. Pelebaran jalan ini diharapkan dapat meminimalkan kemacetan pergerakan lalu lintas di sekitarnya.

1.2 Rumusan Masalah

Dalam tugas akhir ini, rumusan masalah yang akan ditinjau adalah sebagai berikut :

1. Bagaimana kondisi dan karakteristik lalu lintas ruas jalan masuk dan keluar kabupaten Tuban sebelum ada rencana pelebaran Jalan Bulu Tuban?
2. Berapa penghematan biaya operasional kendaraan (BOK) dan nilai waktu setelah adanya pelebaran Jalan Bulu Tuban?
3. Bagaimana tingkat kelayakan pelebaran Jalan Bulu Tuban?

1.3 Tujuan

Tujuan dari tugas akhir ini adalah sebagai berikut :

1. Menganalisa bagaimana kondisi dan karakteristik lalu lintas ruas jalan masuk dan keluar Kabupaten Tuban sebelum ada rencana pelebaran Jalan Bulu Tuban.
2. Menganalisa penghematan biaya operasional kendaraan (BOK) dan nilai waktu setelah ada pelebaran Jalan Bulu Tuban.
3. Menganalisa tingkat kelayakan pelebaran Jalan Bulu Tuban.

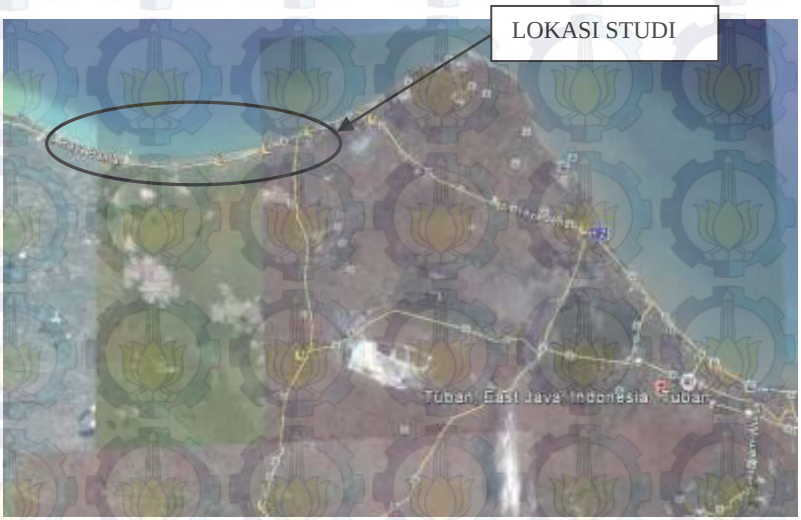
1.4 Batasan Masalah

Untuk menghindari penyimpangan pembahasan dari masalah yang dibahas tugas akhir, maka diperlukan pembatasan masalah di antaranya :

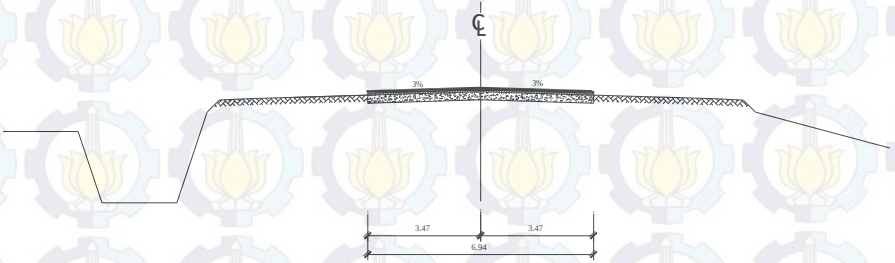
1. Peninjauan lalu lintas hanya pada kapasitas, tingkat kinerja, dan analisa volume yang meliputi: derajat kejenuhan dan kecepatan.
2. Tidak menghitung kerugian atau peningkatan hasil produksi di daerah studi, mengenai pembebasan lahan, dan bidang social.

1.5 Lokasi Studi

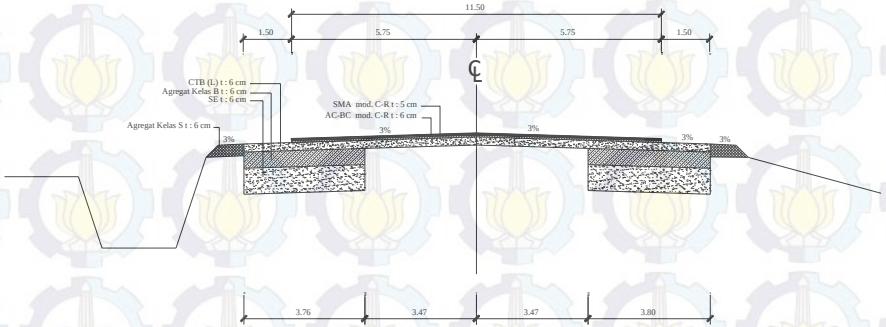
Gambar 1.1 Peta Jawa Timur
(sumber www.google.com)



Gambar 1.2 Peta Lokasi Studi
(sumber www.google.com 7 Maret 2014)



Gambar 1.3 Gambar Potongan Melintang KM 111 + 850 Eksisting
(sumber : Dinas Bina Marga Provinsi Jawa Timur)



Gambar 1.4 Gambar Potongan Melintang KM 111 + 850 Rencana
(sumber : Dinas Bina Marga Provinsi Jawa Timur)

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BAB II
TINJAUAN PUSTAKA

2.1 Umum

Dalam penulisan tugas akhir memerlukan suatu dasar teori sebagai pembahasan keseluruhan masalah. Dasar teori ini nantinya berisikan teori penunjang penulisan yang ditemukan oleh para ahli dibidangnya masing–masing .

2.2. Karakteristik Jalan

2.2.1 Klasifikasi Jalan Raya

Dalam tata cara perencanaan geometrik jalan antar kota yang dikeluarkan oleh Dinas Bina Marga Direktorat Jenderal Bina Marga Tahun 1997. Jalan dikelompokkan menjadi 3 macam berdasarkan fungsinya yaitu :

1. Jalan arteri : Jalan yang melayani angkutan utama dengan ciri-ciri perjalanan jarak jauh, kecepatan rata – rata tinggi, dan jumlah jalan masuk dibatasi.
2. Jalan kolektor : Jalan yang melayani angkutan pengumpulan dengan ciri – ciri perjalanan jarak sedang kecepatan rata – rata, dan jumlah jalan masuk dibatasi.
3. Jalan lokal : Jalan yang melayani angkutan setempat dengan ciri – ciri perjalanan jarak dekat, kecepatan rata – rata rendah, dan jumlah jalan masuk tidak dibatasi.

2.2.2 Tipe Jalan

Tipe jalan digunakan untuk menganalisa kapasitas jalan, menurut MKJI 1997 tipe jalan dibagi menjadi 4 (empat) yaitu :

1. Jalan dua lajur dua arah tak terbagi (2/2 UD) : Tipe jalan ini meliputi semua jalan perkotaan dua lajur dua arah (2/2 UD) dengan lebar lajur lalu lintas lebih kecil dan sama dengan 10,5 m atau sampai dengan 11 m. Kondisi dasar tipe jalan ini didefinisikan sebagai berikut :
    - Tidak ada median.
    - Pemisahan arah lalu lintas 50 – 50.

- Tipe alinyemen : datar.
- Guna lahan : tidak ada pengembangan samping jalan.
- Kelas hambatan samping : rendah / L .
- Kelas jarak pandang : A.
- Lebar jalur lalu lintas efektif 7 m.
- Lebar efektif bahu 1,5 m pada masing – masing sisi .

2. Jalan empat lajur dua arah tak terbagi (4/2 UD) : Tipe jalan ini meliputi semua jalan dua arah tak terbagi dengan marka lajur untuk empat lajur dan lebar jalur lalu lintas tak terbagi antara 12 m dan 15 m. Kondisi dasar tipe jalan ini didefinisikan sebagai berikut :
   - Tidak ada median.
   - Pemisahan arah lalu lintas 50 – 50.
   - Tipe alinyemen : datar.
   - Guna lahan : tidak ada pengembangan samping jalan.
   - Kelas hambatan samping : rendah / L .
   - Kelas jarak pandang : A.
   - Lebar jalur lalu lintas efektif 7 m.
   - Lebar efektif bahu 1,5 m pada masing – masing sisi .

3. Jalan empat lajur dua arah terbagi (4/2 D) : Tipe jalan ini meliputi semua jalan dua arah dengan dua lajur lalu lintas yang dipisahkan oleh median. Setiap jalur lalu lintas mempunyai dua lajur, bermarka dengan lebar antara 3,0 m – 3,75 m. Kondisi dasar tipe jalan ini didefinisikan sebagai berikut :

   - Median.
   - Pemisahan arah lalu lintas 50 – 50.
   - Tipe alinyemen : datar.
   - Guna lahan : tidak ada pengembangan samping jalan.
   - Kelas hambatan samping : rendah / L .
   - Kelas jarak pandang : A.

- Lebar jalur lalu lintas 2 x 7,0 m (tidak termasuk lebar median).
- Lebar efektif bahu 2,0 m diukur sebagai lebar bahu dalam ditambah bahu luar untuk setiap jalur lalu lintas .

4. Jalan enam lajur dua arah terbagi (6/2 D) : Tipe jalan ini meliputi semua jalan dua arah dengan lebar jalur lalu lintas lebih dari 18 m dan kurang dari 24 m. Kondisi dasar tipe jalan ini didefinisikan sebagai berikut :
   - Median.
   - Pemisahan arah lalu lintas 50 – 50.
   - Tipe alinyemen : datar.
   - Guna lahan : tidak ada pengembangan samping jalan.
   - Kelas hambatan samping : rendah / L .
   - Kelas jarak pandang : A.
   - Lebar jalur lalu lintas 2 x 7,0 m (tidak termasuk lebar median).
   - Lebar efektif bahu 2,0 m diukur sebagai lebar bahu dalam ditambah bahu luar untuk setiap jalur lalu lintas .

2.3 Karakteristik Lalu Lintas

2.3.1 Kapasitas

Sebagai arus maksimal yang dapat dipertahankan per satuan jam yang melewati suatu titik jalan dalam kondisi tertentu. Persamaan untuk menentukan kapasitas suatu jalan dengan alinyemen umum menurut MKJI 1997 adalah :

$$C = Co \times F\,Cw \times F\,Csp \times F\,Csf \text{ (smp / jam)} \quad \text{Pers. 2.1}$$

Dimana :

C = kapasitas
Co = kapasitas dasar
F Cw = faktor penyesuaian akibat lebar jalur lalu lintas

F Csp = faktor penyesuaian akibat pemisahan arah
F Csf = faktor penyesuaian akibat hambatan samping

Tabel 2.1 Kapasitas Dasar Pada Jalan Luar Kota 4-Lajur 2-Arah Tak Terbagi (4/2)

Tipe Jalan / Alinyemen Jalan	**Kapasitas Dasar Untuk Satu Lajur (smp / jam / lajur)**
Empat Lajur Terbagi	
Datar	1900
Bukit	1850
Gunung	1800
Empat Lajut Tak terbagi	
Datar	1700
Bukit	1650
Gunung	1600

Sumber : MKJI (1997)

Tabel 2.2 Kapasitas dasar pada jalan luar kota (2/2 UD) (C_0)

Tipe jalan/ Tipe alinyemen	Kapasitas dasar Total kedua arah smp/jam
Dua-lajur tak-terbagi	
- Datar	3100
- Bukit	3000
- Gunung	2900

Sumber : MKJI (1997)

Tabel 2.3 Faktor Penyesuaian Kapasitas Akibat Lebar Jalur Lalu Lintas (F Cw)

Tipe Jalan	**Lebar Efektif Jalur Lalu-lintas (Wc/m)**	**FCw**
Empat – lajur terbagi Enam – lajur terbagi	Per lajur	
	3	0.91
	3.25	0.96
	3.5	1
	3.75	1.03
Empat – lajur tak terbagi	3	0.91
	3.25	0.96
	3.5	1
	3.75	1.03
Dua – lajur tak terbagi	6	0.91
	7	1
	8	1.08
	9	1.15
	10	1.21
	11	1.27

Sumber : MKJI (1997)

Tabel 2.4 Faktor Penyesuaian Kapasitas Akibat Pemisah Arah (F Csp)

Pemisahan arah SP %-%		50-50	55-45	60-40	65-35	70-30
FC_{SPA}	Dua-lajur 2/2	1,00	0,97	0,94	0,91	0,88
	Empat-lajur 4/2	1,00	0,975	0,95	0,925	0,90

Sumber : MKJI (1997)

Tabel 2.5 Faktor Penyesuaian Kapasitas Akibat Hambatan Samping (F Csf)

Tipe jalan	Kelas hambatan samping	Faktor penyesuaian akibat hambatan samping (FC_{SF})			
		Lebar bahu efektif W_s			
		≤ 0,5	1,0	1,5	≥ 2,0
4/2 D	VL	0,99	1,00	1,01	1,03
	L	0,96	0,97	0,99	1,01
	M	0,93	0,95	0,96	0,99
	H	0,90	0,92	0,95	0,97
	VH	0,88	0,90	0,93	0,96
2/2 UD 4/2 UD	VL	0,97	0,99	1,00	1,02
	L	0,93	0,95	0,97	1,00
	M	0,88	0,91	0,94	0,98
	H	0,84	0,87	0,91	0,95
	VH	0,80	0,83	0,88	0,93

Sumber : MKJI (1997)

2.3.2 Volume lalu lintas

Jumlah kendaraan yang melewati satu titik pengamatan pada suatu jalur jalan selama satu satuan waktu. Untuk mendapatkan volume lalu lintas dilakukan survey volume lalu lintas.

- Sedan, jeep, dan station wagon
- Oplet, pick up suburban dan combi (penumpang)
- Micro truck dan mobil penumpang
- Bis kecil
- Bis besar
- Truk 2 as
- Truk Tangki 2 As > 10 T
- Truk Tangki gandengan
- Truk 3 As atau lebih

Dari hasil survey volume lalu lintas dapat diketahui :

- Komposisi arus lalu lintas
- Lalu lintas Harian Rata-rata (LHR)

2.3.3 Derajat Kejenuhan

Rasio arus terhadap kapasitas yang digunakan sebagai faktor kunci dalam penentuan perilaku lalu lintas pada suatu simpang dan juga segmen jalan. Menurut MKJI 1997 nilai derajat kejenuhan menunjukkan apakah segmen jalan akan mempunyai masalah / tidak. Derajat kejenuhan ini diberi batasan maksimum = 0,75 ; bila melebihi dari 0,75 maka dianggap jalan sudah tidak mampu lagi menampung arus lalu lintas.

Ds = Q / C ..... Pers. 2.2

Dimana :

Ds = derajat kejenuhan
Q = arus total lalu lintas (smp/jam)
C = kapasitas

2.3.4 Kecepatan

Dihitung sebagai panjang jalan dibagi waktu tempuh jalan tersebut. Kecepatan tempuh digunakan sebagai ukuran utama kinerja segmen jalan serta masukan yang penting bagi pemakai jalan dalam analisa ekonomi.

$$V = \frac{L}{TT} \quad \text{..... Pers. 2.3}$$

Dimana :

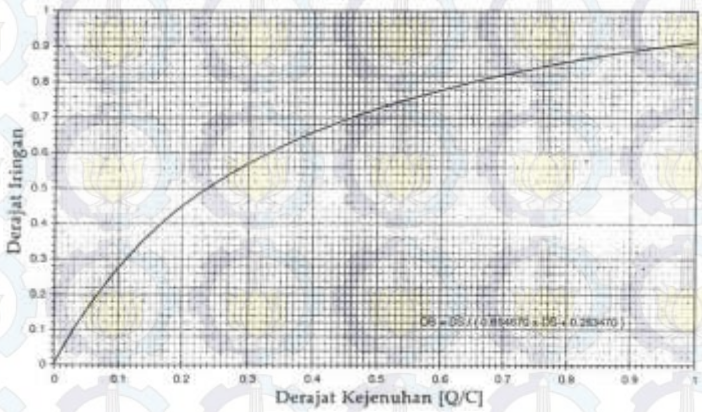
V = kecepatan (km/jam)
TT = waktu tempuh rata – rata (jam)
L = jarak yang ditempuh (km)

2.3.5 Derajat Iringan

Derajat iringan yaitu rasio antara kendaraan didalam pleton terhadap arus total. Pleton didefinisikan sebagai gerakan dari kendaraan yang beriringan dengan waktu antara gandar depan ke gandar depan dari kendaraan yang didepannya dari setiap kendaraan.

DB = DS/(0,814670 x DS + 0,283470)……pers 2.4

Dimana :
DB = Derajat iringan
DS = Derajat kejenuhan



Gambar 2.1 Grafik hubungan antara derajat kejenuhan dengan derajat iringan.

2.3.6 Ekivalensi Mobil Penumpang

Faktor konversi berbagai jenis kendaraan dibandingkan dengan mobil penumpang atau kendaraan ringan lainnya sehubungan dengan dampaknya pada perilaku lalu lintas, dimana arus berbagai kendaraan yang berbeda telah diubah menjadi arus kendaraan ringan (termasuk mobil penumpang/emp) seperti yang tertulis dalam MKJI 1997.

Tabel 2.6 Tabel emp (2/2 UD)

Tipe Alinyemen	Arus Total (kend/jam)	emp					
		MHV	LB	LT	MC		
					Lebar jalur lalu lintas (m)		
					< 6 m	6 - 8 m	> 8 m
Datar	0	1,2	1,2	1,8	0,8	0,6	0,4
	800	1,8	1,8	2,7	1,2	0,9	0,6
	1350	1,5	1,6	2,5	0,9	0,7	0,5
	≥ 1900	1,3	1,5	2,5	0,6	0,5	0,4
Bukit	0	1,8	1,6	5,2	0,7	0,5	0,3
	650	2,4	2,5	5,0	1,0	0,8	0,5
	1100	2,0	2,0	4,0	0,8	0,6	0,4
	≥ 1600	1,7	1,7	3,2	0,5	0,4	0,3
Gunung	0	3,5	2,5	6,0	0,6	0,4	0,2
	450	3,0	3,2	5,5	0,9	0,7	0,4
	900	2,5	2,5	5,0	0,7	0,5	0,3
	≥ 1350	1,9	2,2	4,0	0,5	0,4	0,3

Sumber : MKJI (1997)

Tabel 2.7 Tabel emp (4/2 D)

Tipe Alinyemen	Arus Total (Kend/Jam)		Emp			
	Jalan Terbagi Per Arah (Kend/Jam)	Jalan Tak Terbagi Total (Kend/Jam)	MHV	LB	LT	MC
Datar	0	0	1,2	1,2	1,6	0,5
	1000	1700	1,4	1,4	2	0,6
	1800	3250	1,6	1,7	2,5	0,8
	≥ 2150	≥ 3950	1,3	1,5	2	0,5
Bukit	0	0	1,8	1,6	4,8	0,4
	750	1350	2	2	4,6	0,5
	1400	2500	2,2	2,3	4,3	0,7
	≥ 1750	≥ 3150	1,8	1,9	3,5	0,4
Gunung	0	0	3,2	2,2	5,5	0,3
	550	1000	2,9	2,6	5,1	0,4
	1100	2000	2,6	2,9	4,8	0,6
	≥ 1500	≥ 2700	2	2,4	3,8	0,3

Sumber : MKJI (1997)

2.3.7 Kecepatan Arus Bebas

Jarak yang ditempuh dalam waktu tertentu. Faktor yang mempengaruhi kecepatan adalah kondisi jalan, volume lalu lintas, kondisi kendaraan dan lingkungan. Sedangkan kecepatan kendaraan bebas adalah kecepatan pada saat tingkatan arus nol sesuai dengan kecepatan yang dipilih pengemudi. Seandainya mengendarai kendaraan bermotor, tanpa halangan kendaraan bermotor lainnya.

$$FV = (Fv_o + FV_w) \times FFV_{sf} \times FFV_{rc} \quad \text{Pers. 2.5}$$

Dimana :

FV = Kecepatan arus bebas kendaran ringan pada kondisi lapangan (km/jam).

Fvo = Kecepatan arus bebas dasar kendaraan ringan (km/jam).

FVw = Penyesuaian untuk lebar efektif jalur lalu - lintas (km/jam), penambahan.

FFVsf = Faktor penyesuaian untuk kondisi hambatan samping, perkalian.

FFVrc = Faktor penyesuaian untuk kelas fungsi jalan,perkalian.

Tabel 2.8 Kecepatan Arus Bebas Dasar (FVo)

Tipe jalan/ Tipe alinyemen/ (Kelas jarak pandang)	Kecepatan arus bebas dasar (km/jam)				
	Kendaraan ringan LV	Kendaraan berat menengah MHV	Bus besar LB	Truk besar LT	Sepeda motor MC
Enam-lajur terbagi					
- Datar	83	67	86	64	64
- Bukit	71	56	68	52	58
- Gunung	62	45	55	40	55
Empat-lajur terbagi					
- Datar	78	65	81	62	64
- Bukit	68	55	66	51	58
- Gunung	60	44	53	39	55
Empat-lajur tak terbagi					
- Datar	74	63	78	60	60
- Bukit	66	54	65	50	56
- Gunung	58	43	52	39	53
Dua-lajur tak terbagi					
- Datar SDC: A	68	60	73	58	55
" " B	65	57	69	55	54
" " C	61	54	63	52	53
- Bukit	61	52	62	49	53
- Gunung	55	42	50	38	51

Sumber : MKJI (1997)

Tabel 2.9 Faktor Penyesuaian Kecepatan Arus Bebas Akibat Lebar Jalur Lalu Lintas (FVw)

Tipe jalan	Lebar efektif jalur lalu lintas(W_C) (m)	FV_w (km/jam)		
		Datar: SDC= A,B	- Bukit: SDC= A,B,C -Datar: SDC=C	Gunung
Empat-lajur dan Enam-lajur terbagi	Per lajur			
	3,00	-3	-3	-2
	3,25	-1	-1	-1
	3,50	0	0	0
	3,75	2	2	2
Empat-lajur tak terbagi	Per lajur			
	3,00	-3	-2	-1
	3,25	-1	-1	-1
	3,50	0	0	0
	3,75	2	2	2
Dua-lajur tak terbagi	Total			
	5	-11	-9	-7
	6	-3	-2	-1
	7	0	0	0
	8	1	1	0
	9	2	2	1
	10	3	3	2
	11	3	3	2

Sumber : MKJI (1997)

Tabel 2.10 Faktor Penyesuaian Kecepatan Arus Bebas Akibat Hambatan Samping (FFVsf)

Tipe jalan	Kelas hambatan samping (SFC)	Faktor penyesuaian akibat hambatan samping dan lebar bahu			
		Lebar bahu efektif W_s (m)			
		≤ 0,5 m	1,0 m	1,5 m	≥ 2 m
Empat-lajur terbagi 4/2 D	Sangat rendah	1,00	1,00	1,00	1,00
	Rendah	0,98	0,98	0,98	0,99
	Sedang	0,95	0,95	0,96	0,98
	Tinggi	0,91	0,92	0,93	0,97
	Sangat Tinggi	0,86	0,87	0,89	0,96
Empat-lajur tak terbagi 4/2 UD	Sangat rendah	1,00	1,00	1,00	1,00
	Rendah	0,96	0,97	0,97	0,98
	Sedang	0,92	0,94	0,95	0,97
	Tinggi	0,88	0,89	0,90	0,96
	Sangat Tinggei	0,81	0,83	0,85	0,95
Dua-lajur tak terbagi 2/2 UD	Sangat rendah	1,00	1,00	1,00	1,00
	Rendah	0,96	0,97	0,97	0,98
	Sedang	0,91	0,92	0,93	0,97
	Tinggi	0,85	0,87	0,88	0,95
	Sangat Tinggi	0,76	0,79	0,82	0,93

Sumber : MKJI (1997)

Tabel 2.11 Faktor Penyesuaian Kecepatan Arus Bebas Akibat Kelas Fungsional Jalan (FFVrc)

Tipe Jalan	Faktor penyesuaian FFV_{RC}				
	Pengembangan samping jalan (%)				
	0	25	50	75	100
Empat-lajur terbagi					
Arteri	1,00	0,99	0,98	0,96	0,95
Kolektor	0,99	0,98	0,97	0,95	0,94
Lokal	0,98	0,97	0,96	0,94	0,93
Empat-lajur tak-terbagi:					
Arteri	1,00	0,99	0,97	0,96	0,945
Kolektor	0,97	0,96	0,94	0,93	0,915
Lokal	0,95	0,94	0,92	0,91	0,895
Dua-lajur tak-terbagi					
Arteri	1,00	0,98	0,97	0,96	0,94
Kolektor	0,94	0,93	0,91	0,90	0,88
Lokal	0,90	0,88	0,87	0,86	0,84

Sumber : MKJI (1997)

2.4 Peramalan Lalu Lintas

Untuk memperkirakan biaya – biaya yang akan dikeluarkan dimasa yang akan datang, seiring dengan bertambahnya jumlah kendaraan.

2.4.2 Persamaan Regresi Linear

Peramalan dengan metode regresi linier akan didapatkan persamaan garis linier dengan data yang telah ada. Terdapat hubungan fungsional antara variable – variabelnya dalam persamaan linier yang dihasilkan. Jumlah kendaraan dinyatakan sebagi variabel tidak bebas dengan notasi *Y* sedangkan tahun dinyatakan sebagai variabel bebas dengan notasi *X*. Secara Matematis dapat dirumuskan dalam persamaan:

Penyimpangan diusahakan sekecil mungkin agar sesuai dengan data yang ada, hal ini dinyatakan dalam bentuk matematis sebagai hubungan fungsional antara variabel – variabelnya secara matematis.

Y = ax + b

Sedangkan harga untuk koefisien a dan b dapat dicari dengan persamaan sebagai berikut :

$$a = \frac{\left(n\sum xy - \sum x \sum y\right)}{\left(n\sum x^2 - \left(\sum x\right)^2\right)} \quad \text{Pers. 2.6}$$

$$b = \frac{\left(\sum y - a * \sum x\right)}{n} \quad \text{Pers. 2.7}$$

$$r = \frac{\left(n\sum xy - \sum x \sum y\right)}{\sqrt{\left(n\sum x^2 - \left(\sum x\right)^2 \left(n\sum y^2 - \left(\sum y\right)^2\right)\right)}} \quad \text{Pers. 2.8}$$

Dimana :

a dan b	= koef regresi
Y	= variabel tidak bebas
X	= variabel bebas
n	= jumlah data

2.5 Biaya Operasi Kendaraan

Biaya yang digunakan kendaraan untuk beroperasi dari suatu tempat menuju ke tempat lain.Metode yang digunakan dalam tugas akhir ini menggunakan metode Jasa Marga.Biaya operasional kendaraan (BOK) terdiri dari biaya konsumsi bahan bakar, biaya konsumsi minyak pelumas, biaya pemakaian ban, biaya pemeliharaan, biaya penyusutan, bunga modal, dan biaya asuransi.

2.5.1 Biaya Konsumsi Bahan Bakar

Biaya yang dibutuhkan untuk konsumsi suku cadang kendaraan dalam pengoperasian suatu jenis kendaraan per kilometer jarak tempuh.

KBB = KBB dasar x (1 ± (*k*k + *k*l + k_r)) ..... Pers .2.9

KBB = Konsumsi bahan bakar

KBB dasar kendaraan golongan I = 0,0284 V^2 – 3,0644 V + 141,68

KBB dasar kendaraan golongan IIA = 2,26533 x(KBB dasar golongan I)

KBB dasar kendaraan golongan IIB = 2,90805 x(KBB dasar golongan I)

***k*k** = faktor koreksi akibat kelandaian

***k*l** = faktor koreksi akibat kondisi arus lalulintas

k_r = faktor koreksi akibat kekasaran jalan

V = kecepatan kendaraan (km/jam)

Tabel 2.12 Faktor koreksi konsumsi bahan bakar dasar kendaraan (***k***k)

Faktor koreksi akibat kelandaian negatif (*k*k)	**g<–5%**	**–0,337**
	–5%< g < 0%	**–0,158**
Faktor koreksi akibat kelandaian positif (*k*k)	**0% < g < 5%**	**0,400**
	g > 5%	**0,820**
Faktor koreksi akibat kondisi arus lalulintas (*k*l)	**0 < NVK < 0,6**	**0,050**
	0,6 < NVK < 0,8	**0,185**
	NVK > 0,8	**0,253**
Faktor koreksi akibat kekasaran jalan (k_r)	**< 3 m/km**	**0,035**
	> 3 m/km	**0,085**

g = kelandaian

NVK = nisbah volume per kapasitas

Sumber : Tamin (2000)

2.5.2 Biaya konsumsi oli

Besarnya konsumsi minyak pelumas (liter/km) sangat tergantung pada kecepatan kendaraan dan jenis kendaraan. Konsumsi dasar ini kemudian dikoreksi lagi menurut tingkat kekasaran jalan.

Tabel 2.13 Konsumsi dasar minyak pelumas (liter/km)

Kecepatan (km/jam)	Jenis kendaraan		
	Golongan I	Golongan IIA	Golongan IIB
10-20	0,0032	0,0060	0,0049
20-30	0,0030	0,0057	0,0046
30-40	0,0028	0,0055	0,0044
40-50	0,0027	0,0054	0,0043
50-60	0,0027	0,0054	0,0043
60-70	0,0029	0,0055	0,0044
70-80	0,0031	0,0057	0,0046
80-90	0,0033	0,0060	0,0049
90-100	0,0035	0,0064	0,0053
100-110	0,0038	0,0070	0,0059

Sumber : Tamin (2000)

Tabel 2.14 Faktor koreksi konsumsi minyak pelumas terhadap kondisi kekasaran permukaan

Nilai kekasaran	Faktor koreksi
< 3 m/km	1,00
> 3 m/km	1,50

Sumber : Tamin (2000)

2.5.3 Biaya konsumsi ban

Biaya pemakaian ban besarnya biaya pemakaian ban sangat tergantung pada kecepatan kendaraan dan jenis kendaraan.

Kendaraan golongan I : $Y = 0{,}0008848\ V - 0{,}0045333$..Pers. 2.10

Kendaraan golongan IIA : $Y = 0{,}0012356\ V - 0{,}0064667$..Pers. 2.11

Kendaraan golongan IIB : $Y = 0{,}0015553\ V - 0{,}0059333$...Pers.2.12

Y = pemakaian ban per 1.000 km

2.5.4 Biaya pemeliharaan

Biaya pemeliharaan Komponen biaya pemeliharaan yang paling dominan adalah biaya suku cadang dan upah montir.

a Suku cadang

Golongan I : $Y = 0{,}0000064\ V + 0{,}0005567$… Pers. 2.13

Golongan IIA : $Y = 0{,}0000332\ V + 0{,}0020891$… Pers. 2.14

Golongan IIB : $Y = 0{,}0000191\ V + 0{,}0015400$ …Pers. 2.15

Y = biaya pemeliharaan suku cadang 5per 1.000 km

b Montir

Golongan I : $Y = 0{,}00362\ V + 0{,}36267$ ……Pers. 2.16

Golongan IIA : $Y = 0{,}02311\ V + 1{,}97733$ .....Pers. 2.17

Golongan IIB : $Y = 0{,}01511\ V + 1{,}21200$ ……Pers. 2.18

Y = jam kerja montir per 1.000 km

2.5.5 Biaya penyusutan

Biaya penyusutan hanya berlaku untuk perhitungan BOK pada jalan tol dan jalan arteri, besarnya berbanding terbalik dengan kecepatan kendaraan.

Golongan I : $Y = 1/(2{,}5\ V + 125)$ ……Pers. 2.19

Golongan IIA : $Y = 1/(9{,}0\ V + 450)$ ……...Pers. 2.20

Golongan IIB : $Y = 1/(6{,}0\ V + 300)$ ……Pers. 2.21

Y = biaya penyusutan per 1.000 km (sama dengan 1/2 nilai penyusutan kendaraan)

2.5.6 Bunga modal

Bunga modal menurut *Road User Costs Model* (1991), besarnya biaya
bunga modal per kendaraan per 1.000 km ditentukan oleh persamaan berikut.

Bunga modal = 0,22% x (harga kendaraan baru)…….. Pers. 2.22

2.5.7 Biaya asuransi

Biaya asuransi besarnya biaya asuransi berbanding terbalik dengan kecepatan. Semakin tinggi kecepatan kendaraan, semakin kecil biaya asuransi.

Golongan I : $Y = 38/(500\ V)$ ……. Pers. 2.23

Golongan IIA : $Y = 6/(2571{,}42857\ V)$…….. Pers. 2.24

Golongan IIB : $Y = 61/(1714{,}28571\ V)$……. Pers. 2.25

Y = biaya asuransi per 1.000 km

2.6 Nilai Waktu Kendaraan

Penghematan waktu perjalanan yang dinilai secara ekonomis untuk masing – masing pemakai jalan. Dan nilai waktu ialah sejumlah uang yang dikeluarkan seseorang untuk menghemat satu unit waktu perjalanan. Nilai waktu biasanya sebanding dengan pendapatan per kapita, merupakan perbandingan yang tetap dengan

tingkat pendapatan. Besarnya nilai waktu berbeda- beda menurut jenis kendaraan dan lokasi studi.

Nilai Waktu = maksimum {(k x nilai waktu dasar), nilai waktu minimum}……Pers. 2.26

Beberapa modifikasi dilakukan untuk memilih nilai waktu yang terbesar antar nilai waktu dasar yang dikoreksi menurut lokasi dengan nilai waktu minimum. Dalam laporan ini didapat besarnya nilai waktu, nilai waktu dasar yang diambil nilai waktu dari berbagai studi pada tabel dibawah ini.

Tabel 2.15 Nilai waktu minimum (Rupiah/jam/kendaraan)

No	Kabupaten/ Kodya	Jasa Marga			JIUTR		
		Gol I	Gol IIA	Gol IIB	Gol I	Gol IIA	Gol IIB
1	DKI – Jakarta	8.200	12.369	9.188	8.200	17.022	4.246
2	Selain DKI - Jakarta	6.000	9.051	6.723	6.000	12.455	3.107

Sumber : Tamin (2000)

Tabel 2.16 Nilai Waktu Dasar Dari Berbagai Studi (Rp/Jam/Kend)

No	Referensi	Jasa Marga		
		Gol I	Gol IIa	Gol Iib
1	PT. Jasa Marga (1990-1996)	12287	18534	13768
2	Padalarang – Cileunyi (1996)	3385-5425	3827-38344	5716
3	Semarang (1996)	3411-6221	14541	1506
4	IHCM (1995)	3281	18212	4971
5	PCI (1979)	1341	3827	3152
6	JIUTR Northem Extension (PCI, 1989)	7076	14670	3659
7	Surabaya, Mojokerto (JICA, 1991)	8880	7960	7980

Sumber : Tamin (2000)

2.7 Analisa Ekonomi

Evaluasi ekonomi mencakup evaluasi kelayakan pembangunan jalan dengan memperhitungkan nilai – nilai sebagai berikut :

a. Benefit Cost Ratio (BCR)

Membandingkan semua manfaat (benefit) dengan biaya (cost) total yang dibutuhkan, setelah dikonversikan kedalam nilai uang sekarang (present value). Dengan perumusan :

$$B/C = \frac{Benefit}{Cost} \quad \text{Pers. 2.27}$$

Benefit = penghematan biaya operasi kendaraan, penghematan nilai waktu.

Cost = biaya pembangunan jalan dan biaya pemeliharaan.

Nilai B/C yang mungkin :
B/C > 1 : Berarti manfaat yang ditimbulkan proyek lebih besar dari biaya yang diperlukan secara ekonomi, proyek layak untuk dilaksanakan.
B/C = 1 : Berarti manfaat yang ditimbulkan proyek sama dengan biaya yang diperlukan secara ekonomi, proyek layak dilaksanakan.
B/C < 1 : Berarti manfaat yang ditimbulkan proyek lebih kecil dari biaya yang diperlukan secara ekonomi proyek tidak layak untuk dilaksanakan.

b. Net Present Value (NPV)

Mengurangi semua manfaat (benefit) dengan biaya (cost) total yang dibutuhkan setelah di konversikan ke dalam nilai uang sekarang. Dengan perumusan :

NPV = Benefit – Cost ..... Pers. 2.28

Suatu proyek bisa dikatakan layak jika NPV > 0, yaitu bila manfaat yang dihasilkan proyek lebih besar dari biaya yang diperlukan untuk pelaksanaan pekerjaan.

“Halaman ini sengaja dikosongkan”

BAB III
METODOLOGI

3.1 Umum

Sebelum mengerjakan tugas akhir ini maka perlu disusun langkah-langkah pengerjaan sesuai dengan uraian kegiatan yang akan dilakukan dan dibuat diagram alir metodologi.

3.2 Uraian Kegiatan

- **Studi literatur dan bahan pustaka**

  Dalam penyusunan tugas akhir ini di perlukan literatur yang digunakan sebagai acuan untuk menyusun tugas akhir ini .Literatur yang di gunakan :

  1. Manual Kapasitas Jalan Indonesia (MKJI)
  2. Perencanaan dan Pemodelan Transportasi Ofyar Z.Tamin.

- **Penentuan lokasi survey traffic counting**

  Lokasi survey berada pada bagian tertentu ruas jalan antara batas kota Tuban sampai kecamatan Bulu.

- **Pengumpulan data sekunder**.

  Data sekunder adalah data yang diperoleh melalui instansi terkait atau dari studi yang telah ada, yang terdiri dari:

  1. Data Tata guna lahan di daerah sekitar
  2. Data geometrik jalan
  3. Data LHRT (Lalu-Lintas Harian Rata-rata Tahunan)

- **Pengolahan data**

  1. Peramalan Pertumbuhan Jumlah Kendaraan (Forecasting)

     Peramalan menggunakan regresi linier dengan memasukkan data volume lalu lintas harian rata – rata (LHRT) untuk mendapatkan volume kendaraan pada tahun rencana.

2. Analisa lalu lintas

   Dilakukan untuk meninjau kondisi lalu lintas eksisting maupun ataupun rencana, Data diperoleh dari melakukan *survey traffic counting* pada lokasi studi dan untuk mempermudah perhitungan maka digunakan program bantu KAJI sesuai dengan MKJI 1997, untuk mendapatkan derajad kejenuhan ,kecepatan,dan waktu tempuh.

3. Menghitung biaya operasional kendaraan

   Dengan menggunakan data kecepatan kendaraan eksisting dan rencana yang diperoleh dari program bantu KAJI maka dengan menggunakan metode Jasa Marga didapatkan biaya operasional perkendaraan baik itu dengan kecepatan kondisi eksisting maupun rencana.

4. Menghitung biaya nilai waktu

   Dengan menggunakan data yang telah terkumpul yaitu nilai waktu dan jumlah kendaraan/hari. Maka bisa didapatkan biaya nilai waktu kondisi eksisting maupun rencana.

- **Analisa ekonomi**

1. Penghematan (BOK) Biaya Operasional Kendaraan

   Penghematan biaya operasional kendaraan merupakan selisih antara biaya operasional kendaraan pada jalan eksisting dan biaya operasional kendaraan setelah dilakukan pelebaran jalan.

2. Penghematan Nilai Waktu

   Perhitungan penghematan nilai waktu diperoleh dengan membandingkan nilai waktu pada kondisi eksisting dan kondisi setelah dilebarkan.

3. Benefit Cost Ratio

   Membandingkan antara besarnya biaya penghematan (benefit) dengan besarnya biaya pembangunan (cost). Untuk memenuhi syarat layak

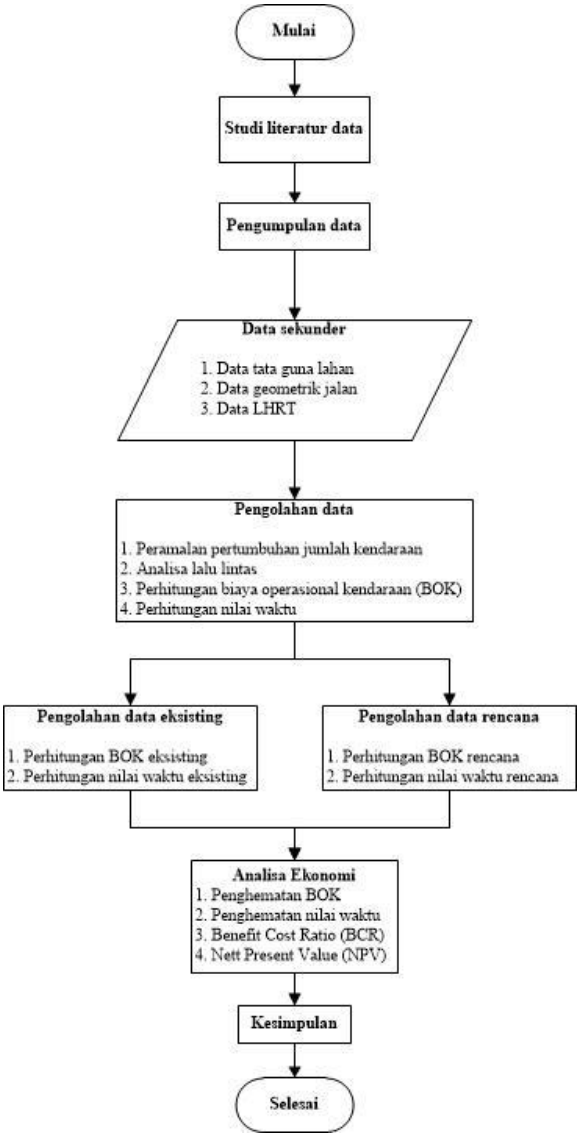
tidaknya pelebaran jalan ini dilaksanakan nilai BCR harus lebih besar dari 1 (BCR >1).

4. Net Present Value

   Selisih antara pengeluaran dan pemasukan. Pelebaran jalan di jalan bulu Tuban layak dilaksanakan bila nilai NPV > 0.

3.3 Bagan Alir Metodologi

Tahapan pengerjaan proposal tugas akhir ini dapat ditunjukkan dalam bagan alir seperti pada gambar 3.1



Gambar 3.1 Bagan Alir

BAB IV
DATA DAN ANALISA

4.1 Umum

Analisa data diperoleh dengan cara mengolah data sekunder. Kemudian dari pengolahan data tersebut dilanjutkan dengan analisa ekonomi yang meliputi biaya operasional kendaraan (BOK),nilai waktu, benefit cost ratio (BCR),dan net present value (NPV).

4.2 Peramalan

Data jumlah kendaraan bermotor dari tahun 2007 sampai tahun 2010 digunakan untuk meramalkan pertumbuhan lalu lintas untuk masing masing jenis kendaraan .Untuk mengolah data pertumbuhan jumlah kendaraan tiap tahun digunakan program bantu (MS Excel) yaitu dengan cara perhitungan regresi linear. Langkah langkah dalam mencari pertumbuhan jumlah kendaraan adalah sebagai berikut :

1. Dari data masing masing jumlah kendaraan bermotor dapat diperoleh grafik dan persamaan regresi.
2. Cek grafik regresi apabila nilai r mendekati 1 maka rumus dari grafik tersebut mendekati data yang sebenarnya.
3. Dari persamaan regresi dapat diperoleh prediksi pertumbuhan kendaraan untuk masing masing tahun pada umur 20 tahun mendatang dengan menggunakan rumus hasil regresi.
4. Dari hasil perhitungan persamaan regresi dapat diperoleh pertumbuhan tiap kendaraan untuk masing masing tahun.

5. Dengan jumlah hasil dari hitungan persamaan pertumbuhan lalu lintas pada tiap kendaraan untuk masing masing tahun dapat diperoleh rata rata pertumbahan lalu lintas (i).
6. Kemudian kita ubah hasil dari rata rata pertumbuhan lalu lintas (i) kedalam bentuk persen (%).maka dapat diketahui pertumbuhan lalu lintas dari masing masing jenis kendaraan.

Tabel 4.1 Data jumlah kendaraan jalan Bulu – Tuban tahun 2007 – 2010

Jenis Kendaraan	Tahun			
	2007	2008	2009	2010
MC	3720	4322	4957	5452
LV	3345	3891	4568	5291
MHV	414	548	650	744
LB	14	15	21	24
LT	311	401	446	559

(sumber : Dinas Bina Marga Provinsi Jawa Timur)

Hasil regresi dari data jumlah masing masing kendaraan dari tahun 2007 – 2010 dapat diperoleh pertumbuhan lalu lintas untuk masing masing jenis kendaraan sebagai berikut :

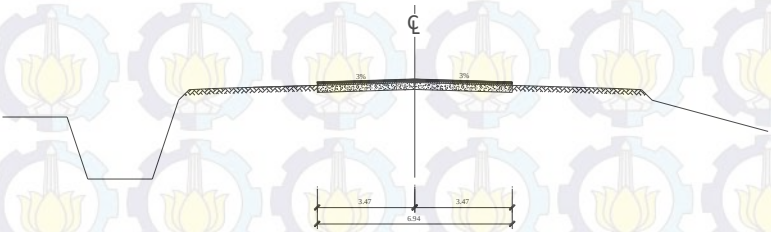
Tabel 4.2 Data pertumbuhan jumlah kendaraan jalan Bulu – Tuban.

No	Jenis Kendaraan	Pertumbuhan Kendaraan (%)
1	MC	6.36
2	LV	6.97
3	MHV	7.43
4	LB	8.36
5	LT	8.34

4.3 Kondisi Eksisting Ruas Jalan

Kondisi ruas jalan Bulu – Tuban saat ini adalah berupa jalan arteri primer yang mana merupakan jalan nasional yang menghubungkan antar kota.jalan tersebut berfungsi melayani angkutan utama dengan ciri ciri perjalanan jarak jauh, kecepatan rata rata tinggi,dan jumlah jalan masuk dibatasi secara daya guna.Analisa kondisi eksisting pada jalan tersebut dianalisa sampai 20 tahun mendatang yaitu sampai tahun 2034 dengan pertimbangan volume jalan raya pada tahun tersebut yang semakin padat,sehingga untuk menghindari kemacetan tersebut diperlukan pelebaran jalan dari 2 lajur 2 arah tak terbagi menjadi 4 lajur 2 arah tak terbagi.karakteristik ruas jalan Bulu – Tuban adalah sebagai berikut:

- Tipe jalan : 2 lajur 2 arah tak terbagi (2/2 UD)
- Lebar jalan : 7m
- Panjang jalan : 7,5 km



Gambar 4.1 Potongan melintang jalan Bulu Tuban eksisting.

Dari hasil peramalan volume kendaraan maka dapat dicari tingkat kinerja jalan eksisting pada tahun 2014 sampai dengan tahun 2034 dengan menggunakan program bantu (KAJI) .

Tabel 4.3 Perkiraan volume LHR (kend/hari) masing masing jenis kendaraan

Tahun	LV	MHV	LB	LT	MC	TOTAL
2014	7856	8699	38	864	7820	25277
2015	8508	9365	42	943	8403	27261
2016	9159	10032	46	1022	8986	29244
2017	9810	10699	49	1101	9569	31228
2018	10462	11366	53	1180	10152	33212
2019	11113	12033	56	1258	10735	35196
2020	11765	12699	60	1337	11318	37180
2021	12416	13366	64	1416	11902	39164
2022	13068	14033	67	1495	12485	41148
2023	13719	14700	71	1574	13068	43132
2024	14371	15367	74	1653	13651	45116
2025	15023	16033	78	1732	14234	47100
2026	15674	16700	82	1811	14817	49083
2027	16325	17367	85	1890	15400	51067
2028	16977	18034	89	1969	15983	53051
2029	17628	18701	92	2047	16566	55035
2030	18280	19367	96	2126	17149	57019
2031	18931	20034	100	2205	17733	59003
2032	19583	20701	103	2284	18316	60987
2033	20234	21368	107	2363	18899	62971
2034	20886	22035	110	2442	19482	64955

Hasil dari analisa program KAJI akan diperoleh nilai derajat kejenuhan (DS) ,waktu tempuh (travel time),dan kecepatan aktual kendaraan.

Contoh perhitungan kecepatan aktual dan travel time masing-masing jenis kendaraan pada kondisi eksisting tahun 2014 adalah sebagai berikut :

Data jalan eksisting

Tipe jalan : 2 lajur 2 arah tak terbagi (2/2 UD)
Kelas jalan : Jalan nasional
Kelas fungsional : Arteri
Panjang jalan : 7,5 km
Tipe alinyemen : Datar

Penampang melintang jalan:

Lebar lalu lintas rata-rata (Wc) : 3,5 m
Lebar bahu efektif (Ws) :3,7 m

Kondisi permukaan jalan:

Tipe Perkerasan : Perkerasan lentur
Kondisi bahu :
Tipe permukaan:
Beda tinggi :

Lalu lintas harian rata rata tahunan:

emp:
LV = 1 ; MHV = 1,3 ; LB=1,5 ; LT = 2,5 ; MC = 0,5
k = 0,08
data jumlah masing-masing kendaraan (kend/hari)

Tahun	LV	MHV	LB	LT	MC	TOTAL
2014	7856	8699	38	864	7820	25277

LV = Volume LV(kend/hari) x k
= 7856 x 0,08 = 628 kend/jam
MHV = Volume MHV(kend/hari) x k
= 8699 x 0,08 = 696 kend/jam
LB = Volume LB(kend/hari) x k
= 38 x 0,08 = 3 kend/jam
LT = Volume LT(kend/hari) x k
= 864 x 0,08 = 69 kend/jam
MC = Volume MC(kend/hari) x k
= 7820 x 0,08 = 626 kend/jam

LV = Volume kend/hari x k x emp
= 628 x 1 = 628 smp/jam
MHV = Volume kend/hari x k x emp
= 696 x 1,3 = 905 smp/jam
LB = Volume kend/hari x k x emp
= 3 x 1,5 = 5 smp/jam
LT = Volume kend/hari x k x emp
= 69 x 2,5 = 173 smp/jam
MC = Volume kend/hari x k x emp
= 626 x 0,5 = 313 smp/jam

Arus total (Q)

$Q = Q_{LV} + Q_{MHV} + Q_{LB} + Q_{LT} + Q_{MC}$
= 628 + 696 + 3 + 69 + 626 = 2022 kend/jam
$Q = Q_{LV} + Q_{MHV} + Q_{LB} + Q_{LT} + Q_{MC}$
= 628 + 905 + 5 + 173 + 313 = 2023 smp/jam
Hambatan samping = L

Kecepatan arus bebas kendaraan ringan

Fvo = 68 km/jam

Fvw = 0 km/jam

Fvo + Fvw = 65 + 0 = 68 km/jam

FFvsf = 0,98

FFvcs = 1

FV = (Fvo + Fvw) x FFvsf x FFvcs

= 68 x 0,98 x 1 = 66,64 km/jam

Kecepatan arus bebas kendaraan kendaraan berat menengah (MHV)

FFV = FVo – FV

= 68 – 66,64 = 1,36 km/jam

$FV_{MHV} = FV_{MHV\,O} – FFV \times FV_{MHV\,O} / FV_O$

= 60 – 1,36 x 60/68 = 58,8 km/jam

Kecepatan arus bebas kendaraan kendaraan berat (LT)

FFV = FVo – FV

= 68 – 66,64 = 1,36 km/jam

$FV_{LT} = FV_{LT\,O} – FFV \times FV_{LT\,O} / FV_O$

= 58 – 1,36 x 58/68 = 56,84 km/jam

Kapasitas

C_o = 3100 smp/jam

FC_w = 1

FC_{SP} = 0,97

FC_{SF} = 1

$C = C_o \times FC_w \times FC_{SP} \times FC_{SF}$

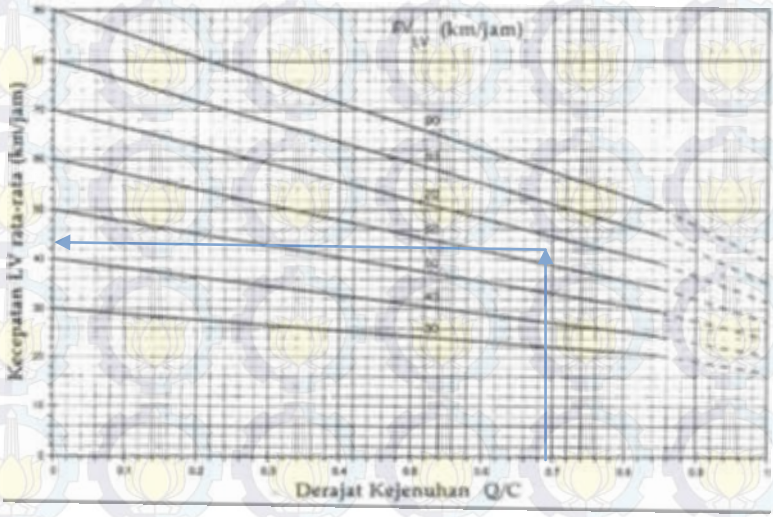
= 3100 x 1 x 0,97 x 1 = 3007 smp/jam

Kecepatan kendaraan ringan

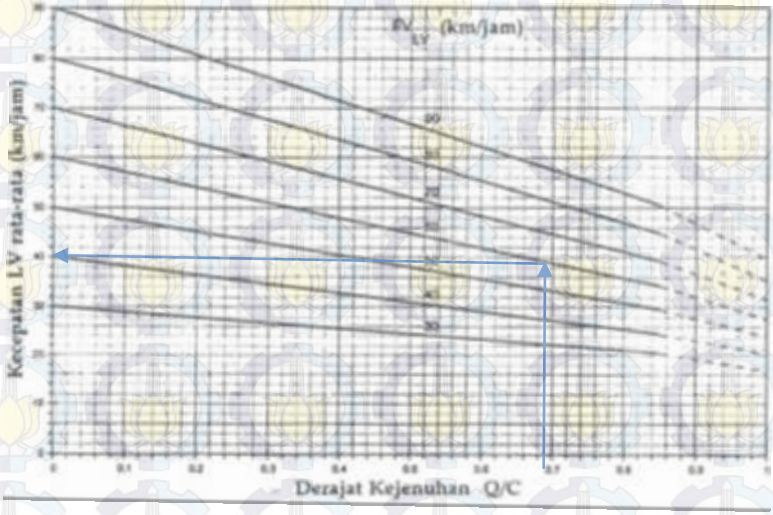
Q = 2023 smp/jam

DS = Q/C

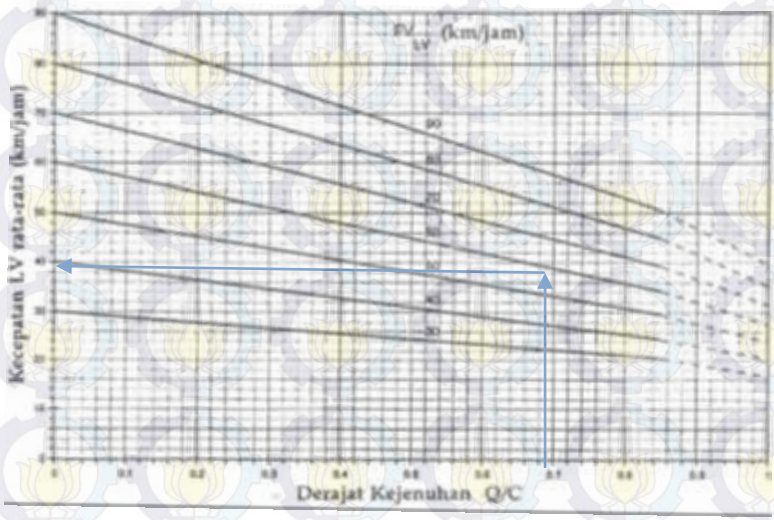
= 2023/3007 =0.673



Gambar 4.2 Grafik hubungan antara DS dan kecepatan LV



Gambar 4.3 Grafik hubungan antara DS dan kecepatan MHV

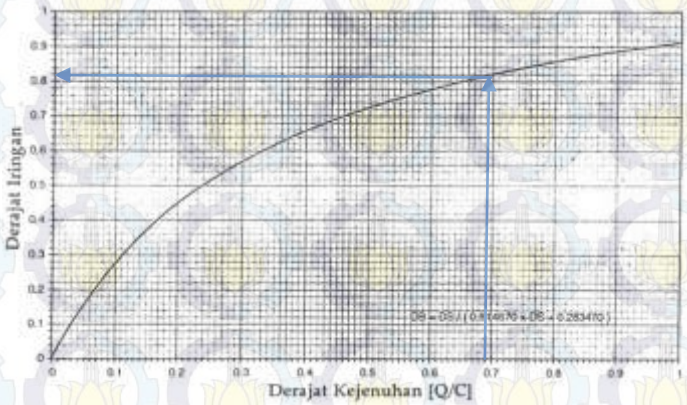


Gambar 4.4 Grafik hubungan antara DS dan kecepatan LT

V_{LV} = 43,58 km/jam
V_{MHV} = 40,70 km/jam
V_{LT} = 39,98 km/jam

TT_{LV} = Panjang jalan/ V_{LV} x 3600
= 7,5/42,47 x 3600 = 635,743 detik
TT_{MHV} = Panjang jalan/ V_{MHV} x 3600
= 7,5/42,47 x 3600 = 635,743 detik
TT_{LT} = Panjang jalan/ V_{LT} x 3600
= 7,5/42,47 x 3600 = 635,743 detik

Derajat iringan (DB)



Gambar 4.5 Grafik hubungan antara DS dan derajat iringan

DB = 0,81

Tabel 4.4 Tabel derajat kejenuhan, kecepatan ,dan traveltime untuk kondisi jalan eksisting kendaraan gol I.

TAHUN	DS	KECEPATAN AKTUAL GOL I (KM/JAM)	TRAVEL TIME (DETIK)
2014	0.673	43.58	619.433
2015	0.749	40.58	665.352
2016	0.804	38.74	696.954
2017	0.860	36.70	735.695
2018	0.914	34.10	791.789
2019	0.969	31.41	859.599
2020	1.025	N/A	N/A
2021	1.081	N/A	N/A
2022	1.135	N/A	N/A
2023	1.191	N/A	N/A
2024	1.246	N/A	N/A
2025	1.302	N/A	N/A
2026	1.356	N/A	N/A
2027	1.411	N/A	N/A
2028	1.467	N/A	N/A
2029	1.522	N/A	N/A
2030	1.578	N/A	N/A
2031	1.631	N/A	N/A
2032	1.687	N/A	N/A
2033	1.742	N/A	N/A
2034	1.797	N/A	N/A

Tabel 4.5 Tabel kecepatan ,dan traveltime untuk kondisi jalan eksisting kendaraan gol II A.

TAHUN	KECEPATAN AKTUAL GOL II A (KM/JAM)	TRAVEL TIME (DETIK)
2014	40.7	663.3906634
2015	38.28	705.3291536
2016	36.84	732.8990228
2017	35.24	766.1748014
2018	33.2	813.253012
2019	31.09	868.4464458
2020	N/A	N/A
2021	N/A	N/A
2022	N/A	N/A
2023	N/A	N/A
2024	N/A	N/A
2025	N/A	N/A
2026	N/A	N/A
2027	N/A	N/A
2028	N/A	N/A
2029	N/A	N/A
2030	N/A	N/A
2031	N/A	N/A
2032	N/A	N/A
2033	N/A	N/A
2034	N/A	N/A

Tabel 4.6 Tabel kecepatan ,dan traveltime untuk kondisi jalan eksisting kendaraan gol II B.

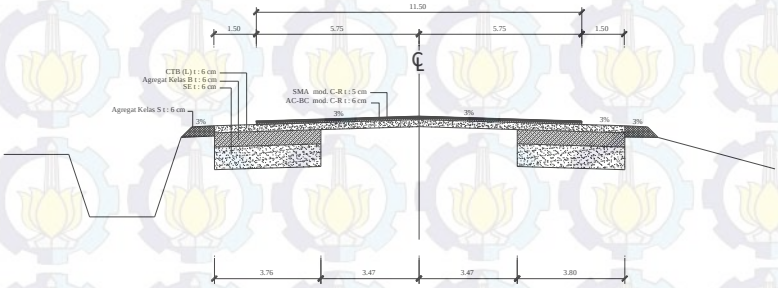
TAHUN	KECEPATAN AKTUAL GOL IIB (KM/JAM)	TRAVEL TIME (DETIK)
2014	39.98	675.337669
2015	37.71	715.990453
2016	36.37	742.370085
2017	34.88	774.082569
2018	32.97	818.926297
2019	31.01	870.686875
2020	N/A	N/A
2021	N/A	N/A
2022	N/A	N/A
2023	N/A	N/A
2024	N/A	N/A
2025	N/A	N/A
2026	N/A	N/A
2027	N/A	N/A
2028	N/A	N/A
2029	N/A	N/A
2030	N/A	N/A
2031	N/A	N/A
2032	N/A	N/A
2033	N/A	N/A
2034	N/A	N/A

Tabel 4.7 Tabel derajat iringan kendaraan

TAHUN	DB
2014	0.81
2015	0.84
2016	0.86
2017	0.87
2018	0.89
2019	0.90
2020	N/A
2021	N/A
2022	N/A
2023	N/A
2024	N/A
2025	N/A
2026	N/A
2027	N/A
2028	N/A
2029	N/A
2030	N/A
2031	N/A
2032	N/A
2033	N/A
2034	N/A

4.4 Kondisi Rencana Ruas Jalan

Pada kondisi jalan rencana, jalan bulu - tuban akan diperlebar 3.5 m pada masing masing arah sehingga jalan tersebut menjadi 4 lajur 2 arah.Setelah diakukan pelebaran, jalan tersebut dianalisa sampai dengan 20 tahun mendatang yaitu tahun 2034. Untuk mengetahui kinerja jalan tersebut, dengan menggunakan program bantu (KAJI) maka dapat diperoleh nilai derajat kejenuhan (DS) ,waktu tempuh (travel time),dan kecepatan aktual kendaraan pada jalan rencana.



Gambar 4.6 Potongan melintang jalan Bulu Tuban rencana

Data jalan rencana

Tipe jalan : 4 lajur 2 arah tak terbagi (4/2 UD)
Kelas jalan : Jalan nasional
Kelas fungsional : Arteri
Panjang jalan : 7,5 km
Tipe alinyemen : Datar

Penampang melintang jalan:

Lebar lalu lintas rata-rata (Wc) : 5,75 m
Lebar bahu efektif (Ws) :1,5 m

Kondisi permukaan jalan:

Tipe Perkerasan : Perkerasan lentur
Kondisi bahu :
Tipe permukaan:
Beda tinggi :

Lalu lintas harian rata rata tahunan:

emp:
LV = 1 ; MHV = 1,44 ; LB=1,46 ; LT = 2,1 ; MC = 0,64
k = 0,08
data jumlah masing-masing kendaraan (kend/hari)

Tahun	LV	MHV	LB	LT	MC	TOTAL
2014	7856	8699	38	864	7820	25277

LV = Volume LV(kend/hari) x k
= 7856 x 0,08 = 628 kend/jam
MHV = Volume MHV(kend/hari) x k
= 8699 x 0,08 = 696 kend/jam

LB = Volume LB(kend/hari) x k
= 38 x 0,08 = 3 kend/jam
LT = Volume LT(kend/hari) x k
= 864 x 0,08 = 69 kend/jam
MC = Volume MC(kend/hari) x k
= 7820 x 0,08 = 626 kend/jam

LV = Volume kend/hari x k x emp
= 628 x 1 = 628 smp/jam
MHV = Volume kend/hari x k x emp
= 696 x 1,44 = 1002 smp/jam
LB = Volume kend/hari x k x emp
= 3 x 1,46 = 4 smp/jam
LT = Volume kend/hari x k x emp
= 69 x 2,1 = 145 smp/jam
MC = Volume kend/hari x k x emp
= 626 x 0,64 = 401 smp/jam

Arus total (Q)

$Q = Q_{LV} + Q_{MHV} + Q_{LB} + Q_{LT} + Q_{MC}$
$= 628 + 696 + 3 + 69 + 626 = 2022$ kend/jam
$Q = Q_{LV} + Q_{MHV} + Q_{LB} + Q_{LT} + Q_{MC}$
$= 628 + 1002 + 4 + 145 + 401 = 2180$ smp/jam
Hambatan samping = L

Kecepatan arus bebas kendaraan ringan

Fvo = 74 km/jam
Fvw = -3 km/jam
Fvo + Fvw = 74 - 3 = 71 km/jam

FFvsf = 0,97

FFvcs = 1

FV = (Fvo + Fvw) x FFvsf x FFvcs

= 71 x 0,97 x 1 = 68,87 km/jam

Kecepatan arus bebas kendaraan kendaraan berat menengah (MHV)

FFV = FVo – FV

= 74 – 68,87 = 5,13 km/jam

$FV_{MHV} = FV_{MHV\,O} - FFV \times FV_{MHV\,O} / FV_O$

= 63 – 5,13 x 63/74 = 58,63 km/jam

Kecepatan arus bebas kendaraan kendaraan berat (LT)

FFV = FVo – FV

= 74 – 68,87 = 5,13 km/jam

$FV_{LT} = FV_{LT\,O} - FFV \times FV_{LT\,O} / FV_O$

= 60 – 5,13 x 60/74 = 55,84 km/jam

Kapasitas

C_o = 6800 smp/jam

FC_w = 0,91

FC_{SP} = 0,975

FC_{SF} = 0,97

$C = C_o \times FC_w \times FC_{SP} \times FC_{SF}$

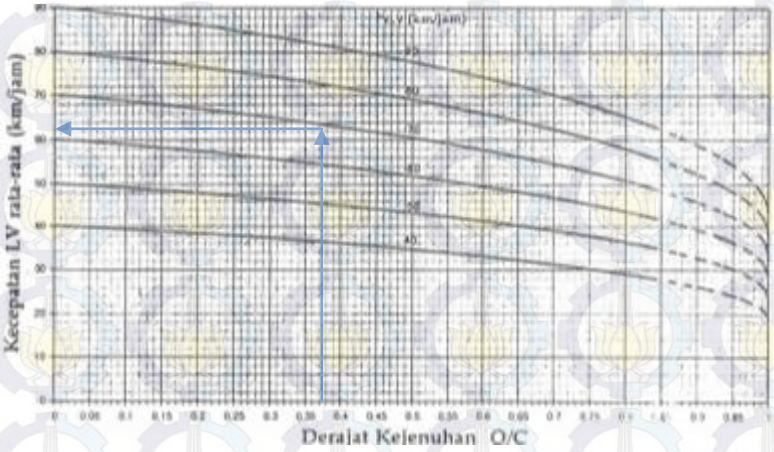
= 6800 x 0,91 x 0,975 x 0,97 = 5852,301 smp/jam

Kecepatan kendaraan ringan

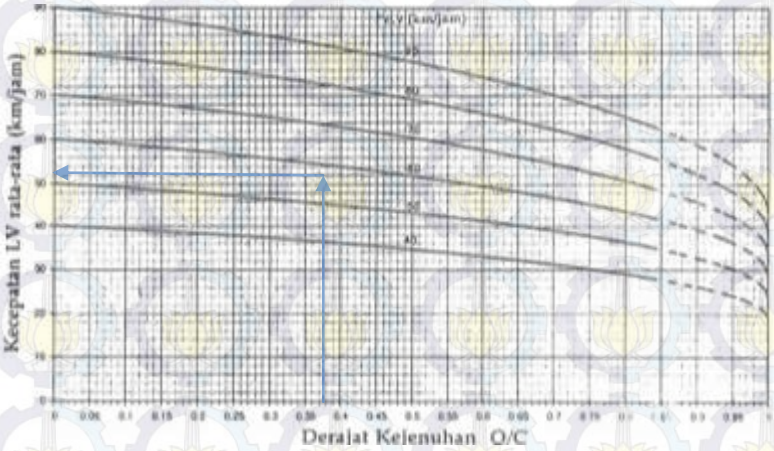
Q = 2180 smp/jam

DS = Q/C

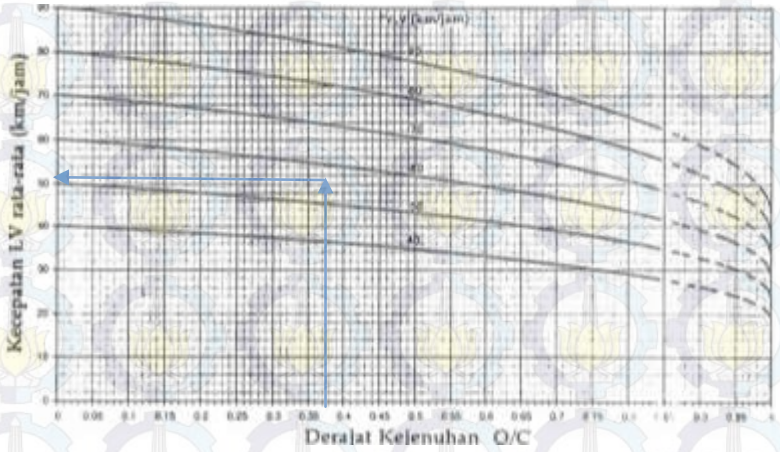
= 2023/5852,301 =0.373



Gambar 4.7 Grafik hubungan antara DS dan kecepatan LV



Gambar 4.8 Grafik hubungan antara DS dan kecepatan MHV



Gambar 4.9 Grafik hubungan antara DS dan kecepatan LT

V_{LV} = 62,74 km/jam
V_{MHV} = 53,41 km/jam
V_{LT} = 50,87km/jam

TT_{LV} = Panjang jalan/ V_{LV} x 3600
= 7,5/62,74 x 3600 = 430,347 detik
TT_{MHV} = Panjang jalan/ V_{MHV} x 3600
= 7,5/53,41 x 3600 = 505,523 detik
TT_{LT} = Panjang jalan/ V_{LT} x 3600
= 7,5/50,87 x 3600 = 530,765 detik

Tabel 4.8 Tabel derajat kejenuhan, kecepatan ,dan traveltime untuk kondisi jalan rencana kendaraan gol I.

TAHUN	DS	KECEPATAN AKTUAL GOL I (KM/JAM)	TRAVEL TIME (DETIK)
2014	0.373	62.74	430.309
2015	0.408	61.97	435.675
2016	0.444	61.16	441.426
2017	0.481	60.27	447.939
2018	0.518	59.34	454.946
2019	0.556	58.34	462.773
2020	0.595	57.26	471.514
2021	0.636	56.07	481.516
2022	0.667	55.11	489.890
2023	0.671	54.97	491.102
2024	0.673	54.92	491.546
2025	0.672	54.96	491.218
2026	0.668	55.08	490.178
2027	0.690	54.35	496.719
2028	0.718	53.43	505.329
2029	0.745	52.47	514.559
2030	0.772	51.44	524.793
2031	0.798	50.39	535.81
2032	0.825	49.21	548.595
2033	0.852	47.96	562.915
2034	0.879	46.58	579.611

Tabel 4.9 Tabel kecepatan ,dan traveltime untuk kondisi jalan rencana kendaraan gol II A.

TAHUN	KECEPATAN AKTUAL GOL II A (KM/JAM)	TRAVEL TIME (DETIK)
2014	53.41	505.5233102
2015	52.760	511.7513268
2016	52.070	518.5327444
2017	51.310	526.2132138
2018	50.520	534.4418052
2019	49.670	543.5876787
2020	48.750	553.8461538
2021	47.730	565.681961
2022	46.920	575.4475703
2023	46.800	576.9230769
2024	46.760	577.4165954
2025	46.790	577.0463774
2026	46.89	575.815739
2027	46.27	583.5314459
2028	45.48	593.6675462
2029	44.67	604.432505
2030	43.8	616.4383562
2031	42.9	629.3706294
2032	41.9	644.3914081
2033	40.83	661.2784717
2034	39.65	680.9583859

Tabel 4.10 Tabel kecepatan ,dan traveltime untuk kondisi jalan rencana kendaraan gol II B.

TAHUN	KECEPATAN AKTUAL GOL IIB (KM/JAM)	TRAVEL TIME (DETIK)
2014	50.87	530.765
2015	50.240	537.420
2016	49.590	544.465
2017	48.570	555.899
2018	48.110	561.214
2019	47.300	570.825
2020	46.420	581.646
2021	45.460	593.929
2022	44.680	604.297
2023	44.570	605.789
2024	44.530	606.333
2025	44.560	605.925
2026	44.66	604.568
2027	44.07	612.662
2028	43.32	623.269
2029	42.54	634.697
2030	41.71	647.327
2031	40.85	660.955
2032	39.9	676.692
2033	38.89	694.266
2034	37.76	715.042

4.5 Analisa Ekonomi

Analisa ekonomi dilakukan untuk mengetahui kelayakan pelebaran jalan ditinjau dari segi ekonomi,yaitu meliputi biaya operasional kendaraan,nilai waktu,benefit cost ratio,dan net present value.

4.5.1 Biaya Operasional Kendaraan (BOK)

Biaya operasional kendaraan adalah penjumlahan dari biaya gerak (running cost) dan biaya tetap (standing cost). Metode perhitungan biaya operasional kendaraan yang digunakan dalam tugas akhir ini adalah dengan menggunakan metode jasa marga.

Penghematan biaya operasional kendaraan diperoleh dengan cara membandingkan biaya operasional kendaraan pada saat ruas jalan sebelum dilakukan pelebaran (eksisting) dengan pada saat ruas jalan telah dilakukan pelebaran.Parameter yang digunakan dalam perhitungan biaya operasional kendaraan yaitu kecepatan kendaraan yang diperoleh dari hasil program Kaji.

Selain kecepatan,parameter yang dibutuhkan untuk menghitung biaya operasional kendaraan adalah harga komponen dari masing masing jenis kendaraan.Harga komponen masing masing kendaraan adalah sebagai berikut:

1. Kendaraan Pribadi
   - Honda Mobilio RS type MT :Rp. 190.800.000
     (Sumber : www.honda-indonesia.com)
   - BBM :Rp.8.500/Liter
   - Oli :Rp.49.500/Liter
   - Ban :Rp.1.100.000/Buah
   - Upah Montir :Rp.7.500/Jam
2. Bus
   - Bus sedang
     Hino A215 Chasis+karoseri :Rp.740.300.000
     (Sumber : www.e-hargamobil.com)

   - Bus besar
     Hino R260 Chasis + Karoseri :Rp.1.212.200.000

(Sumber : www.e-hargamobil.com)

- BBM :Rp.7.500/Liter
- Oli :Rp.49.500/Liter
- Ban bus sedang :Rp.1.158.000/Buah
- Ban bus besar :Rp.1.432.000/Buah
- Upah Montir :Rp.7.500/Jam

3. Truk
   - Truk tunggal berat
     Hino FM 320 PD 10 Roda :Rp.1.001.000.000
     (Sumber : www.e-hargamobil.com)
   - Semi trailer
     HINO FM320P + Ekor Trailer :Rp.1.118.700.000
     (Sumber : www.e-hargamobil.com)
   - BBM :Rp.7.500/Liter
   - Oli :Rp. 49.500/Liter
   - Ban truk tunggal berat :Rp. 1.432.000 /Buah
   - Ban semi trailer :Rp. 1.446.000 /Buah
   - Upah Montir :Rp. 7.500/Jam

Perhitungan besarnya BOK tiap kendaraan per 1000 km dari berbagai macam kecepatan yaitu dengan cara memasukan harga dari masing – masing komponen dari tiap jenis kendaraan dan dari persamaan BOK yang akan digunakan, maka dapat dicari berapa besar BOK.

Contoh hasil perhitungan BOK eksisting dengan menggunakan metode jasa marga adalah sebagai berikut :

Golongan I

1. Konsumsi Bahan Bakar
   Konsumsi BBM = konsumsi BBM dasar x $(1 \pm (k_k + k_l + k_r))$

   Konsumsi BBM dasar

Gol I = $0.0284V^2 - 3.0644V + 141.68$
= $0.0284(42,47^{2)} - 3.0644(42,47) + 141.68$
= 62,76 lt/1000km

Konsumsi BBM
Y = 62,76 x (1+(0,4+0,185+0,035))
Y = 101,671 lt/1000km

Y' = Konsumsi BBM x Harga BBM
Y' = 101,671 x 8500
= Rp.864.205,717 /1000km

2. Konsumsi Oli Mesin
Konsumsi Pelumas = Konsumsi pelumas dasar x faktor koreksi
Y = (0,0027 lt/km x 1000) = 2,7 /1000km
Y' = Konsumsi Pelumas x Harga Pelumas
Y' = 2,7 x 49500 = Rp.133.650 /1000km

3. Konsumsi Ban
Y = 0,0008848 V – 0,0045333
Y = 0,0008848 (42,47) – 0,0045333
Y = 0.033044/1000km

Y' = Y x Harga Ban
Y' = 0.033044 x 1.100.000
Y' = Rp. 36.348,57/1000km

4. Biaya Pemeliharaan (Suku Cadang)
Y = 0,0000064 V + 0,0005567
Y = 0,0000064 (42,47) + 0,0005567
Y = 0,000829/1000km

Y' = Y x Harga Kendaraan
Y' = 0,000829 x 190800000
Y' = Rp.158.079/1000km

5. Biaya Pemeliharaan (Mekanik)
   Y = 0,00362 V + 0,36267
   Y = 0,00362 (42,47) + 0,36267
   Y = 0,154298/1000km

   Y' = Y x Upah kerja per jam
   Y' = 0,154298 x 7500
   Y' = Rp.1.157,236/1000km

6. Depresiasi
   Y = 1/(2,5 V + 125)
   Y = 1/(2,5 (42,47) + 125)
   Y = 0.004326/1000km

   Y'= Y x setengah harga kendaraan
   Y' = 0.004326 x (0,5 x 190800000)
   Y' = Rp.412.674,381/1000km

7. Bunga Modal
   INT = AINT / AKM

   INT = 0.22% * Harga kendaraan baru
   INT = 0.22% x 190800000
   INT = Rp.419.760/1000km

8. Asuransi
   Y = 38/(500 V)
   Y = 38/(500 (42,47))
   Y = 0.001789/1000km

   Y' = Y x Harga kendaraan
   Y' = 0.001789 x 190800000
   Y' = Rp.341.436,308/1000km

Biaya Operasional Kendaraan Gol I adalah
= (Konsumsi Bahan bakar + Konsumsi Oli Mesin + Konsumsi Pemakaian Ban + Biaya Pemeliharaan (suku cadang) + Biaya Pemeliharaan (montir) + Biaya Penyusutan Kendaraan + Biaya Suku Bunga + Biaya Asuransi).
= (Rp. 864.205,717 + Rp. 133.650 + Rp. 36.348,57+ Rp. 158.079+ Rp. 1.157,236+ Rp. 412.674,381+ Rp.419.760+ Rp. 341.436,308)
= Rp.2.367.311,54

Total BOK/1000km = Rp. 2.367.311,54

Panjang Jalan = 7,5 Km
Volume Kendaraan (LV) = 7856 Kendaraan/hari
1Tahun = 365 Hari

BOK/hari = (BOK/1000km x Panjang Jalan x Vol Kendaraan)/1000
= (Rp. 2.367.311,54 x 7,5 km x 7856 kend/hari)/1000
= Rp. 139.481.995,9
BOK/Tahun = (BOK/1000km x 365 x Panjang Jalan x Vol Kendaraan)/1000
= (Rp. 2.367.311,54 x 365 x 7,5 km x 7856 kend/hari)/1000
= Rp. 50.910.928.512,92

Tabel 4.11 Perhitungan BOK Gol I Jalan Eksisting

Tahun	Jumlah Kendaraan	Panjang Jalan (Km)	Kecepatan Aktual (Km/Jam)	Bahan Bakar	Minyak Pelumas	Ban	Pemeliharaan Suku Cadang	Mekanik	Depresiasi	Bunga Modal	Asuransi	BOK/1000km (Rupiah)	BOK/Hari (Rupiah)	BOK/Tahun (Rupiah)
2014	7856	7.5	42.47	864205.7172	133650	36348.57	158079.3264	1157.236	412674.3809	419760	341436.31	2367311.54	139481995.9	50910928512.92
2015	8508	7.5	40.58	882573.85	133650	34509.07	155771.410	1105.922	421285.0519	419760	357338.59	2405993.90	153517448.28	56033868623.16
2016	9159	7.5	38.74	903140.04	138600	32718.24	153524.549	1055.966	430020.284	419760	374310.79	2453129.86	168511623.19	61506742465.33
2017	9810	7.5	36.70	929037.06	138600	30732.75	151033.464	1000.58	440138.4083	419760	395117.17	2505419.42	184345629.42	67286154738.52
2018	10462	7.5	34.10	966760.91	138600	28202.22	147858.552	929.9903	453745.541	419760	425243.40	2581100.61	202526059.62	73922011762.59
2019	11113	7.5	31.41	1011355.52	138600	25584.09	144573.739	856.9568	468738.4842	419760	461661.89	2671130.69	222642081.93	81264359905.43

Tabel 4.12 Perhitungan BOK Gol I Jalan Rencana

Tahun	Jumlah Kendaraan	Panjang Jalan (Km)	Kecepatan Aktual (Km/Jam)	Bahan Bakar	Minyak Pelumas	Ban	Pemeliharaan Suku Cadang	Mekanik	Depresiasi	Bunga Modal	Asuransi	BOK/1000km (Rupiah)	BOK/Hari (Rupiah)	BOK/Tahun (Rupiah)
2014	7856	7.5	62.74	842871.06	143550	56076.9572	182831.429	1707.566	338477.914	419760	231125.28	2216400.21	130590300.16	47665459557.93
2015	8508	7.5	61.97	837809.62	143550	55327.5316	181891.166	1686.661	340805.573	419760	233997.10	2214827.65	141319846.47	51581743960.55
2016	9159	7.5	61.16	832985.73	143550	54539.1748	180902.059	1664.669	343288.953	419760	237096.14	2213786.73	152070544.95	55505748906.95
2017	9810	7.5	60.27	828277.10	143550	53672.9556	179815.262	1640.506	346059.672	419760	240597.31	2213372.81	162857204.41	59442879610.59
2018	10462	7.5	59.34	824018.76	133650	52767.8052	178679.621	1615.256	349003.110	419760	244368.05	2203862.60	172926079.23	63118018917.81
2019	11113	7.5	58.34	820194.67	133650	51794.5252	177458.501	1588.106	352224.478	419760	248556.74	2205227.02	183808428.37	67090076353.41

Golongan II A

1. Konsumsi Bahan Bakar
   Konsumsi BBM = konsumsi BBM dasar x (1 ± (*k*k + *k*l + k_r))
   KKB dasar golongan I = 64,73 lt/1000km
   Konsumsi BBM dasar
   Gol II A = 2,26533 x (KBB dasar golongan I)
   = 2,26533 x 64,73
   = 146,630 lt/1000km
   Konsumsi BBM
   Y = 139,487 x (1+(0,4+0,185+0,035))
   Y = 237,540 lt/1000km

   Y' = Konsumsi BBM x Harga BBM
   Y' = 237,540 x 8500
   = Rp. 1.781.551,14/1000km

2. Konsumsi Oli Mesin
   Konsumsi Pelumas = Konsumsi pelumas dasar x faktor koreksi
   Y = (0,0055 lt/km x 1000) = 5,5 /1000km
   Y' = Konsumsi Pelumas x Harga Pelumas
   Y' = 5,5 x 49500 = Rp. 272.250/1000km

3. Konsumsi Ban
   Y = 0,0012356 V – 0,0064667
   Y = (0,0012356 (39,77)) – 0,0064667
   Y = 0,030655/1000km

   Y' = Y x Harga Ban
   Y' = 0,030655 x 1.432.000
   Y' = Rp. 61.107,90/1000km

4. Biaya Pemeliharaan (Suku Cadang)
   Y = 0,0000332 V + 0,0020891
   Y = 0,0000332 (39,77) + 0,0020891
   Y = 0,003409/1000km

   Y' = Y x Harga Kendaraan
   Y' = 0,003409 x 1.212.200.000
   Y' = Rp. 4.132.952,26/1000km

5. Biaya Pemeliharaan (Mekanik)
   Y = 0,02311 V + 1,97733
   Y = 0,02311 (39,77) + 1,97733
   Y = 0,921174/1000km

   Y' = Y x Upah kerja per jam
   Y' = 0,921174 x 7500
   Y' = Rp. 6.908,8/1000km

6. Depresiasi
   Y = 1/(9,0 V + 450)
   Y = 1/(9,0 (39,77) + 450)
   Y = 0,001238/1000km

   Y'= Y x setengah harga kendaraan
   Y' = 0,001238 x (0,5 x 1.212.200.000)
   Y' = Rp. 750.188,754/1000km

7. Bunga Modal
   INT = AINT / AKM

   INT = 0.22% * Harga kendaraan baru
   INT = 0.22% x 1.212.200.000
   INT = Rp. 2.666.840/1000km

8. Asuransi
   Y = 6/(2571,42857 V)
   Y = 6/(2571,42857 (39,77))
   Y = 0.000587/1000km

   Y' = Y x Harga kendaraan
   Y' = 0.000587 x 1.212.200.000
   Y' = Rp. 711.206,102/1000km

Biaya Operasional Kendaraan Gol II A adalah
= (Konsumsi Bahan bakar + Konsumsi Oli Mesin + Konsumsi Pemakaian Ban + Biaya Pemeliharaan (suku cadang) + Biaya Pemeliharaan (montir) + Biaya Penyusutan Kendaraan + Biaya Suku Bunga + Biaya Asuransi).
= (Rp. 1.781.551,14 + Rp. 272.250 + Rp. 61.107,90+ Rp. 4.132.952,26 + Rp. 6.908,8 + Rp. 750.188,754+ Rp. 2.666.840+ Rp. 711.206,102)
= Rp. 10.383.004,961

Total BOK/1000km = Rp. 10.383.004,961
Panjang Jalan = 7,5 Km
Volume Kendaraan (LV) = 8736 Kendaraan/hari
1Tahun = 365 Hari

BOK/hari = (BOK/1000km x Panjang Jalan x Vol Kendaraan)/1000
= (Rp. 10.383.004,961 x 7,5 km x 8736 kend/hari)/1000
= Rp. 680.364.570,31

BOK/Tahun = (BOK/1000km x 365 x Panjang Jalan x Vol Kendaraan)/1000
= (Rp. 10.383.004,961 x 365 x 7,5 km x 8736 kend/hari)/1000
= Rp. 248.333.068.164,7

Tabel 4.13 Perhitungan BOK Gol II A Jalan Eksisting

Tahun	Jumlah Kendaraan	Panjang Jalan (Km)	Kecepatan Aktual (Km/Jam)	Bahan Bakar	Minyak Pelumas	Ban	Pemeliharaan Suku Cadang	Mekanik	Depresiasi	Bunga Modal	Asuransi	BOK/1000km (Rupiah)	BOK/Hari (Rupiah)	BOK/Tahun (Rupiah)
2014	8737	7.5	39.77	1781551.14	272250	61107.9	4132952.261	6908.804	750188.75	2666840	711206.10	10383004.961	680364570.31	248333068164.70
2015	9407	7.5	38.28	1816318.94	272250	58471.52	4072987.151	6650.549	762850.53	2666840	738888.89	10395257.58	733434799.71	267703701893.75
2016	10078	7.5	36.84	1853218.08	272250	55923.62	4015034.294	6400.961	775500.28	2666840	767770.54	10412937.77	787038472.20	287269042352.67
2017	10748	7.5	35.24	1898019.18	272250	53092.61	3950642.230	6123.641	790056.83	2666840	802629.59	10439654.08	841548345.50	307165146106.76
2018	11419	7.5	33.20	1960945.00	272250	49483.08	3868542.348	5770.058	809428.42	2666840	851947.79	10485206.69	897939994.43	327748097965.86
2019	12089	7.5	31.09	2032874.77	272250	45749.68	3783625.314	5404.343	830490.13	2666840	909767.34	10547001.58	956262355.32	349035759692.71

Tabel 4.14 Perhitungan BOK Gol II A Jalan Rencana

Tahun	Jumlah Kendaraan	Panjang Jalan (Km)	Kecepatan Aktual (Km/Jam)	Bahan Bakar	Minyak Pelumas	Ban	Pemeliharaan Suku Cadang	Mekanik	Depresiasi	Bunga Modal	Asuransi	BOK/1000km (Rupiah)	BOK/Hari (Rupiah)	BOK/Tahun (Rupiah)
2014	8737	7.5	53.41	1624590.841	267300	85242.229	4681894.606	9272.96	651237.25	2666840	529576.23	10515954.12	689076296.73	251512848306.97
2015	9407	7.5	52.76	1625470.550	267300	84092.132	4655735.330	9160.30	655356.60	2666840	536100.58	10500055.49	740828790.22	270402508429.35
2016	10078	7.5	52.07	1627127.132	267300	82871.261	4627966.253	9040.70	659786.86	2666840	543204.66	10484136.86	792419895.49	289233261855.50
2017	10748	7.5	51.31	1629813.178	267300	81526.532	4597380.022	8908.97	664736.40	2666840	551250.57	10467755.67	843813635.59	307991976989.67
2018	11419	7.5	50.52	1633562.412	267300	80128.723	4565586.441	8772.05	669960.65	2666840	559870.68	10452020.95	895098009.20	326710773357.27
2019	12089	7.5	49.67	1638686.054	267300	78624.750	4531378.157	8624.72	675674.17	2666840	569451.71	10436579.57	946250750.38	345381523887.57

Golongan II B

1. Konsumsi Bahan Bakar
   Konsumsi BBM = konsumsi BBM dasar x (1 ± (*k*k + *k*l + k_r))
   KBB dasar golongan I = 65,288 lt/1000km
   Konsumsi BBM dasar
   Gol IIB = 2,90805 x (KBB dasar golongan I)
   = 2,90805 x 65,288
   = 189,863 lt/1000km
   Konsumsi BBM
   Y = 189,863 x (1+(0,4+0,185+0,035))
   Y = 307,577 lt/1000km

   Y' = Konsumsi BBM x Harga BBM
   Y' = 307,577 x 8500
   = Rp. 2.306.830 /1000km

2. Konsumsi Oli Mesin
   Konsumsi Pelumas = Konsumsi pelumas dasar x faktor koreksi
   Y = (0,0044 lt/km x 1000) = 4,4 /1000km
   Y' = Konsumsi Pelumas x Harga Pelumas
   Y' = 4,4 x 49500 = Rp. 217.800/1000km

3. Konsumsi Ban
   Y = 0,0015553 V – 0,0059333
   Y = 0,0015553 (39,09) – 0,0059333
   Y = 0.054863/1000km

   Y' = Y x Harga Ban
   Y' = 0.054863 x 1.446.000
   Y' = Rp. 79.332,44/1000km

4. Biaya Pemeliharaan (Suku Cadang)
   Y = 0,0000191 V + 0,0015400
   Y = 0,0000191 (39,09) + 0,0015400
   Y = 0.002287/1000km

   Y' = Y x Harga Kendaraan
   Y' = 0.002287 x 11187000000
   Y' = Rp. 2.558.040,675 /1000km

5. Biaya Pemeliharaan (Mekanik)
   Y = 0,01511 V + 1,21200
   Y = 0,01511 (39,09) + 1,21200
   Y = 0.592190/1000km

   Y' = Y x Upah kerja per jam
   Y' = 0.592190 x 7500
   Y' = Rp. 4.441,424/1000km

6. Depresiasi
   Y = 1/(6,0 V + 300)
   Y = 1/(6,0 (39,09) + 300)
   Y = 0.001871/1000km

   Y'= Y x setengah harga kendaraan
   Y' = 0.001871 x (0,5 x 11187000000)
   Y' = Rp. 1.046.413,739/1000km

7. Bunga Modal
   INT = AINT / AKM

   INT = 0.22% * Harga kendaraan baru
   INT = 0.22% x 11187000000
   INT = Rp. 2.461.140/1000km

8. Asuransi

Y = 61/(1714,28571 V)
Y = 61/(1714,28571 (39,09))
Y = 0.000910 /1000km

Y' = Y x Harga kendaraan
Y' = 0.000910 x 11187000000
Y' = Rp. 1.018.344,208/1000km

Biaya Operasional Kendaraan Gol II B adalah
= (Konsumsi Bahan bakar + Konsumsi Oli Mesin + Konsumsi Pemakaian Ban + Biaya Pemeliharaan (suku cadang) + Biaya Pemeliharaan (montir) + Biaya Penyusutan Kendaraan + Biaya Suku Bunga + Biaya Asuransi).
= (Rp. 2.306.830 + Rp. 217.800 + Rp. 79.332,44+ Rp. 2.558.040,675 + Rp. 4.441,424 + Rp. 1.046.413,739+ Rp. 2.461.140 + Rp. 1.018.344,208)
= Rp. 9.692.342,1

Total BOK/1000km = Rp. 9.692.342,1

Panjang Jalan = 7,5 Km
Volume Kendaraan (LV) = 864 Kendaraan/hari
1Tahun = 365 Hari

BOK/hari = (BOK/1000km x Panjang Jalan x Vol Kendaraan)/1000
= (Rp. 9.692.342,1 x 7,5 km x 864 kend/hari)/1000
= Rp. 62.806.376,79

BOK/Tahun = (BOK/1000km x 365 x Panjang Jalan x Vol Kendaraan)/1000
= (Rp. 9.692.342,1 x 365 x 7,5 km x 864 kend/hari)/1000
= Rp. 22.924.327.529,38

Tabel 4.15 Perhitungan BOK Gol II B Jalan Eksisting

Tahun	Jumlah Kendaraan	Panjang Jalan (Km)	Kecepatan Aktual (Km/Jam)	Bahan Bakar	Minyak Pelumas	Ban	Pemeliharaan Suku Cadang	Mekanik	Depresiasi	Bunga Modal	Asuransi	BOK/1000km (Rupiah)	BOK/Hari (Rupiah)	BOK/Tahun (Rupiah)
2014	864	7.5	39.09	2306829.608	217800	79332.443	2558040.675	4441.424	1046413.739	2461140	1018344.2	9692342.10	62806376.79	22924327529.38
2015	943	7.5	37.71	2349897.700	217800	76228.873	2528553.981	4285.036	1062877.665	2461140	1055610.6	9756393.84	68994778.12	25183094014.28
2016	1022	7.5	36.37	2395374.822	217800	73215.262	2499921.973	4133.180	1079367.836	2461140	1094503	9825456.10	75297382.82	27483544729.95
2017	1101	7.5	34.88	2450173.922	217800	69864.306	2468084.890	3964.326	1098315.269	2461140	1141257.9	9910600.60	81814485.59	29862287240.60
2018	1180	7.5	32.97	2526936.163	217800	65568.785	2427273.595	3747.875	1123598.891	2461140	1207372.6	10033437.92	88765825.31	32399526238.37
2019	1258	7.5	31.01	2613319.269	217800	61160.816	2385393.942	3525.758	1150783.854	2461140	1283685.1	10176808.74	96056353.53	35060569038.33

Tabel 4.16 Perhitungan BOK Gol II B Jalan Rencana

Tahun	Jumlah Kendaraan	Panjang Jalan (Km)	Kecepatan Aktual (Km/Jam)	Bahan Bakar	Minyak Pelumas	Ban	Pemeliharaan Suku Cadang	Mekanik	Depresiasi	Bunga Modal	Asuransi	BOK/1000km (Rupiah)	BOK/Hari (Rupiah)	BOK/Tahun (Rupiah)
2014	864	7.5	50.87	2094750.293	212850	105825.237	2809745.938	5776.393	924209.378	2461140	782525.557	9396822.80	60891411.72	22225365277.76
2015	943	7.5	50.24	2099043.649	212850	104408.390	2796284.621	5704.998	930017.957	2461140	792338.278	9401787.89	66487093.53	24267789138.16
2016	1022	7.5	49.59	2104308.174	212850	102946.563	2782395.960	5631.337	936087.961	2461140	802723.837	9408083.83	72098850.45	26316080412.97
2017	1101	7.5	48.57	2114278.708	212850	100652.620	2760601.447	5515.745	945774.576	2461140	819581.534	9420394.63	77767712.77	28385215161.04
2018	1180	7.5	48.11	2119458.373	212850	99618.097	2750772.549	5463.616	950208.949	2461140	827417.899	9426929.48	83400045.12	30441016470.26
2019	1258	7.5	47.30	2129611.338	212850	97796.436	2733465.141	5371.823	958119.219	2461140	841587.211	9439941.17	89101244.70	32521954316.16

Sepeda Motor (MC)

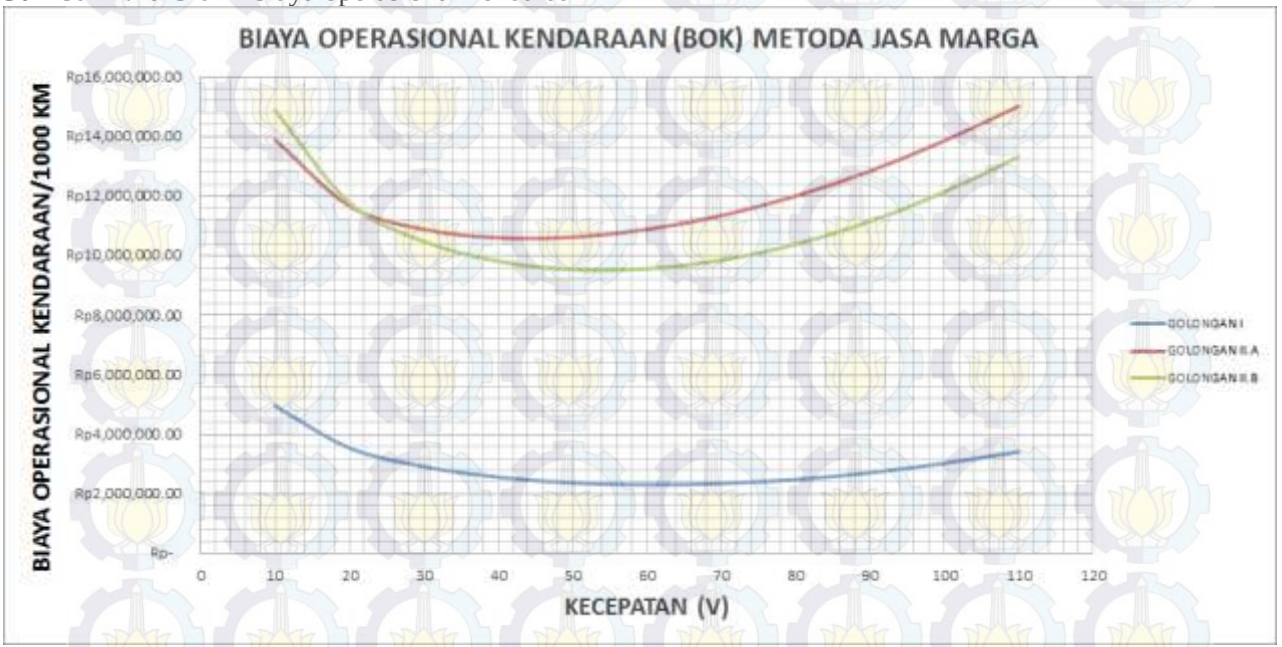
Pada perhitungan metode Jasa Marga tidak dibahas secara khusus untuk jenis kendaraan sepeda motor. Oleh sebab itu untuk pengaruh jenis kendaraan MC terhadap LV dihitung sebagai berikut:

MC = 7820 kend/hari, LV = 7856 kend/hari
Perbandingan MC dengan LV adalah 100/7856*7820 = 99,54
Faktor penyesuaian 0.18*99,54/100 = 0.179
Akibat adanya sepeda motor biaya operasi kendaraan auto/tahun akan dikalikan dengan 1+(0.18*99,682)/100= 1,179
(*Sumber : Kartika,Gde,A Agung 2006.Diktat ekonomi jalan raya jurusan teknik ITS Surabaya)*

Contoh perhitungan = 1.179 x Rp. 50.910.928.512,923
= Rp. 60.023.984.716,736

Dengan memasukan besarnya kecepatan kendaraan dan besarnya volume lalu lintas yang didapat dari output KAJI, didapatkan BOK eksisting dan BOK rencana dengan cara menarik kecepatan pada Gambar 4.3 grafik BOK,kemudian didapatkan besarnya BOK untuk masing – masing jenis kendaraan.Besarnya BOK akan ditabelkan pada Tabel 4.16, Tabel 4.17 dan Tabel 4.18 dibawah ini.

Gambar 4.10 Grafik biaya operasional kendaraan



Tabel 4.17 Biaya Operasional Kendaraan/tahun Pada Jalan Eksisting

Tahun	Gol I	Gol II A	Gol II B	Sepeda Motor	TOTAL
2014	Rp 50,910,928,512.923	Rp 248,333,068,164.698	Rp 22,924,327,529.376	Rp 60,023,984,716.74	Rp 382,192,308,923.732
2015	Rp 56,033,868,623.156	Rp 267,703,701,893.753	Rp 25,183,094,014.282	Rp 66,063,931,106.70	Rp 414,984,595,637.893
2016	Rp 61,506,742,465.332	Rp 287,269,042,352.674	Rp 27,483,544,729.946	Rp 72,516,449,366.63	Rp 448,775,778,914.578
2017	Rp 67,286,154,738.523	Rp 307,165,146,106.755	Rp 29,862,287,240.600	Rp 79,330,376,436.72	Rp 483,643,964,522.597
2018	Rp 73,922,011,762.590	Rp 327,748,097,965.855	Rp 32,399,526,238.367	Rp 87,154,051,868.09	Rp 521,223,687,834.906
2019	Rp 81,264,359,905.434	Rp 349,035,759,692.710	Rp 35,060,569,038.335	Rp 95,810,680,328.51	Rp 561,171,368,964.985

Tabel 4.18 Biaya Operasional Kendaraan/tahun Pada Jalan Rencana

Tahun	Gol I	Gol II A	Gol II B	Sepeda Motor	TOTAL
2014	Rp 47,665,459,557.929	Rp 251,512,848,306.965	Rp 22,225,365,277.765	Rp 56,197,576,818.80	Rp 377,601,249,961.456
2015	Rp 51,581,743,960.546	Rp 270,402,508,429.353	Rp 24,267,789,138.160	Rp 60,814,876,129.48	Rp 407,066,917,657.543
2016	Rp 55,505,748,906.950	Rp 289,233,261,855.498	Rp 26,316,080,412.972	Rp 65,441,277,961.29	Rp 436,496,369,136.713
2017	Rp 59,442,879,610.590	Rp 307,991,976,989.673	Rp 28,385,215,161.041	Rp 70,083,155,060.89	Rp 465,903,226,822.191
2018	Rp 63,118,018,917.809	Rp 326,710,773,357.266	Rp 30,441,016,470.264	Rp 74,416,144,304.10	Rp 494,685,953,049.436
2019	Rp 67,090,076,353.407	Rp 345,381,523,887.565	Rp 32,521,954,316.159	Rp 79,099,200,020.67	Rp 524,092,754,577.797

Tabel 4.19 Saving biaya operasional kendaraan

Tahun	Saving	
2014	Rp	4,591,058,962.276
2015	Rp	7,917,677,980.350
2016	Rp	12,279,409,777.865
2017	Rp	17,740,737,700.406
2018	Rp	26,537,734,785.470
2019	Rp	37,078,614,387.188

4.5.2 Analisa Biaya Nilai Waktu

Nilai waktu adalah sejumlah uang yang dikeluarkan seseorang untuk menghemat satu unit perjalanan.Manfaat dari nilai waktu pada dasarnya yaitu penghematan waktu perjalanan yang dinilai secara ekonomis. Nilai waktu biasanya sebanding dengan pendapatan perkapita suatu daerah.

Nilai waktu besarnya berbeda - beda menurut jenis kendaraan dan lokasi studi. Pada tugas akhir ini metode perhitungan nilai waktu menggunakan PT. Jasa Marga (1990-1996) .Rumus yang digunakan yaitu sebagai berikut:

Nilai Waktu : Max {(K * Nilai Waktu Dasar) ; Nilai Waktu Minimum }

Nilai K adalah nilai faktor koreksi dengan asumsi bahwa nilai waktu dasar tersebut hanya berlaku untuk daerah DKI Jakarta dan sekitarnya.Untuk faktor koreksi pada daerah selain Jakarta yaitu menggunakan nilai K pada tabel 4.10.

Tabel 4.20 Nilai waktu dasar dari berbagai studi.

Referensi	Nilai Waktu (Rp/Jam/kend)		
	Gol I	Gol IIa	Gol IIb
PT. Jasa Marga (1990-1996), Formula Herbert Mohring	12.287.00	18.534.00	13.768.00
Padalarang-Cileunyi (1996)	3385 - 5425	3827 - 38344	5.716.00
Semarang -1996	3411 - 6221	14.541.00	1.506.00
IHCM (1995)	3281,25	18.212.00	4971,20
PCI (1979)	1.341.00	3.827.00	3.152.00
JIUTR northern extension (PCI 1989)	7.067.00	14.670.00	3.659.00
Surabaya-Mojokerto (JICA 1991)	8.880.00	7.960.00	7.980.00

Sumber : Tamin (2000)

Tabel 4.21 Besarnya Nilai waktu Minimum

No	Kab/Kota	Jasa Marga			JIUTR		
		Gol I	*Gol IIa*	*Gol IIb*	*Gol I*	*Gol IIa*	*Gol IIb*
1	DKI	8200	12369	9188	8200	17022	4246
2	Selain DKI	6000	9051	6723	6000	12455	3170

Sumber : Tamin (2000)

Tabel 4.22 Nilai koreksi (K)

No	Lokasi	Nilai koreksi
1	DKI Jakarta	1,00
2	Jawa Barat	0,23
3	Kodya	0,39
4	Jawa Tengah	0,20
5	Kodya	0,52
6	Jawa Timur	0,25
7	Kodya	0,74
8	Sumatera	0,29
9	Kodya Medan	0,46

Tabel 4.23 Nilai waktu kendaraan (Rp/Jam/Kend)

no	Jenis Kendaraan	K	Nilai Waktu Dasar	Nilai waktu	Nilai Waktu Minimum	Nilai Waktu yang dipakai
1	Gol I	0.25	Rp 12,287.00	Rp 3,071.75	Rp 6,000.00	Rp 6,000.00
2	Gol IIa	0.25	Rp 18,534.00	Rp 4,633.50	Rp 9,051.00	Rp 9,051.00
3	Gol IIb	0.25	Rp 13,768.00	Rp 3,442.00	Rp 6,723.00	Rp 6,723.00

Harga nilai waktu yang dipakai diatas merupakan harga nilai waktu pada saat tahun 1996. Harga nilai tersebut perlu dikonversikan ke tahun sekarang (2014),dengan mengalikan faktor bunga selama 18 tahun. Nilai suku bunga yang dipakai yaitu pada tabel 4.12. (*sumber , www.bi.go.id*)

Tabel 4.24 Nilai Suku Bunga per Tahun

Tahun	BI rate I (%)
1996	
1997	21.89
1998	21.89
1999	21.89
2000	10.99
2001	10.99
2002	10.99
2003	10.99
2004	10.99
2005	12.75
2006	9.75
2007	8
2008	9.25
2009	6.5
2010	6.5
2011	6
2012	5.75
2013	7.5
2014	7.75

Tabel 4.25 Nilai waktu kendaraan tahun 2014-2034 (Rp/Jam/Kend)

Tahun	Gol I	Gol IIa	Gol IIb
1996	6000	9051	6723
2014	29261.186	59498.545	44194.975
2015	31528.927	64109.683	47620.086
2016	33972.419	69078.183	51310.642
2017	36605.282	74431.742	55287.217
2018	39442.191	80200.202	59571.977
2019	42498.961	86415.718	64188.805
2020	45792.630	93112.936	69163.437
2021	49341.559	100329.189	74523.603
2022	53165.530	108104.701	80299.183
2023	57285.859	116482.815	86522.369
2024	61725.513	125510.233	93227.853
2025	66509.240	135237.276	100453.012
2026	71663.706	145718.165	108238.120
2027	77217.643	157011.323	116626.574
2028	83202.011	169179.700	125665.134
2029	89650.167	182291.127	135404.182
2030	96598.054	196418.690	145898.006
2031	104084.404	211641.138	157205.101
2032	112150.945	228043.326	169388.497
2033	120842.643	245716.684	182516.105
2034	130207.948	264759.727	196661.103

Nilai waktu = Selisih waktu antara rencana dengan waktu Eksisting x Jumlah Kendaraan x Nilai waktu.

Nilai selisih waktu rencana dengan waktu eksisting didapatkan dari nilai dari bantuan program KAJI yang akan ditabelkan pada tabel 4.13.

Tabel 4.26 Selisih waktu rencana dengan waktu eksisting kendaraan

Tahun	Selisih Waktu GOL I (jam)	Selisih Waktu GOL II A (jam)	Selisih Waktu GOL II B (jam)
2014	0.057	0.048	0.044
2015	0.064	0.054	0.050
2016	0.071	0.060	0.055
2017	0.080	0.067	0.061
2018	0.094	0.077	0.072
2019	0.110	0.090	0.083

Contoh hasil perhitungan nilai waktu pada masing-masing kendaraan

Gol I

Nilai Waktu/Tahun = Selisih waktu x 365 x Nilai Waktu x Jumlah Kendaraan/hari
= 0,057 x 365 x Rp.29.261,86 x 7856
= Rp. 4.786.389.879,18

Gol II A

Nilai Waktu/Tahun = Selisih waktu x 365 x Nilai Waktu x Jumlah Kendaraan/hari
= 0,048 x 365 x Rp.59.498,545 x 8737
= Rp. 9.138.060.778,364

Gol II B

Nilai Waktu/Tahun = Selisih waktu x 365 x Nilai Waktu x Jumlah Kendaraan/hari
= 0,044 x 365 x Rp.44.194,975 x 864
= Rp. 619.239.494,158

MC = 7820 kend/hari, LV = 7856 kend/hari
Perbandingan MC dengan LV adalah 100/7856*7820 = 99,54
Faktor penyesuaian 0.18*99,54/100 = 0.179
Akibat adanya sepeda motor biaya operasi kendaraan auto/tahun akan dikalikan dengan 1+(0.18*99,682)/100= 1,179

Contoh perhitungan = 1,179 x Rp. 4.786.389.879,18
= Rp 5.643.153.667,554

Tabel 4.27 Nilai waktu per tahun tiap jenis kendaraan

Tahun	Gol I	Gol IIa	Gol IIb	MC	Total Saving per Tahun
2014	Rp 4,786,389,879.18	Rp 9,138,060,778.36	Rp 619,239,494.16	Rp 5,643,153,667.55	Rp 14,543,690,151.70
2015	Rp 6,246,255,768.33	Rp 11,836,807,767.99	Rp 812,933,170.74	Rp 7,364,335,550.86	Rp 18,895,996,707.06
2016	Rp 8,061,270,306.39	Rp 15,130,356,592.71	Rp 1,052,014,011.60	Rp 9,504,237,691.24	Rp 24,243,640,910.70
2017	Rp 10,477,300,042.54	Rp 19,463,546,333.86	Rp 1,346,191,034.00	Rp 12,352,736,750.15	Rp 31,287,037,410.40
2018	Rp 14,092,675,579.18	Rp 25,887,201,825.56	Rp 1,836,125,967.45	Rp 16,615,264,507.85	Rp 41,816,003,372.19
2019	Rp 19,002,882,779.78	Rp 34,408,400,362.25	Rp 2,455,979,931.37	Rp 22,404,398,797.36	Rp 55,867,263,073.40

4.6 Penghematan

Penghematan yang terjadi dalam proyek pelebaran jalan Bulu – Tuban adalah sebagai berikut :

Tabel 4.28 Penghematan Total

Tahun	Penghematan BOK	Penghematan Nilai Waktu	Penghematan Total
2014	Rp 4,591,058,962.276	Rp 14,543,690,151.705	Rp 19,134,749,113.981
2015	Rp 7,917,677,980.350	Rp 18,895,996,707.057	Rp 26,813,674,687.407
2016	Rp 12,279,409,777.865	Rp 24,243,640,910.704	Rp 36,523,050,688.570
2017	Rp 17,740,737,700.406	Rp 31,287,037,410.400	Rp 49,027,775,110.806
2018	Rp 26,537,734,785.470	Rp 41,816,003,372.188	Rp 68,353,738,157.659
2019	Rp 37,078,614,387.188	Rp 55,867,263,073.398	Rp 92,945,877,460.586
		Total	Rp 292,798,865,219.009

Penghematan total yang diperoleh dari proyek pelebaran jalan Bulu – Tuban adalah sebesar Rp.292.789.865.219,009

4.7 Rencana Anggaran Biaya (RAB)

Biaya konstruksi pelebaran jalan Bulu Tuban merupakan biaya investasi (cost). Hasil rekapitulasi RAB dapat dilihat pada tabel 4.28 dan 4.29.

Perhitungan volume pekerjaan

1. Galian tanah
   Galian pada ruas kiri jalan
   Galian = tinggi galian x lebar galian x panjang jalan
   = 1,3 x 3,7 x 7500 = 36.075 m3
   Galian pada ruas kanan jalan
   Galian = tinggi galian x lebar galian x panjang jalan
   = 1,3 x 3,8 x 7500 = 37.050 m3

2. Pekerjaan perkerasan dan bahu jalan
   Lapis pondasi agregat kelas B (t =50cm)
   Pondasi pada ruas kiri jalan
   Volume = tebal pondasi x lebar x panjang jalan
   = 0,5 x 3,7 x 7500 = 13.875 m3
   Pondasi pada ruas kanan jalan
   Volume = tebal pondasi x lebar x panjang jalan
   = 0,5 x 3,8 x 7500 = 14.250,5 m3

   Lapis pondasi agregat kelas S (t =80cm)
   Pondasi pada ruas kiri jalan
   Volume = tebal pondasi x lebar x panjang jalan
   = 0,8 x 3,7 x 7500 = 22.200 m3
   Pondasi pada ruas kanan jalan
   Volume = tebal pondasi x lebar x panjang jalan
   = 0,8 x 3,8 x 7500 x 1,67 = 22.800m3

3. Pekerjaan perkerasan berbutir
   Lapis pondasi atas CTB (Cement Treated Base) (t=25cm)
   Pondasi pada ruas kiri jalan

Volume = tebal pondasi x lebar x panjang jalan
= 0,25 x 3,7 x 7500 = 6937,5 m3
Pondasi pada ruas kanan jalan
Volume = tebal pondasi x lebar x panjang jalan
= 0,25 x 3,8 x 7500 = 7125 m3

4. Pekerjaan perkerasan aspal
Lapis perekat aspal (liter)
Prime coat (1,3lt/m2)
Volume = 2,26 x 7500 x 1,3 = 22.035 lt
Tack coat (0,5lt/m2)
Volume = 2,26 x 7500 x 0,5 = 8.475 lt

Aspal modifikasi crumb rubber (SMA Mod. CR) (t=5cm)
Volume = tebal pondasi x lebar x panjang jalan
= 0,05 x 2,26 x 7500 x 2 = 1695 m3

Laston crumb rubber (AC-BC Mod.CR) (t=6cm)
Volume = tebal pondasi x lebar x panjang jalan
= 0,06 x 2,26 x 7500 x 2 = 2034 m3

Perhitungan harga satuan

Tabel 4.29 Harga sewa alat per jam

No.	Uraian	Kapasitas		Biaya sewa alat (per jam)	
1	DUMP TRUCK	12	Ton	Rp	636,679.685
2	EXCAVATOR 80-140 HP	0.93	M3	Rp	627,539.776
3	DUMP TRUCK 3 - 4 m3	6	Ton	Rp	292,647.820
4	MOTOR GRADER >100 HP	800		Rp	800,538.908
5	TANDEM ROLLER 6-8 T.	8.1	Ton	Rp	569,325.862
6	WATER TANKER 3000-4500 L.	5000	Liter	Rp	254,606.403
7	WHEEL LOADER 1.0-1.6 M3	1.5	M3	Rp	598,547.301
8	VIBRATORY ROLLER 5-8 T.	7.05	Ton	Rp	569,325.862
9	CTB PLANT			Rp	332,057.000
10	ASPHALT DISTRIBUTOR	4000	Liter	Rp	373,066.072
11	COMPRESSOR 4000-6500 L\M	5000	L/m	Rp	171,116.579
12	ASPHALT MIXING PLANT	50	T/Jam	Rp	6,396,132.331
13	GENERATOR SET	395	KVA	Rp	485,626.547
14	ASPHALT FINISHER	10	Ton	Rp	1,560,011.961
15	TIRE ROLLER 8-10 T.	9	Ton	Rp	559,704.294

Tabel 4.30 Harga bahan

No.	Uraian	Satuan	Harga Satuan (Rp.)
1	Agregat Base Kelas B	m3	189304.5
2	Agregat Base Kelas B	m3	96558
3	Bahan Agr.Base Kelas A	m3	198198
4	Semen / PC (kg)	Kg	1504.751
5	Aspal Modifikasi (BNA)	kg	10390.341
6	Agregat Pecah Mesin 0 - 5 mm / Abu Batu	m3	218526
7	Agregat Pecah Mesin 5 - 10 mm	m3	213444
8	Agregat Pecah Mesin 10 - 20 mm	m3	213444
9	Aspal Asbuton crumb rubber	Kg	10530

Tabel 4.31 Harga Upah

No.	Uraian	Satuan	Harga Satuan (Rp.)
1	Pekerja	Jam	6931.767
2	Tukang	Jam	9299.3865
3	M a n d o r	Jam	10655.8245
4	Operator	Jam	12286.8285
5	Pembantu Operator	Jam	10336.1805
6	Sopir / Driver	Jam	12000.993
7	Pembantu Sopir / Driver	Jam	9951.993
8	Mekanik	Jam	13171.9965
9	Pembantu Mekanik	Jam	11122.9965
10	Kepala Tukang	Jam	9953.0175

Tabel 4.32 Harga Satuan Pekerjaan Galian

Galian Biasa					
Kebutuhan		Satuan	Indeks	Harga Satuan	Jml. Harga
Alat	Excavator	Jam	0.01	Rp 627,539.78	Rp 6,829.04
	Dump Truck	Jam	0.18	Rp 636,679.68	Rp 114,716.57
Upah	Pekerja	Jam	0.02	Rp 6,931.77	Rp 138.64
	Mandor	Jam	0.01	Rp 10,655.82	Rp 106.56
				Jumlah	Rp 121,790.80

Tabel 4.33 Harga Satuan Pekerjaan Pondasi Agregat Klas B

Lapis Pondasi Agregat Klas B					
Kebutuhan		Satuan	Indeks	Harga Satuan	Jml. Harga
Alat	Wheel Loader	Jam	0.0071	Rp 598,547.30	Rp 4,242.01
	Dump Truck	Jam	0.429	Rp 636,679.68	Rp 273,439.14
	Motor Grader	Jam	0.004	Rp 800,538.91	Rp 3,409.87
	Tandem Roller	Jam	0.005	Rp 569,325.86	Rp 3,048.60
	Water Tanker	Jam	0.014	Rp 254,606.40	Rp 3,578.80
Bahan	Agregat klas B	m3	1.20	Rp 189,304.50	Rp 227,165.40
Upah	Pekerja	Jam	0.05	Rp 6,931.77	Rp 343.89
	Mandor	Jam	0.01	Rp 10,655.82	Rp 75.52
				Jumlah	Rp 515,303.22

Tabel 4.34 Harga Satuan Pekerjaan Pondasi Agregat Klas S

Lapis Pondasi Agregat Klas S							
Kebutuhan		Satuan	Indeks	Harga Satuan		Jml. Harga	
Alat	Wheel Loader	Jam	0.007	Rp	598,547.30	Rp	4,242.01
	Dump Truck	Jam	0.430	Rp	292,647.82	Rp	125,757.06
	Motor Grader	Jam	0.003	Rp	800,538.91	Rp	2,557.40
	Tandem Roller	Jam	0.004	Rp	569,325.86	Rp	2,286.45
	Water Tanker	Jam	0.014	Rp	254,606.40	Rp	3,578.80
Bahan	Agregat klas S	m3	1.20	Rp	96,558.00	Rp	115,869.60
Upah	Pekerja	Jam	0.05	Rp	6,931.77	Rp	343.89
	Mandor	Jam	0.01	Rp	10,655.82	Rp	75.52
				Jumlah		Rp	254,710.72

Tabel 4.35 Harga Satuan Pekerjaan Pondasi Atas CTB

Lapis Pondasi atas bersemen (Cement Treated Base / C T B)							
Kebutuhan		Satuan	Indeks	Harga Satuan		Jml. Harga	
Alat	Dump Truck	Jam	0.275	Rp	292,647.82	Rp	80,470.80
	Motor Grader	Jam	0.003	Rp	800,538.91	Rp	2,572.01
	Vibrator Roller	Jam	0.002	Rp	569,325.86	Rp	894.70
	Water Tanker	Jam	0.004	Rp	254,606.40	Rp	964.13
	CTB Plant	Jam	0.117	Rp	332,057.00	Rp	38,895.57
Bahan	Agregat Kelas A	m3	1.05	Rp	198,198.00	Rp	208,107.90
	Semen (PC)	Kg	122.64	Rp	1,504.75	Rp	184,542.66
Upah	Pekerja	Jam	0.05	Rp	6,931.77	Rp	343.89
	Mandor	Jam	0.01	Rp	10,655.82	Rp	75.52
				Jumlah		Rp	516,867.18

Tabel 4.36 Harga Satuan Pekerjaan Lapis Perekat Prime coat

Lapis Perekat - prime coat							
Kebutuhan		Satuan	Indeks	Harga Satuan		Jml. Harga	
Alat	Asp. Distributor	Jam	0.0002	Rp	373,066.07	Rp	74.91
	Compressor	Jam	0.0002	Rp	171,116.58	Rp	34.36
Bahan	Aspal	Kg	1.061	Rp	10,390.34	Rp	11,023.11
Upah	Pekerja	Jam	0.0008	Rp	6,931.77	Rp	5.57
	Mandor	Jam	0.0002	Rp	10,655.82	Rp	2.14
				Jumlah		Rp	11,140.09

Tabel 4.37 Harga Satuan Pekerjaan Lapis Perekat Prime coat

Lapis Perekat - tack coat							
Kebutuhan		Satuan	Indeks	Harga Satuan		Jml. Harga	
Alat	Asp. Distributor	Jam	0.0002	Rp	373,066.07	Rp	74.91
	Compressor	Jam	0.0002	Rp	171,116.58	Rp	34.36
Bahan	Aspal	Kg	1.061	Rp	10,390.34	Rp	11,023.11
Upah	Pekerja	Jam	0.0008	Rp	6,931.77	Rp	5.57
	Mandor	Jam	0.0002	Rp	10,655.82	Rp	2.14
				Jumlah		Rp	11,140.09

Tabel 4.38 Harga Satuan Pekerjaan Split Matrik Aspal Modifikasi Crumb Rubber (SMA Mod. CR)

Split Matrik Aspal Modifikasi Crumb Rubber (SMA Mod. CR)							
Kebutuhan		Satuan	Indeks	Harga Satuan		Jml. Harga	
Alat	AMP	Jam	0.055	Rp	6,396,132.33	Rp	352,943.21
	Genset	Jam	0.055	Rp	485,626.55	Rp	26,797.22
	Dump Truck	Jam	0.584	Rp	292,647.82	Rp	171,017.29
	Asp. Finisher	Jam	0.025	Rp	1,560,011.96	Rp	39,778.47
	Tandem Roller	Jam	0.025	Rp	569,325.86	Rp	14,290.31
	P. Tyre Roller	Jam	0.011	Rp	559,704.29	Rp	6,027.64
Bahan	Agr 5-10 & 10-20	m3	0.71	Rp	213,444.00	Rp	151,799.27
	Agr 0-5	m3	0.76	Rp	218,526.00	Rp	167,004.74
	Asphalt Asbuton Crumb Rubber	Kg	185.49	Rp	10,530.00	Rp	1,953,209.70
Upah	Pekerja	Jam	0.55	Rp	6,931.77	Rp	3,825.00
	Mandor	Jam	0.06	Rp	10,655.82	Rp	588.00
				Jumlah		Rp	2,887,280.84

Tabel 4.39 Harga Satuan Pekerjaan Laston (AC-BC Mod. CR)

Laston Lapis Antara Modifikasi Crumb Rubber (AC-BC Mod.CR)							
Kebutuhan		Satuan	Indeks	Harga Satuan		Jml. Harga	
Alat	AMP	Jam	0.056	Rp	6,396,132.33	Rp	357,566.92
	Genset	Jam	0.056	Rp	485,626.55	Rp	27,148.28
	Dump Truck	Jam	0.592	Rp	292,647.82	Rp	173,257.70
	Asphalt Finisher	Jam	0.021	Rp	1,560,011.96	Rp	33,148.72
	Tandem Roller	Jam	0.021	Rp	569,325.86	Rp	11,908.59
	P. Tyre Roller	Jam	0.009	Rp	559,704.29	Rp	5,023.04
Bahan	Agr 5-10 & 10-20	m3	0.88	Rp	213,444.00	Rp	187,004.85
	Agr 0-5	m3	0.66	Rp	218,526.00	Rp	144,780.02
	Asphalt Asbuton Crumb Rubber	Kg	157.71	Rp	10,530.00	Rp	1,660,724.21
Upah	Pekerja	Jam	0.559	Rp	6,931.77	Rp	3,875.11
	Mandor	Jam	0.056	Rp	10,655.82	Rp	595.70
				Jumlah		Rp	2,605,033.12

Tabel 4.40 Rencana anggaran biaya pelebaran jalan Bulu Tuban

No.	Uraian	Vol	Sat	Harga Satuan	Jumlah
1	**Pekerjaan Persiapan**				
	Mobilisasi	1	Ls	51600000	51,600,000.000
	Menajemen & Keselamatan Lalu-lintas	1	LS	66750000	66,750,000.000
					118,350,000.000
2	**Pekerjaan Tanah**				
	Galian Biasa	73125	m^3	121790.7973	8,905,952,049.378
					8,905,952,049.378
3	**Pekerjaaan Perkerasan dan Bahu Jalan**				
	Lapis Pondasi Agregat Klas B (t : 6cm)	28125.5	m^3	515303.2221	14,493,160,773.206
	Lapis Pondasi Agregat Klas S (t : 6cm)	45000	m^3	254710.722	11,461,982,488.943
					25,955,143,262.149
4	**Pekerjaan Perkerasan Berbutir**				
	Lapis Pondasi atas bersemen (Cement Treated Base / C T B) (t : 6cm)	14062.5	m^3	516867.1814	7,268,444,738.626
					7,268,444,738.626
5	**Pekerjaan Perkerasan Aspal**				
	Lapis Perekat - Aspal Emulsi	30510	lt	11140.0938	339,884,261.829
	Split Matrik Aspal Modifikasi Crumb Rubber (SMA Mod. CR) (t : 5cm)	1695	m^3	2887280.841	4,893,941,024.714
	Laston Lapis Antara Modifikasi Crumb Rubber (AC-BC Mod.CR) (t : 6cm)	2034	m^3	2605033.115	5,298,637,356.444
					10,532,462,642.987
6	**Pekerjaan Pemeliharaan**				
	Pemeliharaan Rutin	1	Ls	5278035269	5,278,035,269.314

Tabel 4.41 Rekapitulasi rencana anggaran biaya pelebaran jalan Bulu Tuban

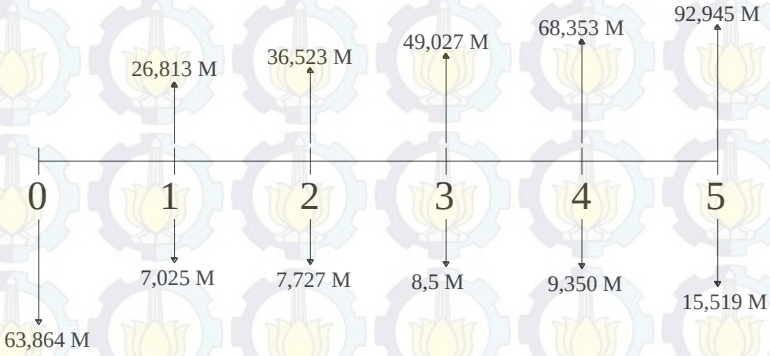
No.	Uraian	Harga
1	Pekerjaan Persiapan	118,350,000.000
2	Pekerjaan Tanah	8,905,952,049.378
3	Pekerjaaan Perkerasan dan Bahu Jalan	25,955,143,262.149
4	Pekerjaan Perkerasan Berbutir	7,268,444,738.626
5	Pekerjaan Perkerasan Aspal	10,532,462,642.987
6	Pekerjaan Pemeliharaan	5,278,035,269.314
	Total	58,058,387,962.454
	PPN 10%	5,805,838,796.245
	Jumlah	63,864,226,758.699

4.8 Analisa Benefit Cost Ratio (BCR)

Benefit cost ratio merupakan salah satu metode untuk mengetahui kelayakan suatu proyek dari segi ekonomi. Pada dasarnya analisa perhitungan ini membandingkan antara besarnya biaya investasi yang dikeluarkan (cost) dengan besarnya biaya penghematan (benefit) yang diperoleh akibat proyek pelebaran jalan Bulu – Tuban tersebut.

Biaya konstruksi pelebaran jalan merupakan biaya investasi yang diperoleh dari perhitungan rencana anggaran biaya.

- Biaya konstruksi pelebaran jalan = Rp.63.864.226.758,699
- Benefit/Manfaat = penghematan BOK + penghematan nilai waktu
  = 106.145.233.593,556 + 186.653.631.625,452
  = Rp. 292.789.865.219,009
- Biaya pemeliharaan = 10% x Biaya konstruksi
  = 10% x Rp. 63.864.226.758,699
  = Rp. 6.386.422.675,869
- Biaya pemeliharaan 5 tahunan = Rp. 5.233.825.286,542



Gambar 4.11 Cash flow

Tabel 4.42 Tabel Perhitungan Present worth cost dan Present Worth Benefit

Tahun	n	Total biaya (cost) (Rupiah/Tahun)	Penghematan BOK (Rupiah/Tahun)	Penghematan Nilai Waktu (Rupiah/Tahun)	Penghematan Total (benefit) (Rupiah/Tahun)	(P/F,i%,n) i= 7.75%	Present worth cost (Rupiah/Tahun)	present worth benefit (Rupiah/Tahun)
2014	0	Rp 63,864,226,758.70				1	Rp 63,864,226,758.70	
2015	1	Rp 7,025,064,943.46	Rp 7,917,677,980.35	Rp 18,895,996,707.06	Rp 26,813,674,687.41	0.9281	Rp 6,519,781,850.08	Rp 24,885,080,916.39
2016	2	Rp 7,727,571,437.80	Rp 12,279,409,777.87	Rp 24,243,640,910.70	Rp 36,523,050,688.57	0.8613	Rp 6,655,925,786.62	Rp 31,458,099,978.85
2017	3	Rp 8,500,328,581.58	Rp 17,740,737,700.41	Rp 31,287,037,410.40	Rp 49,027,775,110.81	0.7994	Rp 6,794,912,635.99	Rp 39,191,361,300.65
2018	4	Rp 9,350,361,439.74	Rp 26,537,734,785.47	Rp 41,816,003,372.19	Rp 68,353,738,157.66	0.7419	Rp 6,936,801,762.96	Rp 50,709,946,820.01
2019	5	Rp 15,519,222,870.26	Rp 37,078,614,387.19	Rp 55,867,263,073.40	Rp 92,945,877,460.59	0.6885	Rp 10,685,222,645.22	Rp 63,994,660,230.41
						TOTAL	Rp 101,456,871,439.58	Rp 210,239,149,246.30
						BCR	2.072202171	
						NPV	Rp 108,782,277,806.73	

Present Worth Benefit = Rp. 210.239.149.246,30
Present Worth Cost = Rp. 101.456.871.439,58

$$BCR = \frac{Rp.210.239.149.246,30}{Rp.101.456.871.439,58} = 2,07 > 1$$

Dari hasil perhitungan diatas maka dapat disimpulkan proyek pelebaran jalan Bulu – Tuban layak dilaksanakan ditinjau dari sisi ekonomi.

4.9 Analisa Net Present Value (NPV)

Net Present Value (NPV) adalah sebagai salah satu parameter kelayakan selain analisis Benefit Cost Ratio (BCR) . Net Present Value (NPV) diperoleh dari selisih semua manfaat dengan semua pengeluaran.Nilai Net Present Value (NPV) akan menentukan layak tidaknya suatu proyek untuk dikerjakan. Suatu proyek layak untuk dikerjakan apabila nilai NPV= (+)

NPV = Present Worth Benefit – Present Worth Cost
= 210.239.149.246,30 – 101.456.871.439,58
= Rp. 108.782.277.806,73 > 0

Dari hasil perhitungan diatas didapatkan nilai NPV>0 maka dapat disimpulkan proyek pelebaran jalan Bulu – Tuban layak dilaksanakan ditinjau dari sisi ekonomi.

“Halaman ini sengaja dikosongkan”

BAB V

KESIMPULAN DAN SARAN

5.1 Kesimpulan

Dari hasil analisa perhitungan pada bab-bab sebelumnya maka dapat diambil kesimpulan sebagai berikut :

1. Kondisi karakteristik jalan Bulu Tuban sebelum dilakukan pelebaran adalah jalan 2 lajur 2 arah tak terbagi dengan DS = 0,673 dan DB = 0,81 pada tahun 2014, DS = 0,969 dan DB = 0,9 pada tahun 2019, sedangkan sesudah dilakukan pelebaran jalan,jalan Bulu Tuban menjadi 4 lajur 2 arah dengan DS = 0,373 pada tahun 2014 dan DS = 0,879 pada tahun 2034.
2. Nilai penghematan BOK pada jalan Bulu = Rp.106.145.233.593,556, penghematan nilai waktu = Rp.186.653.631.625,452, dan penghematan total = Rp.292.789.865.219,009
3. Dari segi ekonomi jumlah penghematan total (NPV) sebesar Rp. 108.782.277.806,73,- (NPV>0) dan nilai BCR sebesar 2,07 (BCR>1). Sehingga dari segi ekonomi proyek pelebaran jalan Bulu tuban dinyatakan layak dari segi ekonomi dikarenakan manfaat yang diterima lebih besar daripada biaya yang dikeluarkan.

5.2 Saran

Berdasarkan dari hasil analisa kelayakan pada proyek pelebaran jalan yang ditinjau dari segi ekonomi pelebaran jalan tersebut dinyatakan layak untuk dikerjakan. pada tahun 2030-2034 DS > 0,75 sehingga terjadi kemacetan. Untuk menghindari kemacetan pada tahun 2030 dan seterusnya sebaiknya dilakukan pelebaran jalan.

```
+--------------------+-----------------------------------+-----------------------------------+
| K A J I            | Province                JAWA TIMUR | Date       :          JUNI 2014 |
|                    | Link number:                       | Handled by :               ARIF |
| INTERURBAN ROADS   | Segment code:                      | Checked by :               ARIF |
|                    +-----------------------------------+-----------------------------------+
| Form IR-1: Input   | Segment between              BULU and              TUBAN                  |
|                    | Specific grade:  No [NO indicates segment, YES spec grade(only 2/2UD)] |
|      GENERAL DATA, +-----------------------------------+-----------------------------------+
|      ROAD GEOMETRY | Administr. road class :   NATIONAL | Functional road class:   ARTERIAL |
|                    | Road type             :     2/2UD | Length (km)          :     7.500 |
| Purpose: Operation | Time period:                       | Case number:                      |
+--------------------+-----------------------------------+-----------------------------------+
| HORIZONTAL ALIGNMENT                                                                         |
|                                              +--> A   *  * * * * *   -----> To:             |
|                                          * *|* * * *                              TUBAN   |
|         To:     <-----                 *    |         * * * * *                            |
|                   BULU  * * * * * * * *     *|* * * * *                  N   Indicate      |
|                                            *   +--> B                    -+-  north (N)    |
|                        * * * * * * * * *                                                     |
|   +-----------------------------------------+  +-----------+--------+--------+--------+    |
|   | Horizontal curvature (radians/km):   NA |  |Roadside    | Side A | Side B |  Mean  |    |
|   | Sight distance > 300 m (%)       :   70 |  |development +--------+--------+--------+    |
|   | Sight distance class (default= B):  A   |  |Default: 0% |    0 % |    0 % |    0 % |    |
|   +-----------------------------------------+  +-----------+--------+--------+--------+    |
+----------------------------------------------------------------------------------------------+
| VERTICAL ALIGNMENT                 * * * * *                                                 |
|                                  *         *          +-----------------------------------+ |
|                * * * * * * *                           | Only for specific grade analysis | |
|                                                        +-----------------------------------+ |
|   +-----------------------------------------+          |   Grade length (km)   :          | |
|   | Rise+fall     :    NA m/km              |          |   Grade slope (%)     :          | |
|   | Alignment type:    FLAT (   FLAT = default)|       |   Climbing lane (Y/N) :          | |
|   +-----------------------------------------+          +-----------------------------------+ |
+----------------------------------------------------------------------------------------------+
| CROSS SECTION                                                                                |
|                                                                                              |
|    Undivided road        |||####============================####|||                         |
|                  side A    WsA       WcA          WcB      WsB    side B                   |
|                          +----+------------+-----------+----+                              |
|                           3.70   3.50            3.50  3.70                                |
|                                                                                              |
|         +-----------------------------------+--------+--------+--------+--------+          |
|         | UNADJUSTED WIDTHS                 | Side A | Side B | Total  |  Mean  |          |
|         +-----------------------------------+--------+--------+--------+--------+          |
|         | Average carriageway width, Wc (m) |   3.50 |   3.50 |   7.00 |        |          |
|         | Unobstructed shoulder width, Ws (m)|  3.70 |   3.70 |   7.40 |   3.70 |          |
|         +-----------------------------------+--------+--------+--------+--------+          |
+----------------------------------------------------------------------------------------------+
|  ROAD SURFACE CONDITIONS                                                                     |
|           +-----------------------------------+------------+------------+                   |
|           | CARRIAGEWAY SURFACE CONDITIONS    |   Side A   |   Side B   |                   |
|           +-----------------------------------+------------+------------+                   |
|           | Type [Flexible(asphalt)/Concrete/Other] | FLEXIBLE  | FLEXIBLE  |             |
|           | Surface condition [Good/Fair/Bad] |    GOOD    |    GOOD    |                   |
|           |                                   |            |            |                   |
|           +-----------------------------------+------------+------------+                   |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
| | SHOULDER SURFACE CONDITIONS       | ------- SIDE A ------ | ------- SIDE B ------ |       |
| |                                   |   Outer   |   Inner   |   Inner   |   Outer   |       |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
| | Surface type [Flexible/Concrete/Other]  |     OTHER |           |           |     OTHER |       |
| | Drop from carriageway to shoulder (cm)  |     10    |           |           |     10    |       |
| | Usability [Traffic/Parking/Emergency]   | EMERGENCY |           |           | EMERGENCY |       |
| | (default shoulder usability)            |(  PARKING)|(         )|(         )|(  PARKING)|       |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
+----------------------------------------------------------------------------------------------+
|  EFFECTIVE WIDTHS                                  +----------------+-----------------+       |
|       +-----------------+--------------+           |                |     Widths (m)  |       |
|       | Undivided road  |  Widths (m)  |           | Divided road   | Side A  | Side B |       |
|       +-----------------+--------------+           +----------------+---------+---------+       |
|       | Shoulder, total |     7.40     |           | Shoulder, total |         |         |       |
|       | Shoulder, mean  |     3.70     |           | Shoulder, mean  |         |         |       |
|       | Carriageway     |     7.00     |           | Carriageway     |         |         |       |
|       +-----------------+--------------+           +----------------+---------+---------+       |
+----------------------------------------------------------------------------------------------+
| TRAFFIC CONTROL CONDITIONS                                                                   |
|         +-----------------------------------------+-----------------------------------+      |
|         | Speed limit       :   NA km/h           | Max gross weight: 0.000 tonnes  |      |
|         | Other limitations :                                                         |      |
|         | More remarks      :                                                         |      |
|         +-----------------------------------------+-----------------------------------+      |
+--------------------+-----------------------------------+-----------------------------------+
| Program version 1.10F| Date of run: 150121/15:33 |                                       |
+--------------------+-----------------------------------+---------------------------------------+
```

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF
TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data (CLASSIFIED-HOURLY) (CLass/AAdt/UNclass)	ANNUAL AVERAGE DAILY TRAFFIC: AADT (veh/day)	K-factor (default: 0.11)	DIRECTIONAL SPLIT: Dir1 - Dir2 (default: 50 - 50)	
			NA - NA %	

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values (normal values)	31.05 (57.0)	34.42 (23.0)	0.197 (7.0)	3.412 (4.0)	30.90 (9.0)	100.0 (100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Di-rec- tion	Light Vehicle veh/h	Light Vehicle pcu/h	Med Heavy Veh veh/h	Med Heavy Veh pcu/h	Large Bus veh/h	Large Bus pcu/h	Large Truck veh/h	Large Truck pcu/h	MotorCycle veh/h	MotorCycle pcu/h	Total flow Split (%)	Total flow veh/h	Total flow pcu/h
		pce,1= 1.00	pce,1= 1.30	pce,1= 1.30	pce,1= 1.50	pce,1= 1.50	pce,1= 2.50	pce,1= 2.50	pce,1= 2.50	pce,1= 0.50				
1.2		pce,2= 1.00	pce,2= 1.30	pce,2= 1.30	pce,2= 1.50	pce,2= 1.50	pce,2= 2.50	pce,2= 2.50	pce,2= 0.50					
2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	322	322	428	556	2	3	38	95	321	161	54.94	1111	1137
4	Dir2	306	306	268	348	2	3	31	78	304	152	45.05	911	887
5	1+2	628	628	696	904	4	6	69	173	625	313		2022	2024
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill						Directional split, SP= Q1/(Q1+Q2)=					54.9%	56.1%	
7							Pcu-factor, Fpcu =						1.000	

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 150121/15:33

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF
SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: FVo (km/h) LV	MHV	LB	LT	MC	Carriage-way width (m)	FVo+FVw: Light vehicle adjust-ment, FVw (km/h)	Adjustment factors: friction Side Tab B2:1 (2)+(3) (4)	Land use FFVsf (5)	FFVrc (6)	Actual free-flow speeds, km/h: Light vehicle (7)	Other vehicle types MHV	LB	LT	MC
1+2	68.0	60.0	73.0	58.0	55.0	0.0	68.0	0.980	1.000	66.64	58.80	71.54	56.84	53.90

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-1:1 (12)	Directional split FCsp Table C-3:1 (13)	Side friction FCsf Table C-4:1 (14)	Actual capacity, C: C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	3100	1.000	0.970	1.000	3008

ACTUAL SPEED and TRAVEL TIME for light vehicles — Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types: km/h MHV	LB	LT	MC	Degree of bunching Fig D3:1 (31)
1+2	2024	0.673	43.58	7.500	619.433	40.70	45.38	39.98	38.90	0.809

Space for user remark:

Program version 1.10F	Date of run: 150121/15:33

```
+--------------------+-----------------------------------+-----------------------------------+
| K A J I            | Province                JAWA TIMUR | Date       :           JUNI 2014 |
|                    | Link number:                       | Handled by :                ARIF |
| INTERURBAN ROADS   | Segment code:                      | Checked by :                ARIF |
|                    +-----------------------------------+-----------------------------------+
| Form IR-1: Input   | Segment between              BULU and              TUBAN                  |
|                    | Specific grade:  No [NO indicates segment, YES spec grade(only 2/2UD)] |
|      GENERAL DATA, +-----------------------------------+-----------------------------------+
|      ROAD GEOMETRY | Administr. road class :   NATIONAL | Functional road class:   ARTERIAL |
|                    | Road type             :     2/2UD | Length (km)           :     7.500 |
| Purpose: Operation | Time period:                       | Case number:                      |
+--------------------+-----------------------------------+-----------------------------------+
| HORIZONTAL ALIGNMENT                                                                         |
|                                              +--> A   *  * * * * *   -----> To:             |
|                                            * *|* * * *                          TUBAN      |
|         To:     <-----                   *    |       * * * * *                             |
|                   BULU  * * * * * * * * *     *|* * * * *                  N   Indicate     |
|                                            *   +--> B                    -+-  north (N)    |
|                       * * * * * * * * * *                                                    |
|   +-----------------------------------------+  +------------+--------+--------+--------+   |
|   | Horizontal curvature (radians/km):   NA |  |Roadside    | Side A | Side B |  Mean  |   |
|   | Sight distance > 300 m (%)       :   70 |  |development +--------+--------+--------+   |
|   | Sight distance class (default= B):  A   |  |Default: 0% |    0 % |    0 % |    0 % |   |
|   +-----------------------------------------+  +------------+--------+--------+--------+   |
+----------------------------------------------------------------------------------------------+
| VERTICAL ALIGNMENT                 * * * * *                                                 |
|                                  *         *          +-----------------------------------+ |
|                * * * * * * *                           | Only for specific grade analysis | |
|                                                        +-----------------------------------+ |
|   +-----------------------------------------+          |   Grade length (km)   :          | |
|   | Rise+fall     :    NA m/km              |          |   Grade slope (%)     :          | |
|   | Alignment type:    FLAT (   FLAT = default)|       |   Climbing lane (Y/N) :          | |
|   +-----------------------------------------+          +-----------------------------------+ |
+----------------------------------------------------------------------------------------------+
| CROSS SECTION                                                                                |
|                                                                                              |
|    Undivided road        |||####============================####|||                         |
|                  side A    WsA       WcA          WcB      WsB    side B                   |
|                          +----+------------+-----------+----+                              |
|                           1.50   3.50             3.50  1.50                               |
|                                                                                              |
|        +-----------------------------------+--------+--------+--------+--------+           |
|        | UNADJUSTED WIDTHS                 | Side A | Side B | Total  |  Mean  |           |
|        +-----------------------------------+--------+--------+--------+--------+           |
|        | Average carriageway width, Wc (m) |   3.50 |   3.50 |   7.00 |        |           |
|        | Unobstructed shoulder width, Ws (m)|  1.50 |   1.50 |   3.00 |   1.50 |           |
|        +-----------------------------------+--------+--------+--------+--------+           |
+----------------------------------------------------------------------------------------------+
|  ROAD SURFACE CONDITIONS                                                                     |
|           +-----------------------------------+------------+------------+                   |
|           | CARRIAGEWAY SURFACE CONDITIONS    |   Side A   |   Side B   |                   |
|           +-----------------------------------+------------+------------+                   |
|           | Type [Flexible(asphalt)/Concrete/Other] | FLEXIBLE  | FLEXIBLE  |             |
|           | Surface condition [Good/Fair/Bad] |    GOOD    |    GOOD    |                   |
|           |                                   |            |            |                   |
|           +-----------------------------------+------------+------------+                   |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
| | SHOULDER SURFACE CONDITIONS       | ------- SIDE A ------ | ------- SIDE B ------ |       |
| |                                   |   Outer   |   Inner   |   Inner   |   Outer   |       |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
| | Surface type [Flexible/Concrete/Other]  |     OTHER |           |           |     OTHER |       |
| | Drop from carriageway to shoulder (cm)  |     10    |           |           |     10    |       |
| | Usability [Traffic/Parking/Emergency]   | EMERGENCY |           |           | EMERGENCY |       |
| | (default shoulder usability)            |(  PARKING)|(         )|(         )|(  PARKING)|       |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
+----------------------------------------------------------------------------------------------+
|  EFFECTIVE WIDTHS                                  +-----------------+-----------------+     |
|        +-----------------+--------------+         |                 |     Widths (m)  |     |
|        | Undivided road  |  Widths (m)  |         | Divided road    | Side A  | Side B |     |
|        +-----------------+--------------+         +-----------------+---------+--------+     |
|        | Shoulder, total |     3.00     |         | Shoulder, total |         |        |     |
|        | Shoulder, mean  |     1.50     |         | Shoulder, mean  |         |        |     |
|        | Carriageway     |     7.00     |         | Carriageway     |         |        |     |
|        +-----------------+--------------+         +-----------------+---------+--------+     |
+----------------------------------------------------------------------------------------------+
| TRAFFIC CONTROL CONDITIONS                                                                   |
|        +-----------------------------------------+-----------------------------------+       |
|        | Speed limit       :   NA km/h           | Max gross weight: 0.000 tonnes  |       |
|        | Other limitations :                                                         |       |
|        | More remarks      :                                                         |       |
|        +-----------------------------------------+-----------------------------------+       |
+--------------------+-----------------------------+-----------------------------------------+
| Program version 1.10F| Date of run:  140610/6:24 |                                         |
+----------------------+---------------------------+-----------------------------------------+
```

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF
TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data (CLASSIFIED-HOURLY) (CLass/AAdt/UNclass)	ANNUAL AVERAGE DAILY TRAFFIC: AADT (veh/day)	K-factor (default: 0.11)	DIRECTIONAL SPLIT: Dir1 - Dir2 (default: 50 - 50) NA - NA %

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.17	34.34	0.183	3.484	30.81	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Di-rec- tion	Light Vehicle pce,1= 1.00 pce,2= 1.00 veh/h	pcu/h	Med Heavy Veh pce,1= 1.30 pce,2= 1.30 veh/h	pcu/h	Large Bus pce,1= 1.50 pce,2= 1.50 veh/h	pcu/h	Large Truck pce,1= 2.50 pce,2= 2.50 veh/h	pcu/h	MotorCycle pce,1= 0.50 pce,2= 0.50 veh/h	pcu/h	Total flow Q Split (%)	veh/h	pcu/h
2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	349	349	460	598	2	3	42	105	345	173	54.92	1198	1228
4	Dir2	331	331	289	376	2	3	34	85	327	164	45.07	983	959
5	1+2	680	680	749	974	4	6	76	190	672	337		2181	2187
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=					54.9%	56.1%
7								Pcu-factor, Fpcu =						1.002

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 140610/6:24

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF
SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed FVo (km/h) for different vehicles: LV	MHV	LB	LT	MC	Table B-1:1 or B-1:2 (2)	Carriage-way width (m) FVw	Light vehicle adjust-ment, FVw (km/h)	FVo+FVw Tab B2:1 (2)+(3) (km/h)	Adjustment factors: friction Tab B3:1 (4)	Side FFVsf (5)	Land use Road func Tab B4:1 FFVrc (6)	Actual free-flow speeds, km/h: Light vehicle (4*5*6)+(7)	Other vehicle types: MHV	LB	LT	MC
1+2	68.0	60.0	73.0	58.0	55.0		0.0	68.0	0.970	1.000			65.96	58.20	70.81	56.26	53.35

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-1:1 (12)	Directional split FCsp Table C-2:1 (13)	Side friction FCsf Table C-3:1 (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	3100	1.000	0.970	0.970	2918

ACTUAL SPEED and TRAVEL TIME for light vehicles — Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types: km/h MHV	LB	LT	MC	Degree of bunching Fig D3:1 DB (31)
1+2	2187	0.749	40.58	7.500	665.298	38.28	42.01	37.71	36.85	0.838

Space for user remark:

Program version 1.10F | Date of run: 140610/6:24

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+--------------------+-----------------------------------+-----------------------------------+
| K A J I            | Province                JAWA TIMUR | Date       :           JUNI 2014  |
|                    | Link number:                       | Handled by :                ARIF  |
| INTERURBAN ROADS   | Segment code:                      | Checked by :                ARIF  |
|                    +-----------------------------------+-----------------------------------+
| Form IR-1: Input   | Segment between              BULU and              TUBAN                  |
|                    | Specific grade:  No [NO indicates segment, YES spec grade(only 2/2UD)]  |
|      GENERAL DATA, +-----------------------------------+-----------------------------------+
|      ROAD GEOMETRY | Administr. road class :   NATIONAL | Functional road class:   ARTERIAL |
|                    | Road type             :     2/2UD | Length (km)           :     7.500 |
| Purpose: Operation | Time period:                       | Case number:                      |
+--------------------+-----------------------------------+-----------------------------------+
| HORIZONTAL ALIGNMENT                                                                         |
|                                              +--> A   *  * * * * *   -----> To:             |
|                                            * *|* * * *                          TUBAN      |
|         To:     <-----                   *    |       * * * * *                             |
|                   BULU  * * * * * * * * *     *|* * * * *                  N   Indicate     |
|                                            *   +--> B                    -+-  north (N)    |
|                       * * * * * * * * * *                                                    |
|   +-----------------------------------------+  +------------+--------+--------+--------+   |
|   | Horizontal curvature (radians/km):   NA |  |Roadside    | Side A | Side B |  Mean  |   |
|   | Sight distance > 300 m (%)       :   70 |  |development +--------+--------+--------+   |
|   | Sight distance class (default= B):  A   |  |Default: 0% |    0 % |    0 % |    0 % |   |
|   +-----------------------------------------+  +------------+--------+--------+--------+   |
+----------------------------------------------------------------------------------------------+
| VERTICAL ALIGNMENT                 * * * * *                                                 |
|                                  *         *          +-----------------------------------+ |
|                * * * * * * *                          | Only for specific grade analysis | |
|                                                       +-----------------------------------+ |
|   +---------------------------------------------+     |   Grade length (km)   :          | |
|   | Rise+fall     :    NA m/km                  |     |   Grade slope (%)     :          | |
|   | Alignment type:    FLAT (   FLAT = default)|     |   Climbing lane (Y/N) :          | |
|   +---------------------------------------------+     +-----------------------------------+ |
+----------------------------------------------------------------------------------------------+
| CROSS SECTION                                                                                |
|                                                                                              |
|    Undivided road        |||####============================####|||                        |
|                  side A    WsA       WcA          WcB      WsB    side B                   |
|                          +----+------------+-----------+----+                              |
|                           1.50   3.50             3.50  1.50                               |
|                                                                                              |
|        +-----------------------------------+-------+-------+-------+-------+               |
|        | UNADJUSTED WIDTHS                 | Side A | Side B | Total  |  Mean  |           |
|        +-----------------------------------+-------+-------+-------+-------+               |
|        | Average carriageway width, Wc (m) |   3.50 |   3.50 |   7.00 |        |           |
|        | Unobstructed shoulder width, Ws (m)|  1.50 |   1.50 |   3.00 |   1.50 |           |
|        +-----------------------------------+-------+-------+-------+-------+               |
+----------------------------------------------------------------------------------------------+
|  ROAD SURFACE CONDITIONS                                                                     |
|           +-----------------------------------+------------+------------+                   |
|           | CARRIAGEWAY SURFACE CONDITIONS    |   Side A   |   Side B   |                   |
|           +-----------------------------------+------------+------------+                   |
|           | Type [Flexible(asphalt)/Concrete/Other] | FLEXIBLE  | FLEXIBLE  |             |
|           | Surface condition [Good/Fair/Bad] |    GOOD    |    GOOD    |                   |
|           |                                   |            |            |                   |
|           +-----------------------------------+------------+------------+                   |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
| | SHOULDER SURFACE CONDITIONS       | ------- SIDE A ------ | ------- SIDE B ------ |       |
| |                                   |   Outer   |   Inner   |   Inner   |   Outer   |       |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
| | Surface type [Flexible/Concrete/Other]  |     OTHER |           |           |     OTHER |       |
| | Drop from carriageway to shoulder (cm)  |     10    |           |           |     10    |       |
| | Usability [Traffic/Parking/Emergency]   | EMERGENCY |           |           | EMERGENCY |       |
| | (default shoulder usability)            |(  PARKING)|(         )|(         )|(  PARKING)|       |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
+----------------------------------------------------------------------------------------------+
|  EFFECTIVE WIDTHS                                  +-----------------+-----------------+     |
|       +-----------------+--------------+           |                 |     Widths (m)  |     |
|       | Undivided road  |  Widths (m)  |           | Divided road    | Side A  | Side B |     |
|       +-----------------+--------------+           +-----------------+---------+--------+     |
|       | Shoulder, total |     3.00     |           | Shoulder, total |         |        |     |
|       | Shoulder, mean  |     1.50     |           | Shoulder, mean  |         |        |     |
|       | Carriageway     |     7.00     |           | Carriageway     |         |        |     |
|       +-----------------+--------------+           +-----------------+---------+--------+     |
+----------------------------------------------------------------------------------------------+
| TRAFFIC CONTROL CONDITIONS                                                                   |
|       +-----------------------------------------+-----------------------------------+        |
|       | Speed limit       :   NA km/h           | Max gross weight: 0.000 tonnes  |        |
|       | Other limitations :                                                         |        |
|       | More remarks      :                                                         |        |
|       +-----------------------------------------+-----------------------------------+        |
+----------------------+-----------------------+-----------------------------------------------+
| Program version 1.10F| Date of run:  140610/6:32 |                                          |
+----------------------+-----------------------+-----------------------------------------------+
```

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF
TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data (CLASSIFIED-HOURLY) (CLass/AAdt/UNclass)	ANNUAL AVERAGE DAILY TRAFFIC: AADT (veh/day)	K-factor (default: 0.11)	DIRECTIONAL SPLIT: Dir1 - Dir2 (default: 50 - 50) NA - NA %

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values (normal values)	31.33 (57.0)	34.28 (23.0)	0.171 (7.0)	3.463 (4.0)	30.73 (9.0)	100.0 (100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Direction	Light Vehicle veh/h	Light Vehicle pcu/h	Med Heavy Veh veh/h	Med Heavy Veh pcu/h	Large Bus veh/h	Large Bus pcu/h	Large Truck veh/h	Large Truck pcu/h	MotorCycle veh/h	MotorCycle pcu/h	Total flow Split (%)	Total flow veh/h	Total flow pcu/h
	rec-	pce,1= 1.00 pce,2= 1.00		pce,1= 1.30 pce,2= 1.30		pce,1= 1.50 pce,2= 1.50		pce,1= 2.50 pce,2= 2.50		pce,1= 0.50 pce,2= 0.50				
1.1	tion													
1.2														
2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	376	376	493	641	2	3	45	113	369	185	54.93	1285	1318
4	Dir2	357	357	309	402	2	3	36	90	350	175	45.06	1054	1027
5	1+2	733	733	802	1043	4	6	81	203	719	360		2339	2345
6	Note. Specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=				54.9%	56.2%	
7								Pcu-factor, Fpcu =					1.002	

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol	Weighting factor (21)	Frequency of events (22)	Weighted frequency (23)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 140610/6:32

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF

SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.
Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: Table B-1:1 or B-1:2 LV (2)	MHV (2)	LB (3)	LT (3)	MC (3)	Carriage-way width (m)	FVo+FVw adjust-ment, FVw (km/h)	Adjustment factors: vehicle friction Tab B2:1 (2)+(3)	Side FFVsf Tab B3:1 (4)	Land use FFVrc Tab B4:1 (5)	Actual free-flow speeds, km/h: Light vehicle (4*5*6) (6)	MHV (7)	LB	LT	MC
1+2	68.0	60.0	73.0	58.0	55.0	0.0	68.0	0.970	1.000	65.96	58.20	70.81	56.26	53.35	

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-2:1 (12)	Directional split FCsp Table C-3:1 (13)	Side friction FCsf Table C-4:1 (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h: (11)*(12)*(13)*(14) (15)
1+2	3100	1.000	0.970	0.970	2918

ACTUAL SPEED and TRAVEL TIME for light vehicles — Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types km/h: MHV	LB	LT	MC	Degree of bunching Fig D3:1 DB (31)
1+2	2345	0.804	38.74	7.500	696.775	36.84	39.93	36.37	35.66	0.856

Space for user remark:

Program version 1.10F | Date of run: 140610/6:32

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+--------------------+-----------------------------------+-----------------------------------+
| K A J I            | Province                JAWA TIMUR | Date       :           JUNI 2014 |
|                    | Link number:                       | Handled by :                ARIF |
| INTERURBAN ROADS   | Segment code:                      | Checked by :                ARIF |
|                    +-----------------------------------+-----------------------------------+
| Form IR-1: Input   | Segment between              BULU and              TUBAN                  |
|                    | Specific grade:  No [NO indicates segment, YES spec grade(only 2/2UD)] |
|      GENERAL DATA, +-----------------------------------+-----------------------------------+
|      ROAD GEOMETRY | Administr. road class :   NATIONAL | Functional road class:   ARTERIAL |
|                    | Road type             :     2/2UD | Length (km)           :     7.500 |
| Purpose: Operation | Time period:                       | Case number:                      |
+--------------------+-----------------------------------+-----------------------------------+
| HORIZONTAL ALIGNMENT                                                                         |
|                                                +--> A   *  * * * * *   -----> To:           |
|                                             * *|* * * *                          TUBAN     |
|         To:     <-----                   *     |         * * * * *                          |
|                   BULU  * * * * * * * * *       *|* * * * *                  N   Indicate    |
|                                             *   +--> B                      -+-  north (N)  |
|                         * * * * * * * * *                                                    |
|   +-----------------------------------------+  +------------+--------+--------+--------+   |
|   | Horizontal curvature (radians/km):   NA |  |Roadside    | Side A | Side B |  Mean  |   |
|   | Sight distance > 300 m (%)       :   70 |  |development +--------+--------+--------+   |
|   | Sight distance class (default= B):  A   |  |Default: 0% |    0 % |    0 % |    0 % |   |
|   +-----------------------------------------+  +------------+--------+--------+--------+   |
+----------------------------------------------------------------------------------------------+
| VERTICAL ALIGNMENT                 * * * * *                                                 |
|                                  *         *          +-----------------------------------+ |
|                * * * * * * *                            | Only for specific grade analysis | |
|                                                         +-----------------------------------+ |
|   +-----------------------------------------+     +     |   Grade length (km)   :          | |
|   | Rise+fall     :    NA m/km               |     |     |   Grade slope (%)     :          | |
|   | Alignment type:    FLAT (   FLAT = default)|    |     |   Climbing lane (Y/N) :          | |
|   +-----------------------------------------+     +     +-----------------------------------+ |
+----------------------------------------------------------------------------------------------+
| CROSS SECTION                                                                                |
|                                                                                              |
|    Undivided road        |||####============================####|||                         |
|                  side A    WsA       WcA          WcB      WsB    side B                   |
|                          +----+------------+-----------+----+                              |
|                           1.50   3.50             3.50  1.50                               |
|                                                                                              |
|         +-----------------------------------+-------+-------+-------+-------+              |
|         | UNADJUSTED WIDTHS                 | Side A | Side B | Total  |  Mean  |          |
|         +-----------------------------------+-------+-------+-------+-------+              |
|         | Average carriageway width, Wc (m)  |   3.50 |   3.50 |   7.00 |        |          |
|         | Unobstructed shoulder width, Ws (m)|   1.50 |   1.50 |   3.00 |   1.50 |          |
|         +-----------------------------------+-------+-------+-------+-------+              |
+----------------------------------------------------------------------------------------------+
|  ROAD SURFACE CONDITIONS                                                                     |
|           +-----------------------------------+-----------+-----------+                      |
|           | CARRIAGEWAY SURFACE CONDITIONS    |   Side A  |   Side B  |                      |
|           +-----------------------------------+-----------+-----------+                      |
|           | Type [Flexible(asphalt)/Concrete/Other] |  FLEXIBLE  |  FLEXIBLE  |             |
|           | Surface condition [Good/Fair/Bad]       |    GOOD    |    GOOD    |             |
|           |                                         |            |            |             |
|           +-----------------------------------------+------------+------------+             |
| +-----------------------------------+-----------+-----------+-----------+-----------+      |
| | SHOULDER SURFACE CONDITIONS       | ------- SIDE A ------ | ------- SIDE B ------ |      |
| |                                   |   Outer   |   Inner   |   Inner   |   Outer   |      |
| +-----------------------------------+-----------+-----------+-----------+-----------+      |
| | Surface type [Flexible/Concrete/Other]  |     OTHER |           |           |     OTHER |      |
| | Drop from carriageway to shoulder (cm)  |     10    |           |           |     10    |      |
| | Usability [Traffic/Parking/Emergency]   | EMERGENCY |           |           | EMERGENCY |      |
| | (default shoulder usability)            |(  PARKING)|(         )|(         )|(  PARKING)|      |
| +-----------------------------------+-----------+-----------+-----------+-----------+      |
+----------------------------------------------------------------------------------------------+
|  EFFECTIVE WIDTHS                                  +----------------+-----------------+      |
|       +-----------------+--------------+          |                |     Widths (m)  |      |
|       | Undivided road  |  Widths (m)  |          | Divided road   | Side A  | Side B |      |
|       +-----------------+--------------+          +----------------+---------+---------+      |
|       | Shoulder, total |     3.00     |          | Shoulder, total |         |         |      |
|       | Shoulder, mean  |     1.50     |          | Shoulder, mean  |         |         |      |
|       | Carriageway     |     7.00     |          | Carriageway     |         |         |      |
|       +-----------------+--------------+          +----------------+---------+---------+      |
+----------------------------------------------------------------------------------------------+
| TRAFFIC CONTROL CONDITIONS                                                                   |
|       +-----------------------------------------+-----------------------------------+        |
|       | Speed limit       :   NA km/h           | Max gross weight: 0.000 tonnes  |        |
|       | Other limitations :                                                         |        |
|       | More remarks      :                                                         |        |
|       +-----------------------------------------+-----------------------------------+        |
+--------------------+-----------------------------------+-----------------------------------+
| Program version 1.10F| Date of run:  140610/6:35 |                                   |
+--------------------+-----------------------------------+-----------------------------------+
```

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF

TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data	ANNUAL AVERAGE DAILY TRAFFIC		DIRECTIONAL SPLIT	
	AADT	K-factor	Dir1 - Dir2	
CLASSIFIED-HOURLY	(veh/day)	(default: 0.11)	(default: 50 - 50)	
(CLass/AAdt/UNclass)			NA - NA %	

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.42	34.26	0.160	3.522	30.62	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Di-rec- tion	Light Vehicle		Med Heavy Veh		Large Bus		Large Truck		MotorCycle		Total flow Q		
		pce,1= 1.00 pce,2= 1.00		pce,1= 1.30 pce,2= 1.30		pce,1= 1.50 pce,2= 1.50		pce,1= 2.50 pce,2= 2.50		pce,1= 0.50 pce,2= 0.50				
		veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	Split (%)	veh/h	pcu/h
2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	403	403	526	684	2	3	49	123	393	197	54.96	1373	1410
4	Dir2	382	382	330	429	2	3	39	98	372	186	45.03	1125	1098
5	1+2	785	785	856	1113	4	6	88	221	765	383		2498	2508
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=					54.9%	56.2%
7								Pcu-factor, Fpcu =						1.004

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

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KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF
SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed FVo (km/h) for different vehicles: Table B-1:1 or B-1:2 LV (2)	MHV (2)	LB (3)	LT (3)	MC (3)	Carriage-way width (m) (4)	Adjustment factors: FVo+FVw vehicle adjust-ment, FVw (km/h) Tab B2:1 (2)+(3)	Side friction Tab B3:1 (5)	Land use Tab B4:1 (6)	Actual free-flow speeds, km/h: Light vehicle (4*5*6) (7)	MHV	LB	LT	MC
1+2	68.0	60.0	73.0	58.0	55.0	0.0	68.0	0.970	1.000	65.96	58.20	70.81	56.26	53.35

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw (12)	Directional split FCsp (13)	Side friction FCsf (14)	Actual capacity, C: C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	3100	1.000	0.970	0.970	2917

ACTUAL SPEED and TRAVEL TIME for light vehicles

Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types km/h MHV	LB	LT	MC	Di-rec-tion	Degree of bunching Fig D3:1 (31)
1+2	2508	0.860	36.70	7.500	735.563	35.24	37.61	34.88	34.33	1+2	0.873

Space for user remark:

Program version 1.10F	Date of run: 140610/6:35

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+--------------------+-----------------------------------+-----------------------------------+
| K A J I            | Province                JAWA TIMUR | Date       :           JUNI 2014 |
|                    | Link number:                       | Handled by :                ARIF |
| INTERURBAN ROADS   | Segment code:                      | Checked by :                ARIF |
|                    +-----------------------------------+-----------------------------------+
| Form IR-1: Input   | Segment between              BULU and              TUBAN                  |
|                    | Specific grade:  No [NO indicates segment, YES spec grade(only 2/2UD)] |
|      GENERAL DATA, +-----------------------------------+-----------------------------------+
|      ROAD GEOMETRY | Administr. road class :   NATIONAL | Functional road class:   ARTERIAL |
|                    | Road type             :     2/2UD | Length (km)           :     7.500 |
| Purpose: Operation | Time period:                       | Case number:                      |
+--------------------+-----------------------------------+-----------------------------------+
| HORIZONTAL ALIGNMENT                                                                         |
|                                              +--> A   *  * * * * *   -----> To:             |
|                                            * *|* * * *                          TUBAN      |
|         To:     <-----                   *    |       * * * * *                             |
|                   BULU  * * * * * * * * *     *|* * * * *                  N   Indicate     |
|                                            *   +--> B                     -+-  north (N)    |
|                       * * * * * * * * * *                                                    |
|   +-----------------------------------------+  +------------+--------+--------+--------+   |
|   | Horizontal curvature (radians/km):   NA |  |Roadside    | Side A | Side B |  Mean  |   |
|   | Sight distance > 300 m (%)       :   70 |  |development +--------+--------+--------+   |
|   | Sight distance class (default= B):  A   |  |Default: 0% |    0 % |    0 % |    0 % |   |
|   +-----------------------------------------+  +------------+--------+--------+--------+   |
+----------------------------------------------------------------------------------------------+
| VERTICAL ALIGNMENT                 * * * * *                                                 |
|                                  *         *          +-----------------------------------+ |
|                * * * * * * *                            | Only for specific grade analysis | |
|                                                         +-----------------------------------+ |
|   +-----------------------------------------+     +-----------------------------------+      |
|   | Rise+fall     :    NA m/km               |     |   Grade length (km)   :           |      |
|   | Alignment type:    FLAT (   FLAT = default)|  |   Grade slope (%)     :           |      |
|   +-----------------------------------------+     |   Climbing lane (Y/N) :           |      |
|                                                   +-----------------------------------+      |
+----------------------------------------------------------------------------------------------+
| CROSS SECTION                                                                                |
|                                                                                              |
|    Undivided road        |||####============================####|||                        |
|                  side A    WsA       WcA          WcB      WsB    side B                   |
|                          +----+------------+-----------+----+                              |
|                           1.50   3.50             3.50  1.50                               |
|                                                                                              |
|        +-----------------------------------+-------+-------+-------+-------+               |
|        | UNADJUSTED WIDTHS                 | Side A | Side B | Total  |  Mean  |           |
|        +-----------------------------------+-------+-------+-------+-------+               |
|        | Average carriageway width, Wc (m) |   3.50 |   3.50 |   7.00 |        |           |
|        | Unobstructed shoulder width, Ws (m)|  1.50 |   1.50 |   3.00 |   1.50 |           |
|        +-----------------------------------+-------+-------+-------+-------+               |
+----------------------------------------------------------------------------------------------+
|  ROAD SURFACE CONDITIONS                                                                     |
|           +-----------------------------------+-----------+-----------+                      |
|           | CARRIAGEWAY SURFACE CONDITIONS    |   Side A  |   Side B  |                      |
|           +-----------------------------------+-----------+-----------+                      |
|           | Type [Flexible(asphalt)/Concrete/Other] | FLEXIBLE | FLEXIBLE |                |
|           | Surface condition [Good/Fair/Bad] |    GOOD   |    GOOD   |                      |
|           |                                   |           |           |                      |
|           +-----------------------------------+-----------+-----------+                      |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
| | SHOULDER SURFACE CONDITIONS       | ------- SIDE A ------ | ------- SIDE B ------ |       |
| |                                   |   Outer   |   Inner   |   Inner   |   Outer   |       |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
| | Surface type [Flexible/Concrete/Other] |    OTHER |           |           |     OTHER |       |
| | Drop from carriageway to shoulder (cm) |     10   |           |           |     10    |       |
| | Usability [Traffic/Parking/Emergency]  | EMERGENCY |           |           | EMERGENCY |       |
| | (default shoulder usability)      |(  PARKING)|(          )|(          )|(  PARKING)|       |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
+----------------------------------------------------------------------------------------------+
|  EFFECTIVE WIDTHS                                +-----------------+---------+---------+     |
|       +-----------------+--------------+         |                 |    Widths (m)     |     |
|       | Undivided road  |  Widths (m)  |         | Divided road    | Side A  | Side B  |     |
|       +-----------------+--------------+         +-----------------+---------+---------+     |
|       | Shoulder, total |     3.00     |         | Shoulder, total |         |         |     |
|       | Shoulder, mean  |     1.50     |         | Shoulder, mean  |         |         |     |
|       | Carriageway     |     7.00     |         | Carriageway     |         |         |     |
|       +-----------------+--------------+         +-----------------+---------+---------+     |
+----------------------------------------------------------------------------------------------+
| TRAFFIC CONTROL CONDITIONS                                                                   |
|       +-----------------------------------------+-----------------------------------+        |
|       | Speed limit       :   NA km/h           | Max gross weight: 0.000 tonnes  |        |
|       | Other limitations :                                                         |        |
|       | More remarks      :                                                         |        |
|       +-----------------------------------------+-----------------------------------+        |
+--------------------+-----------------------------------+-----------------------------------+
| Program version 1.10F| Date of run:  140610/6:37 |                                       |
+----------------------+---------------------------+---------------------------------------+
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KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF

TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data	ANNUAL AVERAGE DAILY TRAFFIC		DIRECTIONAL SPLIT	
	AADT	K-factor	Dir1 - Dir2	
CLASSIFIED-HOURLY	(veh/day)	(default: 0.11)	(default: 50 - 50)	
(CLass/AAdt/UNclass)			NA - NA %	

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.51	34.22	0.150	3.539	30.57	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Di-rec	Light Vehicle		Med Heavy Veh		Large Bus		Large Truck		MotorCycle		Total flow Q		
1.1	tion	pce,1= 1.00		pce,1= 1.30		pce,1= 1.50		pce,1= 2.50		pce,1= 0.50				
1.2		pce,2= 1.00		pce,2= 1.30		pce,2= 1.50		pce,2= 2.50		pce,2= 0.50				
		veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	Split (%)	veh/h	pcu/h
2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	430	430	558	725	2	3	52	130	417	209	54.93	1459	1497
4	Dir2	407	407	351	456	2	3	42	105	395	198	45.06	1197	1169
5	1+2	837	837	909	1181	4	6	94	235	812	407		2656	2666
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=				54.9%	56.1%	
7								Pcu-factor, Fpcu =					1.003	

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 140610/6:37

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF

SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.
Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: FVo (km/h)					Carriage-way adjust-ment, FVw (km/h)	FVo+FVw vehicle (km/h)	Adjustment factors: Light friction Tab B3:1	Road func Tab B4:1	Actual free-flow speeds, km/h: Light vehicle (4*5*6)	Other vehicle types			
	Table B-1:1 or B-1:2							Side friction Tab B2:1 (3)	Land use FFVsf (4)	FFVrc (5)				
	LV (2)	MHV (2)	LB (2)	LT (2)	MC (2)						(6)	(7)	MHV (7)	LB (7)	LT (7)	MC (7)
1+2	68.0	60.0	73.0	58.0	55.0	0.0	68.0	0.970	1.000	65.96	58.20	70.81	56.26	53.35

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-2:1 (12)	Directional split FCsp Table C-3:1 (13)	Side friction FCsf Table C-4:1 (14)	Actual capacity, C: C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	3100	1.000	0.970	0.970	2918

ACTUAL SPEED and TRAVEL TIME for light vehicles — Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types: km/h MHV	LB	LT	MC	Degree of bunching Fig D3:1 DB (31)
1+2	2666	0.914	34.10	7.500	791.749	33.20	34.66	32.97	32.63	0.888

Space for user remark:

Program version 1.10F	Date of run: 140610/6:37

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+--------------------+-----------------------------------+-----------------------------------+
| K A J I            | Province                JAWA TIMUR | Date       :           JUNI 2014  |
|                    | Link number:                       | Handled by :                ARIF  |
| INTERURBAN ROADS   | Segment code:                      | Checked by :                ARIF  |
|                    +-----------------------------------+-----------------------------------+
| Form IR-1: Input   | Segment between              BULU and              TUBAN                  |
|                    | Specific grade:  No [NO indicates segment, YES spec grade(only 2/2UD)]  |
|      GENERAL DATA, +-----------------------------------+-----------------------------------+
|      ROAD GEOMETRY | Administr. road class :   NATIONAL | Functional road class:   ARTERIAL |
|                    | Road type             :     2/2UD | Length (km)           :     7.500 |
| Purpose: Operation | Time period:                       | Case number:                      |
+--------------------+-----------------------------------+-----------------------------------+
| HORIZONTAL ALIGNMENT                                                                         |
|                                              +--> A   *  * * * * *   -----> To:             |
|                                            * *|* * * *                          TUBAN      |
|         To:     <-----                   *    |       * * * * *                             |
|                   BULU  * * * * * * * * *     *|* * * * *                  N   Indicate     |
|                                            *   +--> B                    -+-  north (N)    |
|                       * * * * * * * * * *                                                    |
|   +-----------------------------------------+  +------------+--------+--------+--------+   |
|   | Horizontal curvature (radians/km):   NA |  |Roadside    | Side A | Side B |  Mean  |   |
|   | Sight distance > 300 m (%)       :   70 |  |development +--------+--------+--------+   |
|   | Sight distance class (default= B):  A   |  |Default: 0% |    0 % |    0 % |    0 % |   |
|   +-----------------------------------------+  +------------+--------+--------+--------+   |
+----------------------------------------------------------------------------------------------+
| VERTICAL ALIGNMENT                 * * * * *                                                 |
|                                  *         *          +-----------------------------------+ |
|                * * * * * * *                          | Only for specific grade analysis | |
|                                                       +-----------------------------------+ |
|   +-----------------------------------------+         |   Grade length (km)   :          | |
|   | Rise+fall     :    NA m/km              |         |   Grade slope (%)     :          | |
|   | Alignment type:    FLAT (   FLAT = default)|      |   Climbing lane (Y/N) :          | |
|   +-----------------------------------------+         +-----------------------------------+ |
+----------------------------------------------------------------------------------------------+
| CROSS SECTION                                                                                |
|                                                                                              |
|    Undivided road        |||####============================####|||                         |
|                  side A    WsA       WcA          WcB      WsB    side B                   |
|                          +----+------------+-----------+----+                              |
|                           1.50   3.50             3.50  1.50                               |
|                                                                                              |
|        +-----------------------------------+-------+-------+-------+-------+               |
|        | UNADJUSTED WIDTHS                 | Side A | Side B | Total  |  Mean  |           |
|        +-----------------------------------+-------+-------+-------+-------+               |
|        | Average carriageway width, Wc (m)  |   3.50 |   3.50 |   7.00 |        |           |
|        | Unobstructed shoulder width, Ws (m)|   1.50 |   1.50 |   3.00 |   1.50 |          |
|        +-----------------------------------+-------+-------+-------+-------+               |
+----------------------------------------------------------------------------------------------+
|  ROAD SURFACE CONDITIONS                                                                     |
|           +-----------------------------------+-----------+-----------+                      |
|           | CARRIAGEWAY SURFACE CONDITIONS    |   Side A  |   Side B  |                      |
|           +-----------------------------------+-----------+-----------+                      |
|           | Type [Flexible(asphalt)/Concrete/Other] | FLEXIBLE  | FLEXIBLE  |              |
|           | Surface condition [Good/Fair/Bad]       |    GOOD   |    GOOD   |              |
|           |                                         |           |           |              |
|           +-----------------------------------------+-----------+-----------+              |
| +-----------------------------------+-----------+-----------+-----------+-----------+      |
| | SHOULDER SURFACE CONDITIONS       | ------- SIDE A ------ | ------- SIDE B ------ |      |
| |                                   |   Outer   |   Inner   |   Inner   |   Outer   |      |
| +-----------------------------------+-----------+-----------+-----------+-----------+      |
| | Surface type [Flexible/Concrete/Other]  |     OTHER |           |           |     OTHER |  |
| | Drop from carriageway to shoulder (cm)  |     10    |           |           |     10    |  |
| | Usability [Traffic/Parking/Emergency]   | EMERGENCY |           |           | EMERGENCY |  |
| | (default shoulder usability)            |(  PARKING)|(         )|(         )|(  PARKING)|  |
| +-----------------------------------+-----------+-----------+-----------+-----------+      |
+----------------------------------------------------------------------------------------------+
|  EFFECTIVE WIDTHS                                  +-----------------+---------+---------+  |
|       +-----------------+--------------+           |                 |    Widths (m)     |  |
|       | Undivided road  |  Widths (m)  |           | Divided road    | Side A  | Side B  |  |
|       +-----------------+--------------+           +-----------------+---------+---------+  |
|       | Shoulder, total |     3.00     |           | Shoulder, total |         |         |  |
|       | Shoulder, mean  |     1.50     |           | Shoulder, mean  |         |         |  |
|       | Carriageway     |     7.00     |           | Carriageway     |         |         |  |
|       +-----------------+--------------+           +-----------------+---------+---------+  |
+----------------------------------------------------------------------------------------------+
| TRAFFIC CONTROL CONDITIONS                                                                   |
|       +-----------------------------------------+-----------------------------------+        |
|       | Speed limit       :   NA km/h           | Max gross weight: 0.000 tonnes  |        |
|       | Other limitations :                                                         |        |
|       | More remarks      :                                                         |        |
|       +-----------------------------------------+-----------------------------------+        |
+--------------------+-----------------------------------+-----------------------------------+
| Program version 1.10F| Date of run:  140610/6:39 |                                       |
+----------------------+---------------------------+---------------------------------------+
```

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF

TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data	ANNUAL AVERAGE DAILY TRAFFIC		DIRECTIONAL SPLIT	
	AADT	K-factor	Dir1 - Dir2	
CLASSIFIED-HOURLY	(veh/day)	(default: 0.11)	(default: 50 - 50)	
(CLass/AAdt/UNclass)			NA - NA %	

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.58	34.17	0.142	3.587	30.51	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Di-tion rec-	Light Vehicle veh/h	pcu/h (1)	Med Heavy Veh veh/h	pcu/h (2)	Large Bus veh/h	pcu/h (3)	Large Truck veh/h	pcu/h (4)	MotorCycle veh/h	pcu/h (5)	Total flow Q (6)	Split % (7)	Q veh/h (8)	Q pcu/h (9)
3	Dir1	457	457	591	768	2	3	56	140	441	221	1547	54.95	1589	
4	Dir2	432	432	371	482	2	3	45	113	418	209	1268	45.04	1239	
5	1+2	889	962	1250	4	6	101	253	859	430		2815		2828	
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=					54.9%	56.1%	
7								Pcu-factor, Fpcu =						1.004	

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol	Weighting factor (21)	Frequency of events (22)	Weighted frequency (23)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 140610/6:39

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF
SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: Table B-1:1 or B-1:2 LV (2)	MHV	LB	LT	MC	Carriage-way adjust-ment, FVw (km/h)	FVo+FVw vehicle (km/h)	Adjustment factors: friction Tab B2:1 (2)+(3)	Side FFVsf (3)	Land use FFVrc (4)	Actual free-flow speeds, km/h: Light vehicle (5)	MHV	LB	LT	MC
1+2	68.0	60.0	73.0	58.0	55.0	0.0	68.0	0.970	1.000	65.96	58.20	70.81	56.26	53.35	

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width Table C-1:1 FCw (12)	Directional split Table C-2:1 FCsp (13)	Side friction Table C-3:1 FCsf (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	3100	1.000	0.970	0.970	2918

ACTUAL SPEED and TRAVEL TIME for light vehicles Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types km/h MHV	LB	LT	MC	Degree of bunching Fig D3:1 DB (31)
1+2	2828	0.969	31.41	7.500	859.426	31.09	31.61	31.01	30.89	0.903

Space for user remark:

Program version 1.10F | Date of run: 140610/6:39

```
+--------------------+-----------------------------------+---------------------------------+
| K A J I            | Province              JAWA TIMUR | Date       :           JUNI 2014 |
|                    | Link number:                      | Handled by :                ARIF |
| INTERURBAN ROADS   | Segment code:                     | Checked by :                ARIF |
|                    +-----------------------------------+---------------------------------+
| Form IR-1: Input   | Segment between          BULU and              TUBAN               |
|                    | Specific grade:  No [NO indicates segment, YES spec grade(only 2/2UD)] |
|      GENERAL DATA, +-----------------------------------+---------------------------------+
|      ROAD GEOMETRY | Administr. road class :  NATIONAL | Functional road class:  ARTERIAL |
|                    | Road type             :    2/2UD | Length (km)          :     7.500 |
| Purpose: Operation | Time period:                      | Case number:                     |
+--------------------+-----------------------------------+---------------------------------+
| HORIZONTAL ALIGNMENT                                                                     |
|                                      +--> A   *  * * * * *   -----> To:                  |
|                                   * *|* * * *                                      TUBAN |
|        To:     <-----            *    |          * * * * *                               |
|                 BULU  * * * * * * * *       *|* * * * *                N   Indicate      |
|                                     *   +--> B                        -+-  north (N)     |
|                       * * * * * * * * *                                                 |
|  +-------------------------------------+  +-----------+--------+--------+--------+      |
|  | Horizontal curvature (radians/km):   NA |  |Roadside    | Side A | Side B |  Mean  |  |
|  | Sight distance > 300 m (%)      :    70 |  |development +--------+--------+--------+  |
|  | Sight distance class (default= B):  A   |  |Default: 0% |   0 %  |   0 %  |   0 %  |  |
|  +-------------------------------------+  +-----------+--------+--------+--------+      |
+------------------------------------------------------------------------------------------+
| VERTICAL ALIGNMENT             * * * * *                                                 |
|                            *              *       +---------------------------------+   |
|           * * * * * * *                           | Only for specific grade analysis |   |
|                                                   +---------------------------------+   |
|  +------------------------------------------+     |   Grade length (km)   :         |   |
|  | Rise+fall     :    NA m/km               |     |   Grade slope (%)     :         |   |
|  | Alignment type:    FLAT (   FLAT = default)|    |   Climbing lane (Y/N) :         |   |
|  +------------------------------------------+     +---------------------------------+   |
+------------------------------------------------------------------------------------------+
| CROSS SECTION                                                                            |
|                                                                                          |
|   Undivided road        |||####===========================####|||                       |
|                 side A    WsA       WcA          WcB      WsB    side B                 |
|                          +----+------------+------------+----+                          |
|                           1.50   3.50              3.50  1.50                           |
|                                                                                          |
|        +------------------------------------+--------+--------+--------+--------+      |
|        | UNADJUSTED WIDTHS                  | Side A | Side B | Total  |  Mean  |       |
|        +------------------------------------+--------+--------+--------+--------+      |
|        | Average carriageway width, Wc (m)  |  3.50  |  3.50  |  7.00  |        |       |
|        | Unobstructed shoulder width, Ws (m)|  1.50  |  1.50  |  3.00  |  1.50  |       |
|        +------------------------------------+--------+--------+--------+--------+      |
+------------------------------------------------------------------------------------------+
|  ROAD SURFACE CONDITIONS                                                                 |
|           +----------------------------------------+------------+------------+          |
|           | CARRIAGEWAY SURFACE CONDITIONS          |   Side A   |   Side B   |          |
|           +----------------------------------------+------------+------------+          |
|           | Type [Flexible(asphalt)/Concrete/Other] |  FLEXIBLE  |  FLEXIBLE  |          |
|           | Surface condition [Good/Fair/Bad]       |    GOOD    |    GOOD    |          |
|           |                                         |            |            |          |
|           +----------------------------------------+------------+------------+          |
| +--------------------------------------+-----------+-----------+-----------+-----------+ |
| | SHOULDER SURFACE CONDITIONS          | ------- SIDE A ------ | ------- SIDE B ------ | |
| |                                      |   Outer   |   Inner   |   Inner   |   Outer   | |
| +--------------------------------------+-----------+-----------+-----------+-----------+ |
| | Surface type [Flexible/Concrete/Other] |   OTHER   |           |           |   OTHER | |
| | Drop from carriageway to shoulder (cm) |   10      |           |           |    10   | |
| | Usability [Traffic/Parking/Emergency]  | EMERGENCY |           |           | EMERGENCY | |
| | (default shoulder usability)         |(  PARKING)|(         )|(         )|(  PARKING)| |
| +--------------------------------------+-----------+-----------+-----------+-----------+ |
+------------------------------------------------------------------------------------------+
|  EFFECTIVE WIDTHS                               +-----------------+-------------------+  |
|       +-----------------+--------------+        |                 |    Widths (m)     |  |
|       | Undivided road  |  Widths (m)  |        | Divided road    | Side A  |  Side B |  |
|       +-----------------+--------------+        +-----------------+---------+---------+  |
|       | Shoulder, total |     3.00     |        | Shoulder, total |         |         |  |
|       | Shoulder, mean  |     1.50     |        | Shoulder, mean  |         |         |  |
|       | Carriageway     |     7.00     |        | Carriageway     |         |         |  |
|       +-----------------+--------------+        +-----------------+---------+---------+  |
+------------------------------------------------------------------------------------------+
| TRAFFIC CONTROL CONDITIONS                                                               |
|        +----------------------------------------+-------------------------------+       |
|        | Speed limit       :   NA km/h          | Max gross weight: 0.000 tonnes |       |
|        | Other limitations :                                                     |       |
|        | More remarks      :                                                     |       |
|        +------------------------------------------------------------------------+       |
+----------------------+--------------------------+----------------------------------------+
| Program version 1.10F| Date of run:  140610/6:40 |                                        |
+----------------------+--------------------------+----------------------------------------+
```

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF

TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data	ANNUAL AVERAGE DAILY TRAFFIC		DIRECTIONAL SPLIT	
	AADT	K-factor	Dir1 - Dir2	
CLASSIFIED-HOURLY	(veh/day)	(default: 0.11)	(default: 50 - 50)	
			NA - NA %	
(CLass/AAdt/UNclass)				

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.67	34.16	0.134	3.597	30.43	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Di-rec- tion	Light Vehicle veh/h	Light Vehicle pcu/h	Med Heavy Veh veh/h	Med Heavy Veh pcu/h	Large Bus veh/h	Large Bus pcu/h	Large Truck veh/h	Large Truck pcu/h	MotorCycle veh/h	MotorCycle pcu/h	Total flow Q Split (%)	Total flow Q veh/h	Total flow Q pcu/h
2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	484	484	624	811	2	3	59	148	465	233	54.94	1634	1679
4	Dir2	458	458	392	510	2	3	48	120	440	220	45.05	1340	1311
5	1+2	942	942	1016	1321	4	6	107	268	905	453		2974	2990
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=				54.9%	56.1%	
7								Pcu-factor, Fpcu =					1.005	

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 140610/6:40

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF
SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed FVo (km/h) for different vehicles: Table B-1:1 or B-1:2 LV (2)	MHV	LB	LT	MC	Carriage-way width (m)	FVo+FVw adjust-ment, FVw (km/h)	Adjustment factors: Light vehicle Tab B2:1 (2)+(3)	Side friction Tab B3:1	Land use Tab B4:1	Actual free-flow speeds, km/h: Light vehicle FFVlv = (FVo+FVw)*FFVsf*FFVrc (7)	Other vehicle types MHV	LB	LT	MC
								FFVsf (4)	FFVrc (5)	(6)					
1+2	68.0	60.0	73.0	58.0	55.0	0.0	68.0	0.970	1.000		65.96	58.20	70.81	56.26	53.35

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity: Co pcu/h (11)	Adjustment factors for capacity: Carriageway width Table C-1:1 FCw (12)	Directional split Table C-2:1 FCsp (13)	Side friction Table C-3:1 FCsf (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	3100	1.000	0.970	0.970	2918

ACTUAL SPEED and TRAVEL TIME for light vehicles — Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types km/h: MHV	LB	LT	MC	Degree of bunching Fig D3:1 DB (31)
1+2	2990	1.025	NA	7.500	NA	NA	NA	NA	NA	0.916

Space for user remark:

Program version 1.10F | Date of run: 140610/6:40

```
+--------------------+-----------------------------------+-----------------------------------+
| K A J I            | Province                JAWA TIMUR | Date       :           JUNI 2014  |
|                    | Link number:                       | Handled by :                ARIF  |
| INTERURBAN ROADS   | Segment code:                      | Checked by :                ARIF  |
|                    +-----------------------------------+-----------------------------------+
| Form IR-1: Input   | Segment between              BULU and              TUBAN                  |
|                    | Specific grade:  No [NO indicates segment, YES spec grade(only 2/2UD)]  |
|      GENERAL DATA, +-----------------------------------+-----------------------------------+
|      ROAD GEOMETRY | Administr. road class :   NATIONAL | Functional road class:   ARTERIAL |
|                    | Road type             :     2/2UD | Length (km)           :     7.500 |
| Purpose: Operation | Time period:                       | Case number:                      |
+--------------------+-----------------------------------+-----------------------------------+
| HORIZONTAL ALIGNMENT                                                                         |
|                                              +--> A   *  * * * * *   -----> To:             |
|                                          * *|* * * *                              TUBAN   |
|         To:     <-----                 *    |         * * * * *                            |
|                   BULU  * * * * * * * *     *|* * * * *                  N   Indicate      |
|                                            *   +--> B                    -+-  north (N)    |
|                        * * * * * * * * *                                                     |
|   +-----------------------------------------+  +-----------+--------+--------+--------+    |
|   | Horizontal curvature (radians/km):   NA |  |Roadside   | Side A | Side B |  Mean  |    |
|   | Sight distance > 300 m (%)       :   70 |  |development +--------+--------+--------+    |
|   | Sight distance class (default= B):  A   |  |Default: 0% |    0 % |    0 % |    0 % |    |
|   +-----------------------------------------+  +-----------+--------+--------+--------+    |
+----------------------------------------------------------------------------------------------+
| VERTICAL ALIGNMENT                 * * * * *                                                 |
|                                  *         *          +-----------------------------------+ |
|                * * * * * * *                            | Only for specific grade analysis | |
|                                                         +-----------------------------------+ |
|   +-----------------------------------------+     |   Grade length (km)   :          |     |
|   | Rise+fall     :    NA m/km               |     |   Grade slope (%)     :          |     |
|   | Alignment type:    FLAT (   FLAT = default)|  |   Climbing lane (Y/N) :          |     |
|   +-----------------------------------------+     +-----------------------------------+     |
+----------------------------------------------------------------------------------------------+
| CROSS SECTION                                                                                |
|                                                                                              |
|    Undivided road        |||####============================####|||                        |
|                  side A    WsA       WcA          WcB      WsB    side B                   |
|                          +----+------------+-----------+----+                              |
|                           1.50   3.50             3.50  1.50                               |
|                                                                                              |
|        +-----------------------------------+-------+-------+-------+-------+               |
|        | UNADJUSTED WIDTHS                 | Side A | Side B | Total  |  Mean  |           |
|        +-----------------------------------+-------+-------+-------+-------+               |
|        | Average carriageway width, Wc (m)  |   3.50 |   3.50 |   7.00 |        |           |
|        | Unobstructed shoulder width, Ws (m)|   1.50 |   1.50 |   3.00 |   1.50 |          |
|        +-----------------------------------+-------+-------+-------+-------+               |
+----------------------------------------------------------------------------------------------+
|  ROAD SURFACE CONDITIONS                                                                     |
|           +-----------------------------------+------------+------------+                   |
|           | CARRIAGEWAY SURFACE CONDITIONS    |   Side A   |   Side B   |                   |
|           +-----------------------------------+------------+------------+                   |
|           | Type [Flexible(asphalt)/Concrete/Other] |  FLEXIBLE  |  FLEXIBLE  |            |
|           | Surface condition [Good/Fair/Bad]       |    GOOD    |    GOOD    |            |
|           |                                         |            |            |            |
|           +-----------------------------------------+------------+------------+            |
| +-----------------------------------+-----------+-----------+-----------+-----------+      |
| | SHOULDER SURFACE CONDITIONS       | ------ SIDE A ------ | ------ SIDE B ------ |      |
| |                                   |   Outer   |   Inner   |   Inner   |   Outer   |      |
| +-----------------------------------+-----------+-----------+-----------+-----------+      |
| | Surface type [Flexible/Concrete/Other]  |     OTHER |           |           |     OTHER |  |
| | Drop from carriageway to shoulder (cm)  |     10    |           |           |     10    |  |
| | Usability [Traffic/Parking/Emergency]   | EMERGENCY |           |           | EMERGENCY |  |
| | (default shoulder usability)            |(  PARKING)|(         )|(         )|(  PARKING)|  |
| +-----------------------------------+-----------+-----------+-----------+-----------+      |
+----------------------------------------------------------------------------------------------+
|  EFFECTIVE WIDTHS                                  +-----------------+-----------------+     |
|        +-----------------+--------------+         |                 |     Widths (m)  |     |
|        | Undivided road  |  Widths (m)  |         | Divided road    | Side A  | Side B |     |
|        +-----------------+--------------+         +-----------------+---------+--------+     |
|        | Shoulder, total |     3.00     |         | Shoulder, total |         |        |     |
|        | Shoulder, mean  |     1.50     |         | Shoulder, mean  |         |        |     |
|        | Carriageway     |     7.00     |         | Carriageway     |         |        |     |
|        +-----------------+--------------+         +-----------------+---------+--------+     |
+----------------------------------------------------------------------------------------------+
| TRAFFIC CONTROL CONDITIONS                                                                   |
|        +-----------------------------------------+-----------------------------------+       |
|        | Speed limit       :   NA km/h           | Max gross weight: 0.000 tonnes  |       |
|        | Other limitations :                                                         |       |
|        | More remarks      :                                                         |       |
|        +-----------------------------------------+-----------------------------------+       |
+--------------------+-----------------------------+-----------------------------------------+
| Program version 1.10F| Date of run:  140610/6:42 |                                         |
+----------------------+---------------------------+-----------------------------------------+
```

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF

TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data (CLASSIFIED-HOURLY) (CLass/AAdt/UNclass)	ANNUAL AVERAGE DAILY TRAFFIC: AADT (veh/day)	K-factor (default: 0.11)	DIRECTIONAL SPLIT: Dir1 - Dir2 (default: 50 - 50) NA - NA %

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.71	34.10	0.191	3.605	30.37	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Dir-rec	Light Vehicle veh/h	Light Vehicle pcu/h	Med Heavy Veh veh/h	Med Heavy Veh pcu/h	Large Bus veh/h	Large Bus pcu/h	Large Truck veh/h	Large Truck pcu/h	MotorCycle veh/h	MotorCycle pcu/h	Total flow Q Split (%)	Total flow Q veh/h	Total flow Q pcu/h
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1.1	tion pce,1= 1.00														
1.2	pce,2= 1.00														
3	Dir1	511	511	656	853	3	5	63	158	489	245	54.94	1722	1772
4	Dir2	483	483	413	537	3	5	50	125	463	232	45.05	1412	1382
5	1+2	994	994	1069	1390	6	10	113	283	952	477		3134	3154
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=					54.9%	56.1%
7								Pcu-factor, Fpcu =						1.006

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F | Date of run: 140610/6:42

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF
SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 2/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: Table B-1:1 or B-1:2 LV (2)	MHV	LB	LT	MC	Carriage-way width (m)	FVo+FVw: adjust-ment, FVw (km/h)	Adjustment factors: vehicle friction Tab B2:1 (2)+(3)	Side FFVsf (3)	Land use FFVrc (4)	Actual free-flow speeds, km/h: vehicle FFVlv = (FVo+FVw)*FFVsf*FFVrc (5)	MHV (6)	LB (7)	LT (*5*6)	MC (*5*6)
1+2	68.0	60.0	73.0	58.0	55.0	0.0	68.0	0.970	1.000	65.96	58.20	70.81	56.26	53.35	

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-1:1 (12)	Directional split FCsp Table C-2:1 (13)	Side friction FCsf Table C-3:1 (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	3100	1.000	0.970	0.970	2918

ACTUAL SPEED and TRAVEL TIME for light vehicles — Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv km/h (23)	Road segment length, L (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types: km/h MHV	LB	LT	MC	Di-rec-tion	Degree of bunching DB Fig D3:1 (31)
1+2	3154	1.081	NA	7.500	NA	NA	NA	NA	NA	1+2	0.928

Space for user remark:

Program version 1.10F | Date of run: 140610/6:42

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+--------------------+-----------------------------------+-----------------------------------+
| K A J I            | Province                JAWA TIMUR | Date       :          JUNI 2014 |
|                    | Link number:                       | Handled by :               ARIF |
| INTERURBAN ROADS   | Segment code:                      | Checked by :               ARIF |
|                    +-----------------------------------+-----------------------------------+
| Form IR-1: Input   | Segment between              BULU and              TUBAN                  |
|                    | Specific grade:  No [NO indicates segment, YES spec grade(only 2/2UD)] |
|      GENERAL DATA, +-----------------------------------+-----------------------------------+
|      ROAD GEOMETRY | Administr. road class :   NATIONAL | Functional road class:   ARTERIAL |
|                    | Road type             :      4/2UD | Length (km)          :     7.500 |
| Purpose: Operation | Time period:                       | Case number:                      |
+--------------------+-----------------------------------+-----------------------------------+
| HORIZONTAL ALIGNMENT                                                                         |
|                                              +--> A   *  * * * * *   -----> To:             |
|                                            * *|* * * *                          TUBAN      |
|         To:     <-----                   *     |         * * * * *                          |
|                   BULU  * * * * * * * * *      *|* * * * *                  N   Indicate    |
|                                            *   +--> B                     -+-  north (N)   |
|                       * * * * * * * * *                                                      |
|   +-----------------------------------------+  +-----------+--------+--------+--------+    |
|   | Horizontal curvature (radians/km):   NA |  |Roadside    | Side A | Side B |  Mean  |    |
|   | Sight distance > 300 m (%)       :   70 |  |development +--------+--------+--------+    |
|   | Sight distance class (default= B):  A   |  |Default: 0% |    0 % |    0 % |    0 % |    |
|   +-----------------------------------------+  +-----------+--------+--------+--------+    |
+----------------------------------------------------------------------------------------------+
| VERTICAL ALIGNMENT                 * * * * *                                                 |
|                                  *           *          +-----------------------------------+|
|              * * * * * * *                              | Only for specific grade analysis ||
|                                                         +-----------------------------------+|
|   +-----------------------------------------+           |   Grade length (km)   :           ||
|   | Rise+fall     :    NA m/km              |           |   Grade slope (%)     :           ||
|   | Alignment type:    FLAT (   FLAT = default)|       |   Climbing lane (Y/N) :           ||
|   +-----------------------------------------+           +-----------------------------------+|
+----------------------------------------------------------------------------------------------+
| CROSS SECTION                                                                                |
|                                                                                              |
|    Undivided road        |||####============================####|||                         |
|                  side A    WsA       WcA          WcB      WsB    side B                   |
|                          +----+------------+-----------+----+                              |
|                           1.50   5.75             5.75  1.50                               |
|                                                                                              |
|        +-----------------------------------+-------+-------+-------+-------+               |
|        | UNADJUSTED WIDTHS                 | Side A | Side B | Total  |  Mean  |           |
|        +-----------------------------------+-------+-------+-------+-------+               |
|        | Average carriageway width, Wc (m) |   5.75 |   5.75 |  11.50 |        |           |
|        | Unobstructed shoulder width, Ws (m)|  1.50 |   1.50 |   3.00 |   1.50 |           |
|        +-----------------------------------+-------+-------+-------+-------+               |
+----------------------------------------------------------------------------------------------+
|  ROAD SURFACE CONDITIONS                                                                     |
|           +-----------------------------------+-----------+-----------+                      |
|           | CARRIAGEWAY SURFACE CONDITIONS    |   Side A  |   Side B  |                      |
|           +-----------------------------------+-----------+-----------+                      |
|           | Type [Flexible(asphalt)/Concrete/Other] | FLEXIBLE | FLEXIBLE |                |
|           | Surface condition [Good/Fair/Bad] |    GOOD   |    GOOD   |                      |
|           |                                   |           |           |                      |
|           +-----------------------------------+-----------+-----------+                      |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
| | SHOULDER SURFACE CONDITIONS       | ------ SIDE A ------ | ------ SIDE B ------ |       |
| |                                   |   Outer   |   Inner   |   Inner   |   Outer   |       |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
| | Surface type [Flexible/Concrete/Other]  |     OTHER |           |           |     OTHER |  |
| | Drop from carriageway to shoulder (cm)  |     10    |           |           |     10    |  |
| | Usability [Traffic/Parking/Emergency]   | EMERGENCY |           |           | EMERGENCY |  |
| | (default shoulder usability)            |(  PARKING)|(         )|(         )|(  PARKING)|  |
| +-----------------------------------+-----------+-----------+-----------+-----------+       |
+----------------------------------------------------------------------------------------------+
|  EFFECTIVE WIDTHS                                  +-----------------+-----------------+     |
|        +-----------------+--------------+         |                 |     Widths (m)  |     |
|        | Undivided road  |  Widths (m)  |         | Divided road    | Side A  | Side B |     |
|        +-----------------+--------------+         +-----------------+---------+--------+     |
|        | Shoulder, total |     3.00     |         | Shoulder, total |         |        |     |
|        | Shoulder, mean  |     1.50     |         | Shoulder, mean  |         |        |     |
|        | Carriageway     |    11.50     |         | Carriageway     |         |        |     |
|        +-----------------+--------------+         +-----------------+---------+--------+     |
+----------------------------------------------------------------------------------------------+
| TRAFFIC CONTROL CONDITIONS                                                                   |
|        +-----------------------------------+-------------------------------+                 |
|        | Speed limit       :   NA km/h     | Max gross weight: 0.000 tonnes  |                 |
|        | Other limitations :               |                                 |                 |
|        | More remarks      :               |                                 |                 |
|        +-----------------------------------+---------------------------------+                 |
+--------------------+-----------------------+-----------------------------------------------+
| Program version 1.10F| Date of run:  141015/9:14 |                                         |
+--------------------+-----------------------+-----------------------------------------------+
```

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF
TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data (CLASSIFIED-HOURLY) (CLass/AAdt/UNclass)	ANNUAL AVERAGE DAILY TRAFFIC (default: 0.11): AADT (veh/day)	K-factor	DIRECTIONAL SPLIT (default: 50 - 50): Dir1 - Dir2 NA - NA %

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.05	34.42	0.197	3.412	30.90	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Di-rec- tion	Light Vehicle veh/h	pcu/h	Med Heavy Veh veh/h	pcu/h	Large Bus veh/h	pcu/h	Large Truck veh/h	pcu/h	MotorCycle veh/h	pcu/h	Total flow Split (%)	veh/h	pcu/h
		pce,1= 1.00 pce,2= 1.00		pce,1= 1.44 pce,2= 1.44		pce,1= 1.46 pce,2= 1.46		pce,1= 2.10 pce,2= 2.10		pce,1= 0.64 pce,2= 0.64				
2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	322	322	428	617	2	3	38	80	321	206	54.94	1111	1228
4	Dir2	306	306	268	386	2	3	31	65	304	195	45.05	911	955
5	1+2	628	628	696	1003	4	6	69	145	625	401		2022	2183
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=					54.9%	56.2%
7								Pcu-factor, Fpcu =						1.079

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol	Weighting factor (21)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 141015/9:14

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF

SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: Table B-1:1 or B-1:2 LV (2)	MHV (2)	LB	LT	MC	Carriage-way adjust-ment, FVw (m)	FVo+FVw vehicle (km/h) Tab B2:1 (3)+(3)	Adjustment factors: friction FFVsf (4)	Road func FFVrc (5)	Actual free-flow speeds, km/h: Light vehicle (6)	MHV	LB	LT	MC
1+2	74.0	63.0	78.0	60.0	60.0	-3.0	71.0	0.970	1.000	68.87	58.63	72.59	55.84	55.84

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width Table C-1:1 FCw (12)	Directional split Table C-2:1 FCsp (13)	Side friction Table C-3:1 FCsf (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	6800	0.910	0.975	0.970	5854

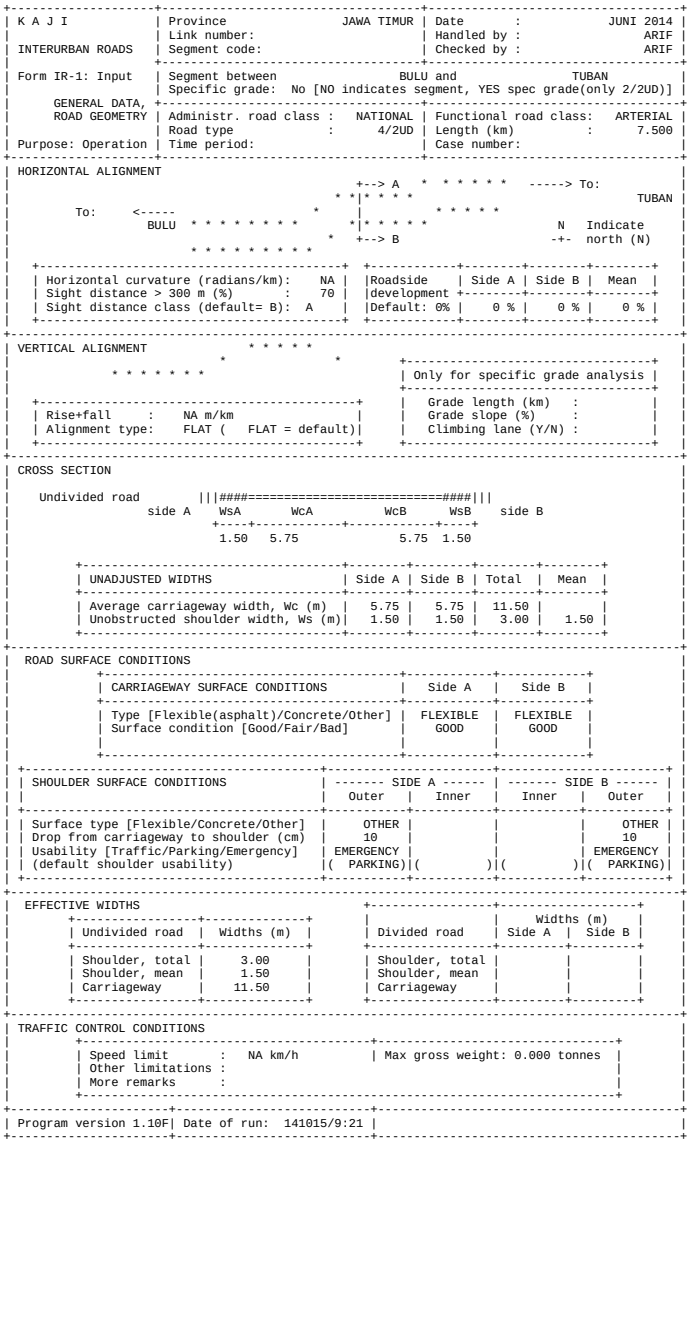
ACTUAL SPEED and TRAVEL TIME for light vehicles

Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types: km/h MHV	LB	LT	MC	Degree of bunching Fig D3:1 DB (31)
1+2	2183	0.373	62.74	7.500	430.309	53.41	66.13	50.87	50.87	

Space for user remark:

Program version 1.10F	Date of run: 141015/9:14	


K A J I
INTERURBAN ROADS
Province JAWA TIMUR
Link number:
Segment code:
Date : JUNI 2014
Handled by : ARIF
Checked by : ARIF
Form IR-1: Input
GENERAL DATA,
ROAD GEOMETRY
Purpose: Operation
Segment between BULU and TUBAN
Specific grade: No [NO indicates segment, YES spec grade(only 2/2UD)]
Administr. road class : NATIONAL
Road type : 4/2UD
Time period:
Functional road class: ARTERIAL
Length (km) : 7.500
Case number:
HORIZONTAL ALIGNMENT
BULU
TUBAN
To:
N Indicate
-+- north (N)
Horizontal curvature (radians/km): NA
Sight distance > 300 m (%) : 70
Sight distance class (default= B): A
Roadside development
Side A
Side B
Mean
Default: 0%
0 %
0 %
0 %
VERTICAL ALIGNMENT
Only for specific grade analysis
Rise+fall : NA m/km
Alignment type: FLAT (FLAT = default)
Grade length (km) :
Grade slope (%) :
Climbing lane (Y/N) :
CROSS SECTION
Undivided road
side A
WsA
WcA
WcB
WsB
side B
1.50 5.75 5.75 1.50
UNADJUSTED WIDTHS
Side A
Side B
Total
Mean
Average carriageway width, Wc (m) 5.75 5.75 11.50
Unobstructed shoulder width, Ws (m) 1.50 1.50 3.00 1.50
ROAD SURFACE CONDITIONS
CARRIAGEWAY SURFACE CONDITIONS
Side A
Side B
Type [Flexible(asphalt)/Concrete/Other]
Surface condition [Good/Fair/Bad]
FLEXIBLE
GOOD
FLEXIBLE
GOOD
SHOULDER SURFACE CONDITIONS
------ SIDE A ------
------ SIDE B ------
Outer
Inner
Inner
Outer
Surface type [Flexible/Concrete/Other]
Drop from carriageway to shoulder (cm)
Usability [Traffic/Parking/Emergency]
(default shoulder usability)
OTHER
10
EMERGENCY
(PARKING)
OTHER
10
EMERGENCY
(PARKING)
EFFECTIVE WIDTHS
Undivided road
Widths (m)
Shoulder, total 3.00
Shoulder, mean 1.50
Carriageway 11.50
Divided road
Widths (m)
Side A
Side B
Shoulder, total
Shoulder, mean
Carriageway
TRAFFIC CONTROL CONDITIONS
Speed limit : NA km/h
Other limitations :
More remarks :
Max gross weight: 0.000 tonnes
Program version 1.10F
Date of run: 141015/9:21

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF

TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data	ANNUAL AVERAGE DAILY TRAFFIC		DIRECTIONAL SPLIT	
	AADT	K-factor	Dir1 - Dir2	
CLASSIFIED-HOURLY	(veh/day)	(default: 0.11)	(default: 50 - 50)	
(CLass/AAdt/UNclass)			NA - NA %	

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.17	34.34	0.183	3.484	30.81	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Di-rec- tion	Light Vehicle		Med Heavy Veh		Large Bus		Large Truck		MotorCycle		Total flow Q		
		pce,1= 1.00 pce,2= 1.00		pce,1= 1.46 pce,2= 1.46		pce,1= 1.49 pce,2= 1.49		pce,1= 2.16 pce,2= 2.16		pce,1= 0.66 pce,2= 0.66				
		veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	Split (%)	veh/h	pcu/h
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	349	349	460	673	2	3	42	91	345	228	54.92	1198	1344
4	Dir2	331	331	289	423	2	3	34	73	327	216	45.07	983	1046
5	1+2	680	680	749	1096	4	6	76	164	672	444		2181	2390
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)= Pcu-factor, Fpcu =					54.9% 1.095	56.2%
7														

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 141015/9:21

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF
SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: Table B-1:1 or B-1:2 LV (2)	MHV	LB	LT	MC	Carriage-way adjust-ment, FVw (m/h)	FVo+FVw vehicle (km/h)	Adjustment factors: friction Tab B2:1 (2)+(3)	Side FFVsf (3)	Land use FFVrc (4)	Actual free-flow speeds, km/h: Light vehicle (5)	MHV	LB	LT	MC
1+2	74.0	63.0	78.0	60.0	60.0	-3.0	71.0	0.970	1.000	68.87	58.63	72.59	55.84	55.84

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-1:1 (12)	Directional split FCsp Table C-2:1 (13)	Side friction FCsf Table C-3:1 (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	6800	0.910	0.975	0.970	5854

ACTUAL SPEED and TRAVEL TIME for light vehicles

Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv km/h (23)	Road segment length, L (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types km/h MHV	LB	LT	MC	Degree of bunching Fig D3:1 DB (31)
1+2	2390	0.408	61.97	7.500	435.675	52.76	65.32	50.24	50.24	

Space for user remark:

Program version 1.10F	Date of run: 141015/9:21

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+--------------------+-----------------------------------+-----------------------------------+
| K A J I            | Province                JAWA TIMUR | Date       :          JUNI 2014 |
|                    | Link number:                       | Handled by :               ARIF |
| INTERURBAN ROADS   | Segment code:                      | Checked by :               ARIF |
|                    +-----------------------------------+-----------------------------------+
| Form IR-1: Input   | Segment between              BULU and              TUBAN                  |
|                    | Specific grade:  No [NO indicates segment, YES spec grade(only 2/2UD)] |
|      GENERAL DATA, +-----------------------------------+-----------------------------------+
|      ROAD GEOMETRY | Administr. road class :   NATIONAL | Functional road class:   ARTERIAL |
|                    | Road type             :      4/2UD | Length (km)          :     7.500 |
| Purpose: Operation | Time period:                       | Case number:                      |
+--------------------+-----------------------------------+-----------------------------------+
| HORIZONTAL ALIGNMENT                                                                          |
|                                          +--> A   *  * * * * *   -----> To:                  |
|                                        * *|* * *                                    TUBAN |
|         To:     <-----                *   |         * * * * *                              |
|                   BULU  * * * * * * * *    *|* * * * *                    N   Indicate     |
|                                          *   +--> B                      -+-  north (N)    |
|                         * * * * * * * * *                                                     |
|   +-------------------------------------+  +-----------+--------+--------+--------+        |
|   | Horizontal curvature (radians/km):    NA |  |Roadside    | Side A | Side B |  Mean  |        |
|   | Sight distance > 300 m (%)       :    70 |  |development +--------+--------+--------+        |
|   | Sight distance class (default= B):  A    |  |Default: 0% |    0 % |    0 % |    0 % |        |
|   +-------------------------------------+  +-----------+--------+--------+--------+        |
+-----------------------------------------------------------------------------------------------+
| VERTICAL ALIGNMENT                 * * * * *                                                  |
|                                 *              *       +-----------------------------------+ |
|              * * * * * * *                             | Only for specific grade analysis | |
|                                                        +-----------------------------------+ |
|   +-------------------------------------------+        |   Grade length (km)   :           | |
|   | Rise+fall     :    NA m/km                |        |   Grade slope (%)     :           | |
|   | Alignment type:    FLAT (   FLAT = default)|        |   Climbing lane (Y/N) :           | |
|   +-------------------------------------------+        +-----------------------------------+ |
+-----------------------------------------------------------------------------------------------+
| CROSS SECTION                                                                                 |
|                                                                                               |
|    Undivided road        |||####==============================####|||                        |
|                  side A     WsA       WcA          WcB      WsB    side B                   |
|                           +----+------------+-----------+----+                              |
|                            1.50   5.75             5.75  1.50                               |
|                                                                                               |
|         +-----------------------------------------+--------+--------+--------+--------+     |
|         | UNADJUSTED WIDTHS                     | Side A | Side B | Total  |  Mean  |     |
|         +-----------------------------------------+--------+--------+--------+--------+     |
|         | Average carriageway width, Wc (m)  |   5.75 |   5.75 |  11.50 |        |     |
|         | Unobstructed shoulder width, Ws (m)|   1.50 |   1.50 |   3.00 |   1.50 |     |
|         +-----------------------------------------+--------+--------+--------+--------+     |
+-----------------------------------------------------------------------------------------------+
|  ROAD SURFACE CONDITIONS                                                                      |
|           +-----------------------------------------+------------+------------+             |
|           | CARRIAGEWAY SURFACE CONDITIONS          |   Side A   |   Side B   |             |
|           +-----------------------------------------+------------+------------+             |
|           | Type [Flexible(asphalt)/Concrete/Other] |  FLEXIBLE  |  FLEXIBLE  |             |
|           | Surface condition [Good/Fair/Bad]       |    GOOD    |    GOOD    |             |
|           |                                         |            |            |             |
|           +-----------------------------------------+------------+------------+             |
| +-----------------------------------------+-------------+-------------+-------------+-----+ |
| | SHOULDER SURFACE CONDITIONS             | ------- SIDE A ------ | ------- SIDE B ------ | |
| |                                         |   Outer   |   Inner   |   Inner   |   Outer   | |
| +-----------------------------------------+-----------+-----------+-----------+-----------+ |
| | Surface type [Flexible/Concrete/Other]  |     OTHER |           |           |     OTHER | |
| | Drop from carriageway to shoulder (cm)  |    10     |           |           |    10     | |
| | Usability [Traffic/Parking/Emergency]   | EMERGENCY |           |           | EMERGENCY | |
| | (default shoulder usability)            |(  PARKING)|(         )|(         )|(  PARKING)| |
| +-----------------------------------------+-----------+-----------+-----------+-----------+ |
+-----------------------------------------------------------------------------------------------+
|  EFFECTIVE WIDTHS                                    +------------------+------------------+  |
|       +-----------------+--------------+             |                  |     Widths (m)   |  |
|       | Undivided road  |  Widths (m)  |             | Divided road     | Side A  | Side B |  |
|       +-----------------+--------------+             +------------------+---------+--------+  |
|       | Shoulder, total |     3.00     |             | Shoulder, total  |         |        |  |
|       | Shoulder, mean  |     1.50     |             | Shoulder, mean   |         |        |  |
|       | Carriageway     |    11.50     |             | Carriageway      |         |        |  |
|       +-----------------+--------------+             +------------------+---------+--------+  |
+-----------------------------------------------------------------------------------------------+
| TRAFFIC CONTROL CONDITIONS                                                                    |
|        +-----------------------------------+-------------------------------------+            |
|        | Speed limit       :   NA km/h     | Max gross weight: 0.000 tonnes      |            |
|        | Other limitations :               |                                     |            |
|        | More remarks      :               |                                     |            |
|        +-----------------------------------+-------------------------------------+            |
+--------------------+--------------------------------------------------------------------------+
| Program version 1.10F| Date of run:  141015/9:22 |                                          |
+--------------------+--------------------------------------------------------------------------+
```

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF
TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data (CLASSIFIED-HOURLY) (CLass/AAdt/UNclass)	ANNUAL AVERAGE DAILY TRAFFIC: AADT (veh/day)	K-factor (default: 0.11)	DIRECTIONAL SPLIT: Dir1 - Dir2 (default: 50 - 50)
			NA - NA %

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values (normal values)	31.33 (57.0)	34.28 (23.0)	0.171 (7.0)	3.463 (4.0)	30.73 (9.0)	100.0 (100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Dir-rec	Light Vehicle veh/h	Light Vehicle pcu/h	Med Heavy Veh veh/h	Med Heavy Veh pcu/h	Large Bus veh/h	Large Bus pcu/h	Large Truck veh/h	Large Truck pcu/h	MotorCycle veh/h	MotorCycle pcu/h	Total flow Q Split (%)	Total flow Q veh/h	Total flow Q pcu/h
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	376	376	493	731	2	3	45	99	369	252	54.93	1285	1461
4	Dir2	357	357	309	458	2	3	36	79	350	239	45.06	1054	1136
5	1+2	733	802	1189	4	6	81	178	719	491			2339	2597
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill						Directional split, SP= Q1/(Q1+Q2)=						54.9%	56.2%
7							Pcu-factor, Fpcu =							1.110

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 141015/9:22

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF

SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: FVo (km/h)					Carriage-way width (m)	FVo+FVw: Light vehicle adjust-ment, FVw (km/h)	Adjustment factors: friction FFVsf	Road func FFVrc	Actual free-flow speeds, km/h: Light vehicle (4*5*6)+(2)+(3)+(4)+(5)+(6)	Other vehicle types: MHV	LB	LT	MC
	LV (2)	MHV	LB	LT	MC	Table B-1:1 or B-1:2 (6)	Tab B2:1 (3)	Tab B3:1	Tab B4:1	(7)				
1+2	74.0	63.0	78.0	60.0	60.0	-3.0	71.0	0.970	1.000	68.87	58.63	72.59	55.84	55.84

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-1:1 (12)	Directional split FCsp Table C-2:1 (13)	Side friction FCsf Table C-3:1 (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h: Table C-4:1 (11)*(12)*(13)*(14) (15)
1+2	6800	0.910	0.975	0.970	5854

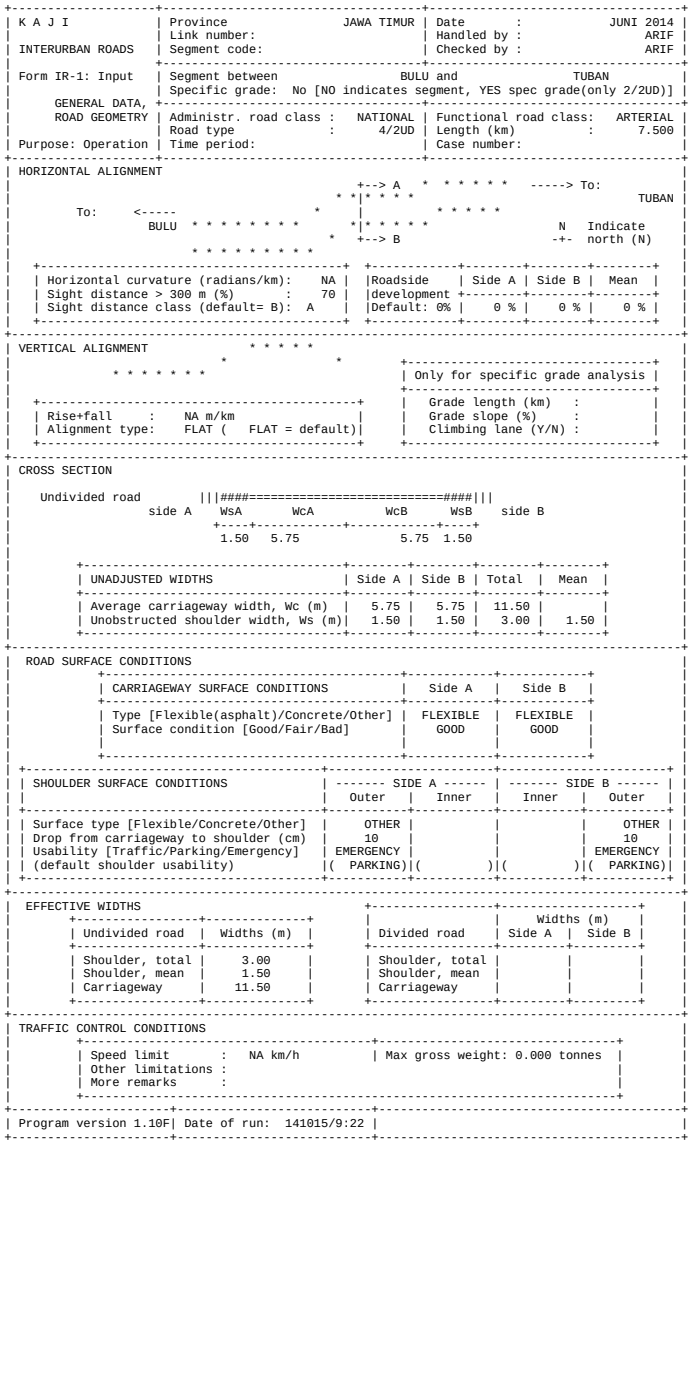
ACTUAL SPEED and TRAVEL TIME for light vehicles

Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types: km/h MHV	LB	LT	MC	Degree of bunching: Fig D3:1 DB (31)
1+2	2597	0.444	61.16	7.500	441.426	52.07	64.47	49.59	49.59	

Space for user remark:

Program version 1.10F	Date of run: 141015/9:22


K A J I
INTERURBAN ROADS
Province JAWA TIMUR
Link number:
Segment code:
Date : JUNI 2014
Handled by : ARIF
Checked by : ARIF
Form IR-1: Input
Purpose: Operation
Segment between BULU and TUBAN
Specific grade: No [NO indicates segment, YES spec grade(only 2/2UD)]
GENERAL DATA,
ROAD GEOMETRY
Administr. road class : NATIONAL
Road type : 4/2UD
Time period:
Functional road class: ARTERIAL
Length (km) : 7.500
Case number:
HORIZONTAL ALIGNMENT
BULU
TUBAN
To:
To:
N Indicate
north (N)
Horizontal curvature (radians/km): NA
Sight distance > 300 m (%) : 70
Sight distance class (default= B): A
Roadside
development
Default: 0%
Side A
0 %
Side B
0 %
Mean
0 %
VERTICAL ALIGNMENT
Only for specific grade analysis
Rise+fall : NA m/km
Alignment type: FLAT (FLAT = default)
Grade length (km) :
Grade slope (%) :
Climbing lane (Y/N) :
CROSS SECTION
Undivided road
side A
WsA
WcA
WcB
WsB
side B
1.50 5.75 5.75 1.50
UNADJUSTED WIDTHS
Side A
Side B
Total
Mean
Average carriageway width, Wc (m)
5.75
5.75
11.50
Unobstructed shoulder width, Ws (m)
1.50
1.50
3.00
1.50
ROAD SURFACE CONDITIONS
CARRIAGEWAY SURFACE CONDITIONS
Side A
Side B
Type [Flexible(asphalt)/Concrete/Other]
FLEXIBLE
FLEXIBLE
Surface condition [Good/Fair/Bad]
GOOD
GOOD
SHOULDER SURFACE CONDITIONS
SIDE A
SIDE B
Outer
Inner
Inner
Outer
Surface type [Flexible/Concrete/Other]
OTHER
OTHER
Drop from carriageway to shoulder (cm)
10
10
Usability [Traffic/Parking/Emergency]
EMERGENCY
EMERGENCY
(default shoulder usability)
PARKING
PARKING
EFFECTIVE WIDTHS
Undivided road
Widths (m)
Shoulder, total
3.00
Shoulder, mean
1.50
Carriageway
11.50
Divided road
Widths (m)
Side A
Side B
Shoulder, total
Shoulder, mean
Carriageway
TRAFFIC CONTROL CONDITIONS
Speed limit : NA km/h
Max gross weight: 0.000 tonnes
Other limitations :
More remarks :
Program version 1.10F
Date of run: 141015/9:22

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF

TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data	ANNUAL AVERAGE DAILY TRAFFIC		DIRECTIONAL SPLIT	
	AADT	K-factor	Dir1 - Dir2	
CLASSIFIED-HOURLY	(veh/day)	(default: 0.11)	(default: 50 - 50)	
(CLass/AAdt/UNclass)			NA - NA %	

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.42	34.26	0.160	3.522	30.62	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Di-rec	Light Vehicle		Med Heavy Veh		Large Bus		Large Truck		MotorCycle		Total flow Q			
														Split	
		veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h			(%)	
2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	
3	Dir1	403	403	526	791	2	3	49	111	393	276	54.96	1373	1584	
4	Dir2	382	382	330	496	2	3	39	88	372	262	45.03	1125	1231	
5	1+2	785	785	856	1287	4	6	88	199	765	538		2498	2815	
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=				54.9%	56.2%		
7								Pcu-factor, Fpcu =					1.126		

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F | Date of run: 141015/9:22

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF

SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: FVo (km/h)					Carriage-way adjust-ment, FVw (km/h)	FVo+FVw Light Tab B2:1 (2)+(3)	Adjustment factors: friction FFVsf Tab B3:1 (4)	Side FFVrc Tab B4:1 (5)	Land use vehicle (6)	Actual free-flow speeds, km/h: Other vehicle types (7)			
	Table B-1:1 or B-1:2													
	LV (2)	MHV	LB	LT	MC						MHV	LB	LT	MC
1+2	74.0	63.0	78.0	60.0	60.0	-3.0	71.0	0.970	1.000	68.87	58.63	72.59	55.84	55.84

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

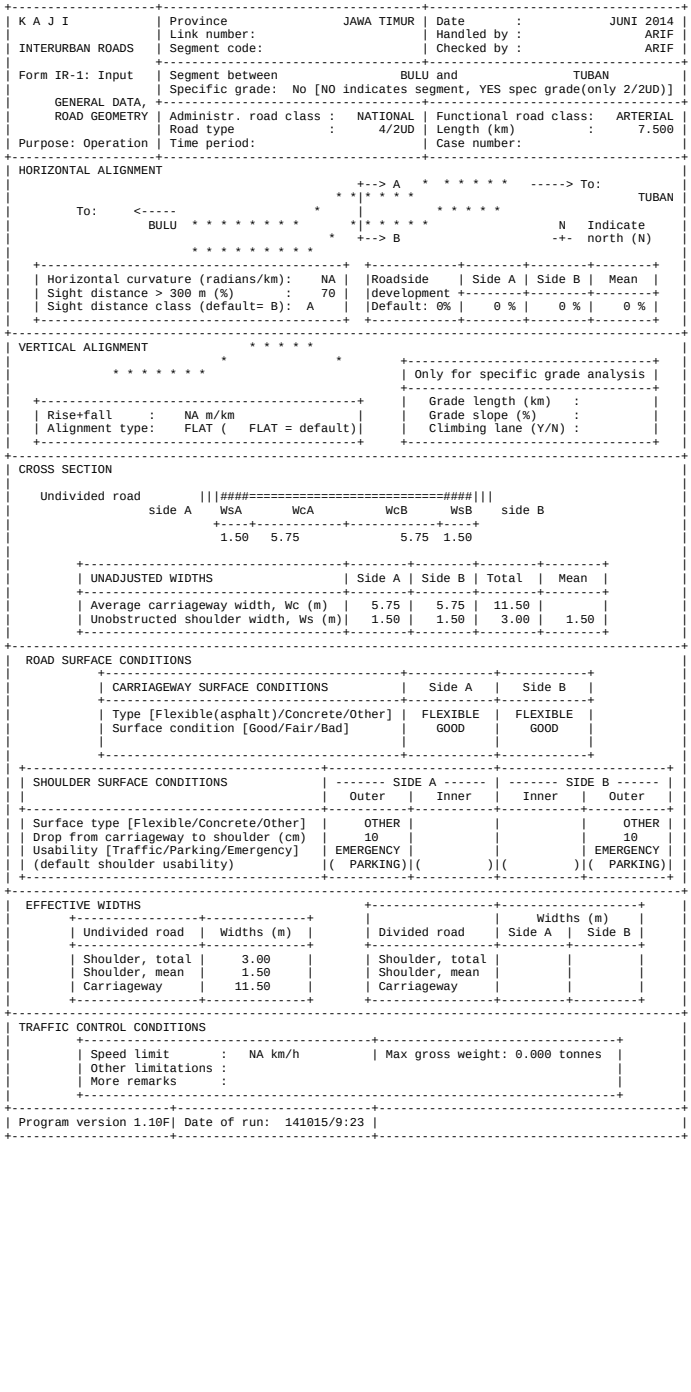
Direction	Base Capacity: Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-1:1 (12)	Directional split FCsp Table C-2:1 (13)	Side friction FCsf Table C-3:1 (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h: Table C-4:1 (11)*(12)*(13)*(14) (15)
1+2	6800	0.910	0.975	0.970	5853

ACTUAL SPEED and TRAVEL TIME for light vehicles — Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv (23)	Road segment length, L (24)	Travel time,TT (24/23) (25)	ACTUAL SPEEDS for other vehicle types km/h: MHV	LB	LT	MC	Degree of bunching Fig D3:1 (31)	DB
			km/h	km	sec						
1+2	2815	0.481	60.27	7.500	447.939	51.31	63.53	48.87	48.87		

Space for user remark:

Program version 1.10F	Date of run: 141015/9:22


K A J I
INTERURBAN ROADS
Province JAWA TIMUR
Link number:
Segment code:
Date : JUNI 2014
Handled by : ARIF
Checked by : ARIF
Form IR-1: Input
Purpose: Operation
Segment between BULU and TUBAN
Specific grade: No [NO indicates segment, YES spec grade(only 2/2UD)]
GENERAL DATA,
ROAD GEOMETRY
Administr. road class : NATIONAL
Road type : 4/2UD
Time period:
Functional road class: ARTERIAL
Length (km) : 7.500
Case number:
HORIZONTAL ALIGNMENT
To:
BULU
TUBAN
N Indicate
north (N)
Horizontal curvature (radians/km): NA
Sight distance > 300 m (%) : 70
Sight distance class (default= B): A
Roadside
development
Default: 0%
Side A
0 %
Side B
0 %
Mean
0 %
VERTICAL ALIGNMENT
Only for specific grade analysis
Rise+fall : NA m/km
Alignment type: FLAT (FLAT = default)
Grade length (km) :
Grade slope (%) :
Climbing lane (Y/N) :
CROSS SECTION
Undivided road
side A
WsA
WcA
WcB
WsB
side B
1.50 5.75 5.75 1.50
UNADJUSTED WIDTHS
Side A
Side B
Total
Mean
Average carriageway width, Wc (m)
5.75
5.75
11.50
Unobstructed shoulder width, Ws (m)
1.50
1.50
3.00
1.50
ROAD SURFACE CONDITIONS
CARRIAGEWAY SURFACE CONDITIONS
Side A
Side B
Type [Flexible(asphalt)/Concrete/Other]
FLEXIBLE
FLEXIBLE
Surface condition [Good/Fair/Bad]
GOOD
GOOD
SHOULDER SURFACE CONDITIONS
------ SIDE A ------
------ SIDE B ------
Outer
Inner
Surface type [Flexible/Concrete/Other]
OTHER
Drop from carriageway to shoulder (cm)
10
Usability [Traffic/Parking/Emergency]
EMERGENCY
(default shoulder usability)
PARKING
EFFECTIVE WIDTHS
Undivided road
Widths (m)
Shoulder, total
3.00
Shoulder, mean
1.50
Carriageway
11.50
Divided road
Widths (m)
Side A
Side B
TRAFFIC CONTROL CONDITIONS
Speed limit : NA km/h
Other limitations :
More remarks :
Max gross weight: 0.000 tonnes
Program version 1.10F
Date of run: 141015/9:23

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF

TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data (CLASSIFIED-HOURLY) (CLass/AAdt/UNclass)	ANNUAL AVERAGE DAILY TRAFFIC: AADT (veh/day) | K-factor (default: 0.11)	DIRECTIONAL SPLIT: Dir1 - Dir2 (default: 50 - 50) NA - NA %

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.51	34.22	0.150	3.539	30.57	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Direction	Light Vehicle veh/h	Light Vehicle pcu/h	Med Heavy Veh veh/h	Med Heavy Veh pcu/h	Large Bus veh/h	Large Bus pcu/h	Large Truck veh/h	Large Truck pcu/h	MotorCycle veh/h	MotorCycle pcu/h	Split (%)	Total flow veh/h	Total flow pcu/h
	rec-	pce,1= 1.00	pce,1= 1.52	pce,1= 1.52	pce,1= 1.59	pce,1= 1.59	pce,1= 2.31	pce,2= 2.31	pce,1= 0.72	pce,2= 1.00	pce,2= 1.52			
		pce,2= 1.00	pce,2= 1.52	pce,2= 1.59	pce,2= 2.31				pce,2= 0.72					
2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	430	430	558	850	2	3	52	120	417	302	54.93	1459	1705
4	Dir2	407	407	351	535	2	3	42	97	395	286	45.06	1197	1328
5	1+2	837	837	909	1385	4	6	94	217	812	588		2656	3033
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=					54.9%	56.2%
7								Pcu-factor, Fpcu =						1.141

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol	Weighting factor (21)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 141015/9:23

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF
SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: FVo (km/h)					Carriage-way width (m)	FVo+FVw: Light vehicle adjust-ment, FVw (km/h)	Adjustment factors: friction Tab B2:1 (2)+(3)		Actual free-flow speeds, km/h: Road func Tab B3:1	Light vehicle Tab B4:1 (4*5*6)	Other vehicle types			
	LV (2)	MHV	LB	LT	MC	Table B-1:1 or B-1:2 (3)		FFVsf (4)	FFVrc (5)	Land use (6)	vehicle (7)	MHV	LB	LT	MC
1+2	74.0	63.0	78.0	60.0	60.0	-3.0	71.0	0.970	1.000		68.87	58.63	72.59	55.84	55.84

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-2:1 (12)	Directional split FCsp Table C-3:1 (13)	Side friction FCsf Table C-4:1 (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	6800	0.910	0.975	0.970	5854

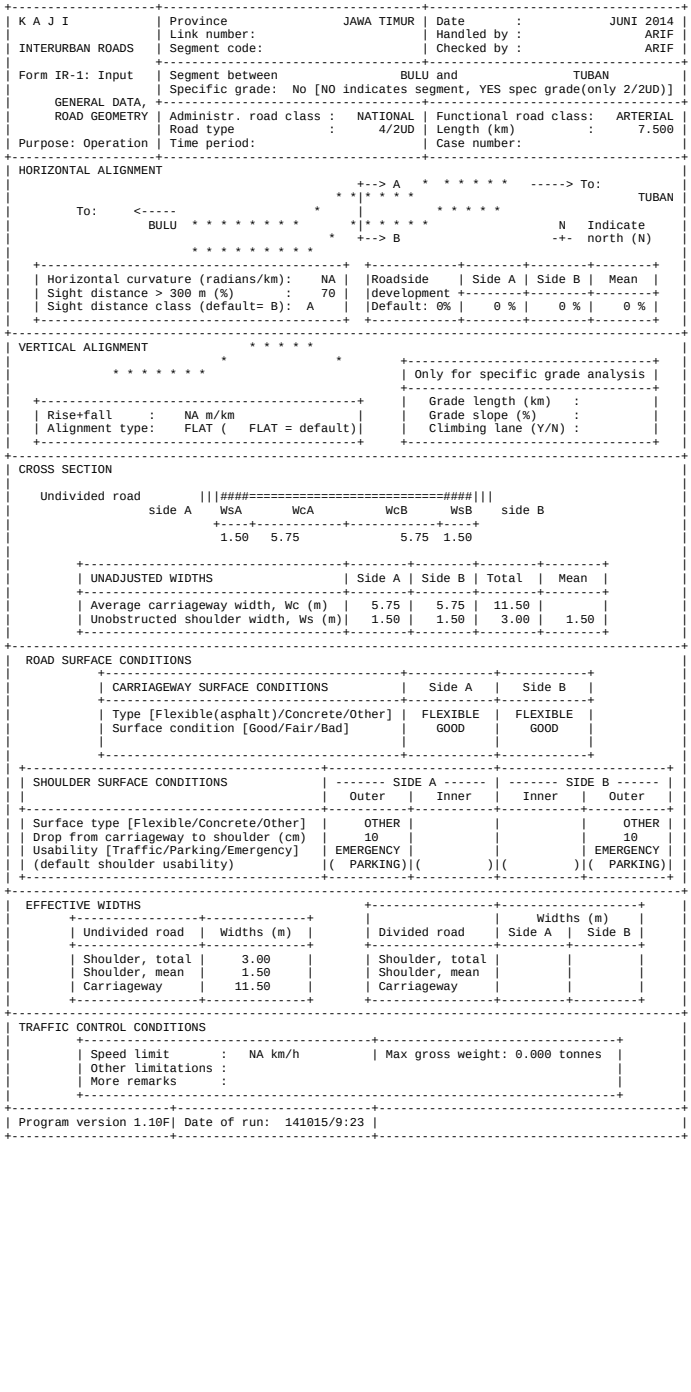
ACTUAL SPEED and TRAVEL TIME for light vehicles

Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv km/h (23)	Road segment length, L (24) km	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types: km/h MHV	LB	LT	MC	Degree of bunching Fig D3:1 (31)
1+2	3033	0.518	59.34	7.500	454.946	50.52	62.55	48.11	48.11	

Space for user remark:

Program version 1.10F | Date of run: 141015/9:23


K A J I
INTERURBAN ROADS
Province JAWA TIMUR
Link number:
Segment code:
Date : JUNI 2014
Handled by : ARIF
Checked by : ARIF
Form IR-1: Input
Purpose: Operation
Segment between BULU and TUBAN
Specific grade: No [NO indicates segment, YES spec grade(only 2/2UD)]
GENERAL DATA,
ROAD GEOMETRY
Administr. road class : NATIONAL
Road type : 4/2UD
Time period:
Functional road class: ARTERIAL
Length (km) : 7.500
Case number:
HORIZONTAL ALIGNMENT
To:
BULU
TUBAN
N Indicate
north (N)
Horizontal curvature (radians/km): NA
Sight distance > 300 m (%) : 70
Sight distance class (default= B): A
Roadside
development
Default: 0%
Side A
0 %
Side B
0 %
Mean
0 %
VERTICAL ALIGNMENT
Only for specific grade analysis
Rise+fall : NA m/km
Alignment type: FLAT (FLAT = default)
Grade length (km) :
Grade slope (%) :
Climbing lane (Y/N) :
CROSS SECTION
Undivided road
side A
WsA
WcA
WcB
WsB
side B
1.50 5.75 5.75 1.50
UNADJUSTED WIDTHS
Side A
Side B
Total
Mean
Average carriageway width, Wc (m)
5.75
5.75
11.50
Unobstructed shoulder width, Ws (m)
1.50
1.50
3.00
1.50
ROAD SURFACE CONDITIONS
CARRIAGEWAY SURFACE CONDITIONS
Side A
Side B
Type [Flexible(asphalt)/Concrete/Other]
FLEXIBLE
FLEXIBLE
Surface condition [Good/Fair/Bad]
GOOD
GOOD
SHOULDER SURFACE CONDITIONS
------ SIDE A ------
------ SIDE B ------
Outer
Inner
Surface type [Flexible/Concrete/Other]
OTHER
Drop from carriageway to shoulder (cm)
10
Usability [Traffic/Parking/Emergency]
EMERGENCY
(default shoulder usability)
PARKING
EFFECTIVE WIDTHS
Undivided road
Widths (m)
Shoulder, total
3.00
Shoulder, mean
1.50
Carriageway
11.50
Divided road
Widths (m)
Side A
Side B
TRAFFIC CONTROL CONDITIONS
Speed limit : NA km/h
Other limitations :
More remarks :
Max gross weight: 0.000 tonnes
Program version 1.10F
Date of run: 141015/9:23

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF
TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data (CLASSIFIED-HOURLY) (CLass/AAdt/UNclass)	ANNUAL AVERAGE DAILY TRAFFIC: AADT (veh/day) | K-factor (default: 0.11)	DIRECTIONAL SPLIT: Dir1 - Dir2 (default: 50 - 50) NA - NA %

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values (normal values)	31.58 (57.0)	34.17 (23.0)	0.142 (7.0)	3.587 (4.0)	30.51 (9.0)	100.0 (100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Direction-rec	Light Vehicle veh/h (1)	Light Vehicle pcu/h (2)	Med Heavy Veh veh/h (3)	Med Heavy Veh pcu/h (4)	Large Bus veh/h (5)	Large Bus pcu/h (6)	Large Truck veh/h (7)	Large Truck pcu/h (8)	MotorCycle veh/h (9)	MotorCycle pcu/h (10)	Total flow veh/h (11)	Total flow pcu/h (12)	Split % (13)	Q veh/h (14)	Q pcu/h (14)
3	Dir1	457	457	591	912	2	3	56	132	441	328	1547	1832	54.95		
4	Dir2	432	432	371	573	2	3	45	106	418	311	1268	1425	45.04		
5	1+2	889	889	962	1485	4	6	101	238	859	639	2815	3257			
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill							Directional split, SP= Q1/(Q1+Q2)=						54.9%	56.2%	
7								Pcu-factor, Fpcu =							1.157	

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 141015/9:23

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF
SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: FVo (km/h)				Table B-1:1 or B-1:2	Carriage-way width (m)	FVo+FVw: Light vehicle adjust-ment, FVw	Adjustment factors: friction Tab B2:1	(2)+(3)	Side FFVsf Tab B3:1	Land use FFVrc Tab B4:1	Actual free-flow speeds, km/h: Light vehicle (4*5*6)	Other vehicle types		
	LV (2)	MHV	LB	LT	MC	(km/h) (3)	(km/h) (4)	(5)	(6)	(7)	MHV	LB	LT	MC
1+2	74.0	63.0	78.0	60.0	60.0	-3.0	71.0	0.970	1.000	68.87	58.63	72.59	55.84	55.84

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

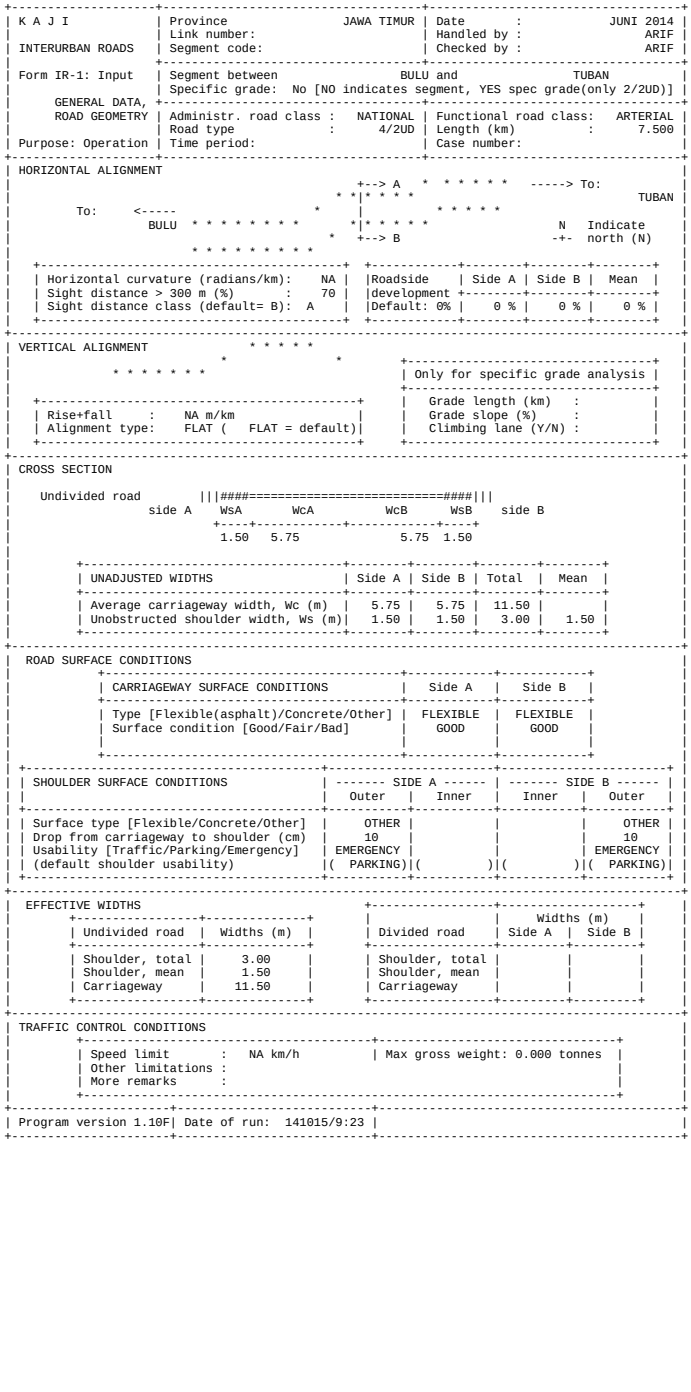
Direc-tion	Base Capacity Co (Table C-1:1 pcu/h) (11)	Adjustment factors for capacity: Carriageway width FCw (Table C-2:1) (12)	Directional split FCsp (Table C-3:1) (13)	Side friction FCsf (Table C-4:1) (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	6800	0.910	0.975	0.970	5854

ACTUAL SPEED and TRAVEL TIME for light vehicles — Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (21)/(15) (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types km/h: MHV	LB	LT	MC	Di-rec-tion	Degree of bunching Fig D3:1 (31)
1+2	3257	0.556	58.34	7.500	462.773	49.67	61.49	47.30	47.30		

Space for user remark:

Program version 1.10F	Date of run: 141015/9:23


K A J I
INTERURBAN ROADS
Province JAWA TIMUR
Link number:
Segment code:
Date : JUNI 2014
Handled by : ARIF
Checked by : ARIF
Form IR-1: Input
Purpose: Operation
Segment between BULU and TUBAN
Specific grade: No [NO indicates segment, YES spec grade(only 2/2UD)]
GENERAL DATA,
ROAD GEOMETRY
Administr. road class : NATIONAL
Road type : 4/2UD
Time period:
Functional road class: ARTERIAL
Length (km) : 7.500
Case number:
HORIZONTAL ALIGNMENT
To:
BULU
TUBAN
N Indicate
north (N)
Horizontal curvature (radians/km): NA
Sight distance > 300 m (%) : 70
Sight distance class (default= B): A
Roadside
development
Default: 0%
Side A
0 %
Side B
0 %
Mean
0 %
VERTICAL ALIGNMENT
Only for specific grade analysis
Rise+fall : NA m/km
Alignment type: FLAT (FLAT = default)
Grade length (km) :
Grade slope (%) :
Climbing lane (Y/N) :
CROSS SECTION
Undivided road
side A
WsA
WcA
WcB
WsB
side B
1.50 5.75 5.75 1.50
UNADJUSTED WIDTHS
Side A
Side B
Total
Mean
Average carriageway width, Wc (m)
5.75
5.75
11.50
Unobstructed shoulder width, Ws (m)
1.50
1.50
3.00
1.50
ROAD SURFACE CONDITIONS
CARRIAGEWAY SURFACE CONDITIONS
Side A
Side B
Type [Flexible(asphalt)/Concrete/Other]
FLEXIBLE
FLEXIBLE
Surface condition [Good/Fair/Bad]
GOOD
GOOD
SHOULDER SURFACE CONDITIONS
------ SIDE A ------
------ SIDE B ------
Outer
Inner
Surface type [Flexible/Concrete/Other]
OTHER
Drop from carriageway to shoulder (cm)
10
Usability [Traffic/Parking/Emergency]
EMERGENCY
(default shoulder usability)
PARKING
EFFECTIVE WIDTHS
Undivided road
Widths (m)
Shoulder, total
3.00
Shoulder, mean
1.50
Carriageway
11.50
Divided road
Widths (m)
Side A
Side B
TRAFFIC CONTROL CONDITIONS
Speed limit : NA km/h
Other limitations :
More remarks :
Max gross weight: 0.000 tonnes
Program version 1.10F
Date of run: 141015/9:23

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF

TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data	ANNUAL AVERAGE DAILY TRAFFIC		DIRECTIONAL SPLIT	
	AADT	K-factor	Dir1 - Dir2	
CLASSIFIED-HOURLY	(veh/day)	(default: 0.11)	(default: 50 - 50)	
(CLass/AAdt/UNclass)			NA - NA %	

Traffic Composition(%)	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.67	34.16	0.134	3.597	30.43	100.0
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Di-tion	Light Vehicle rec-	Med Heavy Veh	Large Bus	Large Truck	MotorCycle	Total flow Q	
1.1	1.2	pce,1= 1.00 pce,2= 1.00	pce,1= 1.56 pce,2= 1.56	pce,1= 1.65 pce,2= 1.65	pce,1= 2.41 pce,2= 2.41	pce,1= 0.76 pce,2= 0.76		
		veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	veh/h	pcu/h	Split (%)	veh/h	pcu/h
2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	Dir1	484	484	624	976	2	3	59	142	465	355	54.94	1634	1960
4	Dir2	458	458	392	613	2	3	48	116	440	336	45.05	1340	1526
5	1+2	942	942	1016	1589	4	6	107	258	905	691		2974	3486
6	Note. If specific grade then dir 1 = uphill, dir 2= downhill				Directional split, SP= Q1/(Q1+Q2)=			54.9%	56.2%
7					Pcu-factor, Fpcu =				1.172

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol	Weighting factor (21)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 141015/9:23

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF

SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles: FVo (km/h)					Carriage-way adjust-ment, FVw	FVo+FVw vehicle (2)+(3)	Adjustment factors: Light friction FFVsf (4)	Road func FFVrc (5)	Actual free-flow speeds, km/h: Light vehicle (6)	Other vehicle types MHV (7)	LB	LT	MC
	LV (2)	MHV	LB	LT	MC	Table B-1:1 or B-1:2 (km/h)		Tab B2:1 (3)	Tab B3:1 (4)	Tab B4:1 (5)	(4*5*6) (6)			
1+2	74.0	63.0	78.0	60.0	60.0	-3.0	71.0	0.970	1.000	68.87	58.63	72.59	55.84	55.84

Comments:

User FFV, dir1: None!
dir2:

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-1:1 (12)	Directional split FCsp Table C-2:1 (13)	Side friction FCsf Table C-3:1 (14)	Actual capacity, C = Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	6800	0.910	0.975	0.970	5854

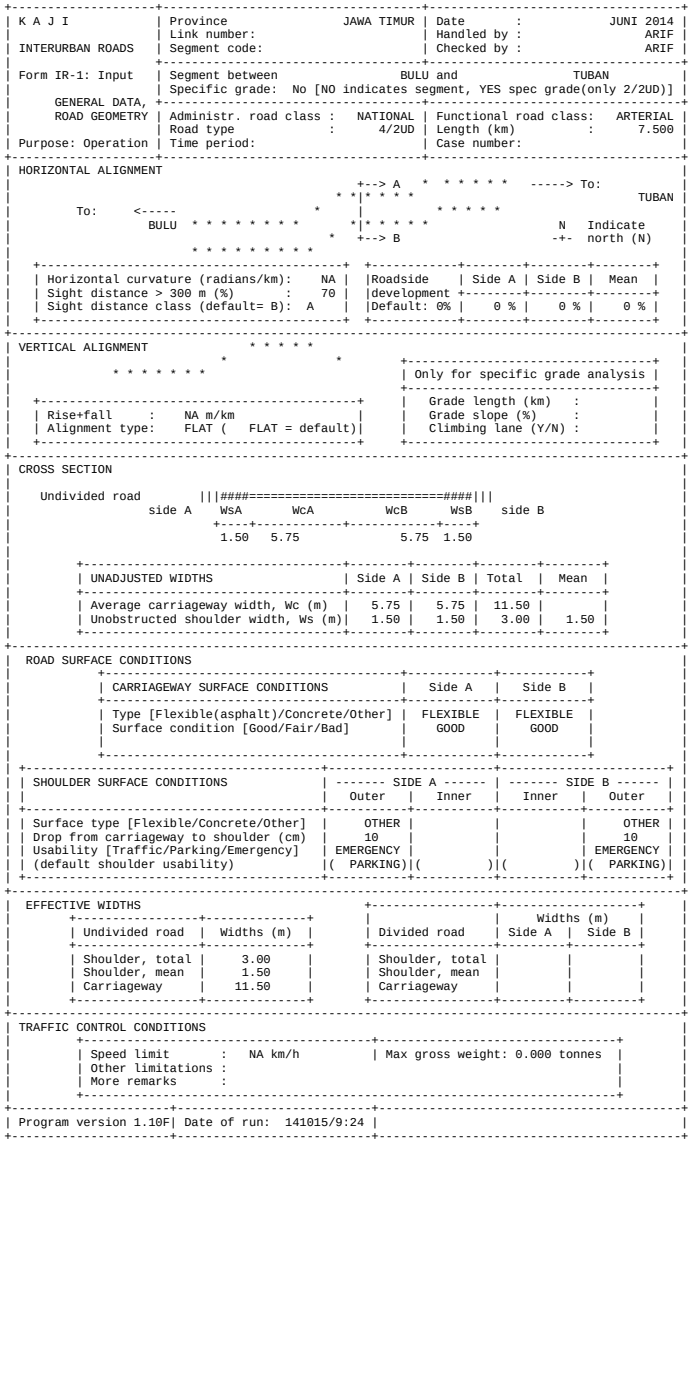
ACTUAL SPEED and TRAVEL TIME for light vehicles

Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types: km/h MHV	LB	LT	MC	Degree of bunching Fig D3:1 DB (31)
1+2	3486	0.595	57.26	7.500	471.514	48.75	60.35	46.42	46.42	

Space for user remark:

Program version 1.10F	Date of run: 141015/9:23


K A J I
INTERURBAN ROADS
Province JAWA TIMUR
Link number:
Segment code:
Date : JUNI 2014
Handled by : ARIF
Checked by : ARIF
Form IR-1: Input
Purpose: Operation
Segment between BULU and TUBAN
Specific grade: No [NO indicates segment, YES spec grade(only 2/2UD)]
GENERAL DATA,
ROAD GEOMETRY
Administr. road class : NATIONAL
Road type : 4/2UD
Time period:
Functional road class: ARTERIAL
Length (km) : 7.500
Case number:
HORIZONTAL ALIGNMENT
BULU
TUBAN
To:
To:
N Indicate north (N)
Horizontal curvature (radians/km): NA
Sight distance > 300 m (%) : 70
Sight distance class (default= B): A
Roadside
development
Side A
Default: 0%
0 %
Side B
0 %
Mean
0 %
VERTICAL ALIGNMENT
Only for specific grade analysis
Rise+fall : NA m/km
Alignment type: FLAT (FLAT = default)
Grade length (km) :
Grade slope (%) :
Climbing lane (Y/N) :
CROSS SECTION
Undivided road
side A
WsA
WcA
WcB
WsB
side B
1.50 5.75 5.75 1.50
UNADJUSTED WIDTHS
Side A
Side B
Total
Mean
Average carriageway width, Wc (m)
5.75
5.75
11.50
Unobstructed shoulder width, Ws (m)
1.50
1.50
3.00
1.50
ROAD SURFACE CONDITIONS
CARRIAGEWAY SURFACE CONDITIONS
Side A
Side B
Type [Flexible(asphalt)/Concrete/Other]
FLEXIBLE
FLEXIBLE
Surface condition [Good/Fair/Bad]
GOOD
GOOD
SHOULDER SURFACE CONDITIONS
------ SIDE A ------
------ SIDE B ------
Outer
Inner
Inner
Outer
Surface type [Flexible/Concrete/Other]
OTHER
OTHER
Drop from carriageway to shoulder (cm)
10
10
Usability [Traffic/Parking/Emergency]
EMERGENCY
EMERGENCY
(default shoulder usability)
(PARKING)
(PARKING)
EFFECTIVE WIDTHS
Undivided road
Widths (m)
Shoulder, total
3.00
Shoulder, mean
1.50
Carriageway
11.50
Divided road
Widths (m)
Side A
Side B
Shoulder, total
Shoulder, mean
Carriageway
TRAFFIC CONTROL CONDITIONS
Speed limit : NA km/h
Max gross weight: 0.000 tonnes
Other limitations :
More remarks :
Program version 1.10F
Date of run: 141015/9:24

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-2: Input	Segment code:	Checked by: ARIF

TRAFFIC FLOW, SIDE FRICTION	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

TRAFFIC DATA:

Type of traffic data (CLASSIFIED-HOURLY) (CLass/AAdt/UNclass)	ANNUAL AVERAGE DAILY TRAFFIC (default: 0.11): AADT (veh/day)	K-factor	DIRECTIONAL SPLIT (default: 50 - 50): Dir1 - Dir2 NA - NA %

Composition(%)	Traffic	LV (%)	MHV (%)	LB (%)	LT (%)	MC (%)	Total (%)
User values	31.71	34.10	0.191	3.605	30.37	100.0	
(normal values)	(57.0)	(23.0)	(7.0)	(4.0)	(9.0)	(100.0)	

LV = Light Vehicle
MHV = Medium Heavy Vehicle
LB = Large Bus
LT = Large Truck
MC = MotorCycle

Traffic flow data for whole segment analysis:

Row	Dir-rec	Light Vehicle veh/h	Light Vehicle pcu/h (1)	Med Heavy Veh veh/h (2)	Med Heavy Veh pcu/h (3)	Large Bus veh/h (4)	Large Bus pcu/h (5)	Large Truck veh/h (6)	Large Truck pcu/h (7)	MotorCycle veh/h (8)	MotorCycle pcu/h (9)	Total flow Q veh/h (10)	Total flow Q pcu/h (11)	Split % (12)	Q veh/h (13)	Q pcu/h (14)
1	Dir1	511	511	656	1040	3	5	63	155	489	384	1722	2095	54.94	1722	2095
2	Dir2	483	483	413	655	3	5	50	123	463	363	1412	1629	45.05	1412	1629
3	1+2	994	994	1069	1695	6	10	113	278	952	747				3134	3724

Note. If specific grade then dir 1 = uphill, dir 2= downhill	Directional split, SP= Q1/(Q1+Q2)=	54.9%	56.2%
	Pcu-factor, Fpcu =		1.188

SIDE FRICTION CLASS: If detailed data are available, use first table to determine weighted frequency of events and then go to second table. If not, use second table only.

1. Determination of frequency of events

Calculation of weighted frequency of events per hour and 200 m of the studied road segment.

Frequencies are for both sides of the road.

Side friction type of events (20)	Symbol (21)	Weighting factor (22)	Frequency of events (23)	Weighted frequency (24)
Pedestrians	PED	0.6	NA / h,200m	NA
Parking, stopping veh.	PSV	0.8	NA / h,200m	NA
Entry+exit of vehicles	EEV	1.0	NA / h,200m	NA
Slow-moving vehicles	SMV	0.4	NA / h	NA
			Total:	NA

2. Determination of side friction class

Weighted frequency of events (30)	Typical conditions	Side friction class
< 50	Rural, agriculture or undeveloped with very few activities	VL= very low
50 - 149	Rural, some roadside buildings and some activities	L= low
150 - 249	Village, residential activities	M= medium
250 - 349	Village, some market activities	H= high
> 350	Almost urban, market and business activities	VH= very high

For current case indicate side friction class: L (L is default)

Program version 1.10F	Date of run: 141015/9:24

KAJI -- INTERURBAN ROADS	Province: JAWA TIMUR	Date: JUNI 2014
	Link number:	Handled by: ARIF
Form IR-3: Analysis	Segment code:	Checked by: ARIF

SPEED, CAPACITY	Administr. road class : NATIONAL	Functional road class: ARTERIAL
	Road type : 4/2UD	Length (km) : 7.500
Purpose: Operation	Time period :	Case number:

FREE FLOW SPEEDS.

Option to enter other free flow speeds: No

Di-rec-tion	Base free-flow speed for different vehicles					Carriage-way width	FVo+FVw adjust-ment, FVw	Adjustment factors			Actual free-flow speeds, km/h			
	Table B-1:1 or B-1:2							Light friction Tab B2:1	Road func Tab B3:1	Light vehicle Tab B4:1	Other vehicle types			
	LV (2)	MHV	LB	LT	MC	(km/h)	(km/h)	(2)+(3) (3)	FFVsf (4)	FFVrc (5)	(4*5*6)+(7) (6)	MHV (7)	LB	LT	MC
1+2	74.0	63.0	78.0	60.0	60.0	-3.0	71.0	0.970	1.000		68.87	58.63	72.59	55.84	55.84

Comments:

User FFV, dir1: None!
dir2:

FFVlv = (FVo+FVw)*FFVsf*FFVrc

CAPACITY

Direc-tion	Base Capacity Co pcu/h (11)	Adjustment factors for capacity: Carriageway width FCw Table C-2:1 (12)	Directional split FCsp Table C-3:1 (13)	Side friction FCsf Table C-4:1 (14)	Actual capacity, C= Co*FCw*FCsp*FCsf pcu/h (11)*(12)*(13)*(14) (15)
1+2	6800	0.910	0.975	0.970	5854

ACTUAL SPEED and TRAVEL TIME for light vehicles

Only 2/2UD roads

Di-rec-tion	Traffic flow, Q Form IR-2 pcu/h (21)	Degree of saturation DS=Q/C (22)	Actual speed,Vlv Fig D2:1/:2 km/h (23)	Road segment length, L km (24)	Travel time,TT (24/23) sec (25)	ACTUAL SPEEDS for other vehicle types km/h MHV	LB	LT	MC	Degree of bunching Fig D3:1 DB (31)
1+2	3724	0.636	56.07	7.500	481.516	47.73	59.10	45.46	45.46	

Space for user remark:

Program version 1.10F	Date of run: 141015/9:24	

KEMENTERIAN PEKERJAAN UMUM
DIREKTORAT JENDERAL BINA MARGA
SNVT - PERENCANAAN DAN PENGAWASAN
JALAN DAN JEMBATAN JAWA TIMUR

Nama Proyek :
PEKERJAAN PERENCANAAN TEKNIK JALAN DAN JEMBATAN PROVINSI JATIM - 1

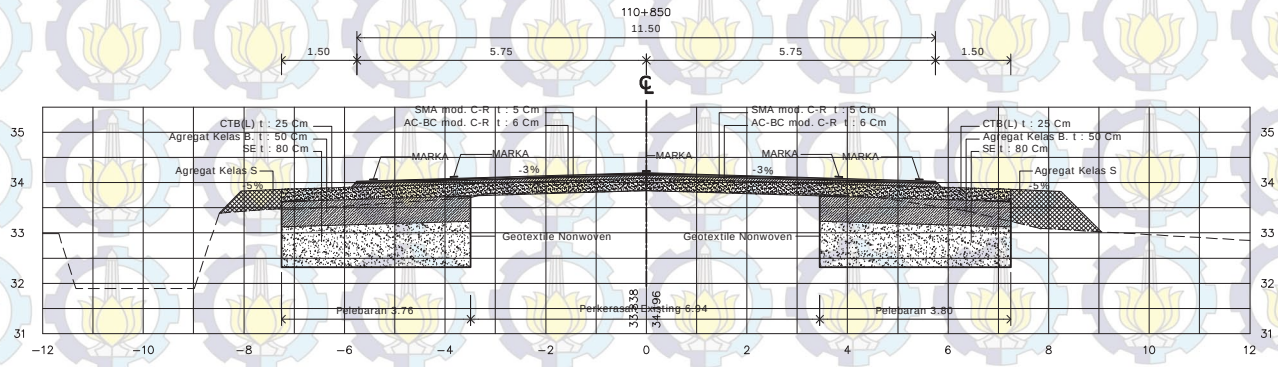
No. Paket	-
No. Link	-
Nama Paket / Link	BULU - BTS. KOTA TUBAN
Provinsi	Jawa Timur

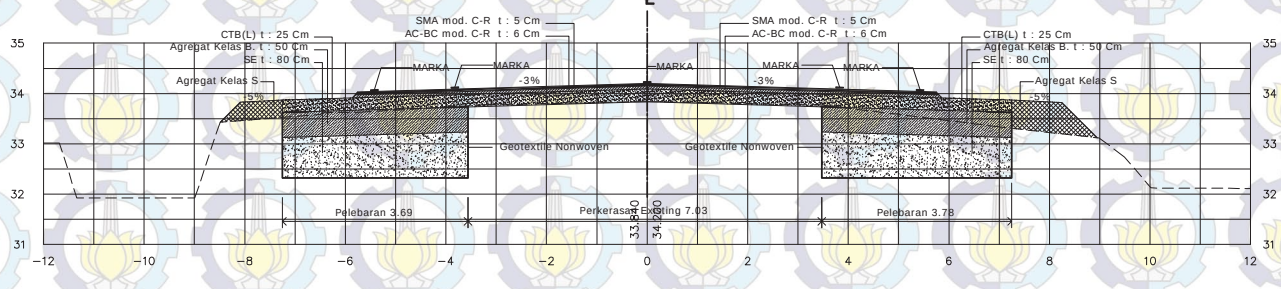
Konsultan Perencana
PT. BUANA ARCHICON
ENGINEERING - MANAGEMENT - SOCIAL DEVELOPMENT

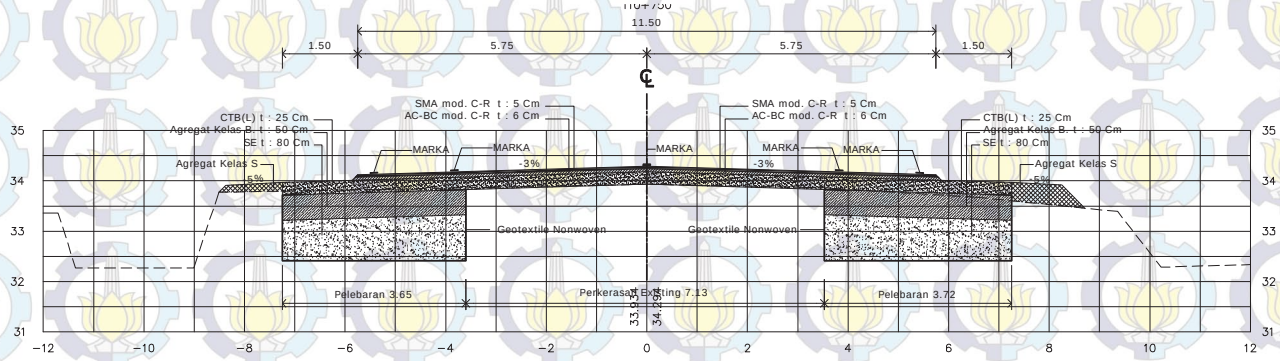
JOKI RESTIAWAN	Ir. DIDIK SULISTYA	Ir. MUKHSIN BAZEID
Juru Gambar	Ahli Jalan Raya	Kepala Tim

JUDUL GAMBAR :
CROSS SECTION

No. Lembar	-
Skala	H 1:100 - V 1:100
Tanggal	-







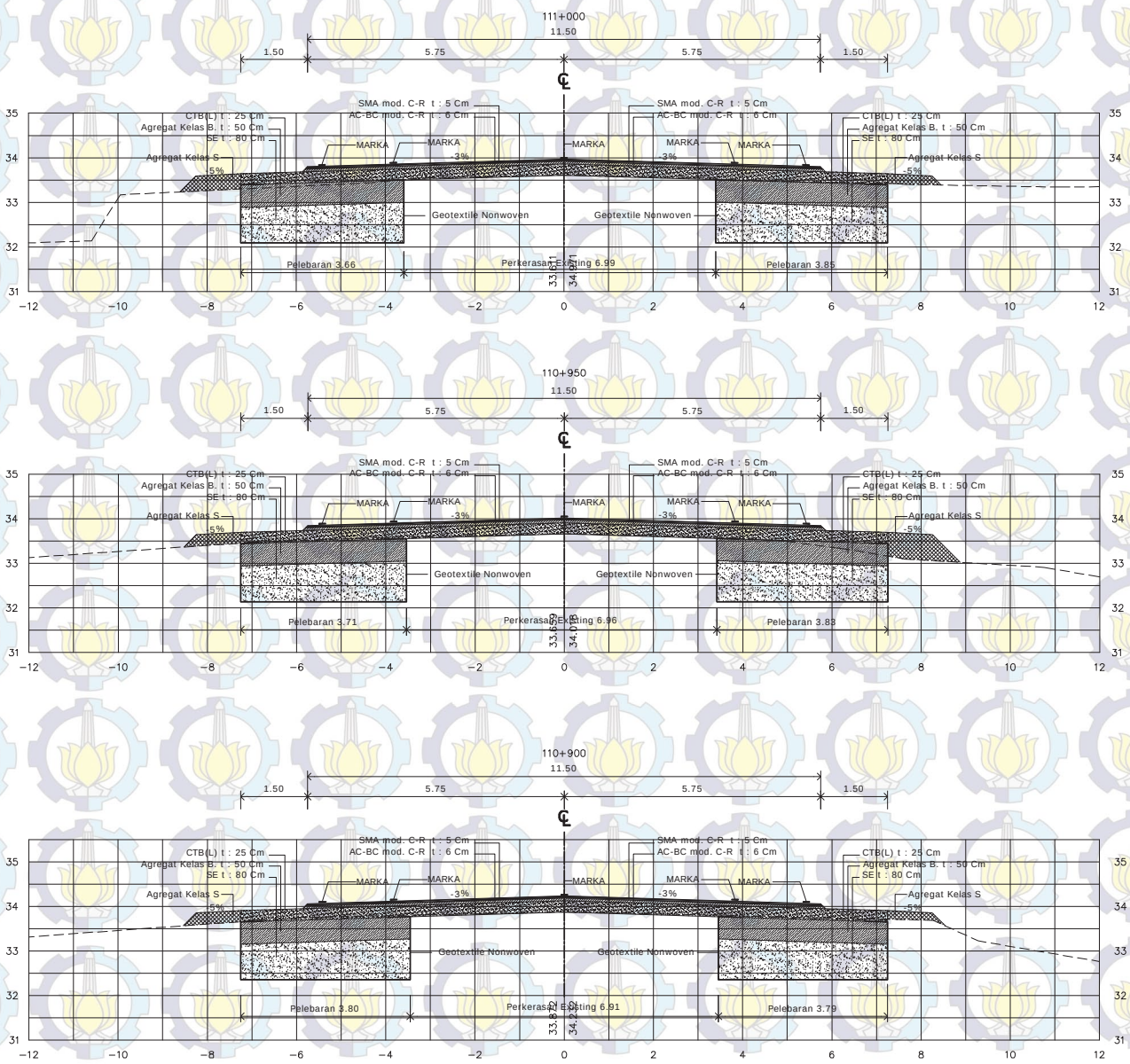
KEMENTERIAN PEKERJAAN UMUM
DIREKTORAT JENDERAL BINA MARGA
SNVT - PERENCANAAN DAN PENGAWASAN
JALAN DAN JEMBATAN JAWA TIMUR

Nama Proyek :	PEKERJAAN PERENCANAAN TEKNIK JALAN DAN JEMBATAN PROVINSI JATIM - 1
No. Paket	-
No. Link	-
Nama Paket / Link	BULU - BTS. KOTA TUBAN
Provinsi	Jawa Timur

Konsultan Perencana	PT. BUANA ARCHICON ENGINEERING - MANAGEMENT - SOCIAL DEVELOPMENT		
JOKO RESTIAWAN Juru Gambar	Ir. DIDIK SULISTYA Ahli Jalan Raya	Ir. MUKHSIN BAZEID Kepala Tim	

JUDUL GAMBAR : CROSS SECTION

No. Lembar	-
Skala	H 1:100 - V 1:100
Tanggal	-



DAFTAR PUSTAKA

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