ANEXO 1

Documentos de laboratorio ensayos y calibración.

INFORME DE VERIFICACIÓN

CA - IV - 058 - 2023

1.	**Expediente**	**0327**
2.	**Solicitante**	**G & C CONSULTORES Y CONTRATISTAS GENERALES S.A.C**
3.	**Dirección**	AV. SIMON BOLIVAR NRO. 2740 - PUNO - PUNO - PUNO.
4.	**Equipo de medición**	**RUGOSÍMETRO MERLIN**
	Marca	No indica
	Modelo	No indica
	Número de Serie	RM-01
	Identificación	NO INDICA
	Procedencia	No indica
	Alcance de Indicación	50 divisiones
	División de Escala	1 división
	Tipo de indicación	ANALOGICO
5.	**Fecha de Calibración**	**2023-03-24**

Fecha de Emisión

2023-03-30

FIRMA DIGITAL

Firmado digitalmente por: ASTETE SORIANO LUCIO FIR 42817546 hard
Motivo: Soy el autor del documento
Fecha: 01/04/2023 10:01:08-0500

CALIBRATEC S.A.C. LABORATORIO PERU

Jefe de Laboratorio

6. Método de Verificación

La calibración se realizó empleando el método de comparación directa entre los Bloques Patrones de longitud y la Cinta Métrica versus la indicación de la escala gráfica del equipo a calibrar, para verificar la relación entre medidas.

7. Lugar de Verificación

Laboratorio de análisis y ensayos de G & C CONSULTORES Y CONTRATISTAS GENERALES S.A.C. ubicado en Av. Simon Bolivar Nro. 2740 - Puno

8. Condiciones Ambientales

	Inicial	Final
Temperatura	15,2 °C	15,2 °C
Humedad Relativa	54%	54%

9. Patrones de referencia

Trazabilidad	Patrón utilizado	Certificado de calibración
INACAL	BLOQUES PATRON DE LONGITUD MARCA: INSIZE	LLA-C-053-2022
METROIL	PIE DE REY DIGITAL de 200 mm MARCA: INSIZE"	1AD-0845-2022
METROIL	TERMOHIGROMETRO DIGITAL BOECO	1AT-1704-2022

10. Observaciones

Se colocó una etiqueta autoadhesiva con la indicación de **VERIFICACIÓN**.

INFORME DE VERIFICACIÓN
CA - IV - 058 - 2023

11. Resultados

VALORES EN ELEVACIONES

VALOR PATRON (mm)	INDICACION DE LA ESCALA GRÁFICA (mm)	RELACIÓN Móvil-Pivote / Pivote-Puntero
1,0	10,0	10,0
2,0	20,0	10,0
3,0	30,0	10,0
4,0	40,0	10,0
5,0	50,0	10,0
6,0	60,0	10,0
7,0	70,0	10,0
8,0	80,0	10,0
9,0	90,0	10,0
10,0	100,0	10,0

Relación Promedio : **1 : 10**

VALORES EN DEPRESIONES

VALOR PATRON (mm)	INDICACION DE LA ESCALA GRÁFICA (mm)	RELACIÓN Móvil-Pivote / Pivote-Puntero
1,0	10,0	10,0
2,0	20,0	10,0
3,0	30,0	10,0
4,0	40,0	10,0
5,0	50,0	10,0
6,0	60,0	10,0
7,0	70,0	10,0
8,0	80,0	10,0
9,0	90,0	10,0
10,0	100,0	10,0

Relación Promedio : **1 : 10**

Posiciones	Longitud (mm)
MOVIL 1 - PIVOTE	100
PIVOTE - PUNTERO	1000,1

Nota 1.- El equipo posee una escala gráfica con divisiones de 5 mm de espesor cada una.

Nota 2.- El equipo presenta una pastilla para el F.C. del ensayo de 6,05 mm de espesor.

12. Incertidumbre

La incertidumbre reportada en el presente certificado es la incertidumbre expandida de medición que resulta de multiplicar la incertidumbre estandar por el factor de cobertura k=2, el cual proporciona un nivel de confianza de aproximadamente 95%.

La incertidumbre expandida de medición fue calculada a partir de los componentes de incertidumbre de los factores de influencia en la calibración. La incertidumbre indicada no incluye una estimación de variaciones a largo plazo.

Fin del documento

G&C GEOTECHNIK M.T.L.
G & C CONSULTORES Y CONTRATISTAS GENERALES S.A.C.
AV. SIMON BOLIVAR 2740 BR. CHANU CHANU 1 CDRA GRIFO DEL CUARTEL
PUNO - PUNO - PUNO

BOLETA DE VENTA ELECTRONICA
RUC: 20601125405
EB01-37

Fecha de Vencimiento	:	
Fecha de Emisión	:	**15/05/2023**
Señor(es)	:	**KEYLA PAMELA ALAVE ARACA**
DNI	:	**70312879**
Dirección del Cliente	:	AV. SIMON BOLIBAR 2738 URB. JOSE CARLOS MARIATEGUI A LA ALTURA DEL GRIFO DEL CUARTEL PUNO-PUNO-PUNO
Tipo de Moneda	:	**SOLES**
Observación	:	**TESIS: DETERMINAR EL NIVEL DE EFICIENCIA DEL EQUIPO BASADO EN EL SENSOR DE DISTANCIA VL53L0X PRA EL CALCULO DEL INDICE DE RUGOSIDAD INTERNACIONAL (IRI) APLICADO AL TRAMO KM 1326+000 - KM 1327+600 DE L**

Cantidad	Unidad Medida	Descripción	Valor Unitario(*)	Descuento(*)	Importe de Venta(**)	ICBPER
1.00	UNIDAD	ENSAYO DE INDICE DE RUGOSIDAD INTERNACIONAL (IRI) CON EL EQUIPO DE MERLIN	1390.00	0.00	1,640.20	0.00

Otros Cargos :	S/0.00
Otros Tributos :	S/0.00
ICBPER :	S/ 0.00
Importe Total :	S/1,640.20

SON: UN MIL SEISCIENTOS CUARENTA Y 20/100 SOLES

(*) Sin impuestos.
(**) Incluye impuestos, de ser Op. Gravada.

ATENDIDO

Op. Gravada :	S/ 1,390.00
Op. Exonerada :	S/ 0.00
Op. Inafecta :	S/ 0.00
ISC :	S/ 0.00
IGV :	S/ 250.20
ICBPER :	S/ 0.00
Otros Cargos :	S/ 0.00
Otros Tributos :	S/ 0.00
Monto de Redondeo :	S/ 0.00
Importe Total :	S/ 1,640.20

Esta es una representación impresa de la Boleta de Venta Electrónica, generada en el Sistema de la SUNAT. El Emisor Electrónico puede verificarla utilizando su clave SOL, el Adquirente o Usuario puede consultar su validez en SUNAT Virtual: www.sunat.gob.pe, en Opciones sin Clave SOL/ Consulta de Validez del CPE.

GEOPERU
Instrumentos y Servicios de Ingeniería

1091

Nº 00509

CERTIFICADO DE CALIBRACION

Otorgado A:

N°G002- 02177

UCHAMACO APAZA HEBER YONI

DATOS DEL EQUIPO:

EQUIPO	MARCA	MODELO	SERIE
NIVEL AUTOMATICO	TOPCON	AT-B4	X36277

EQUIPO DE CALIBRACION UTILIZADO Y RESULTADOS:

Equipo/Marca	Valor Leído en el Instrumento	Valor del Patrón	Precisión En 1 KM Doble de Nivelación	Error al Corregir
Set de Colimadores NCS	00 mm En Milímetros	90°00'00"	+/- 2.00 mm	00 mm en milímetros

PROCEDIMIENTO DE CALIBRACIÓN:

Por medio del cierre angular en directa y en transito enfocando al infinito a través del Colimador.

GEOPERU, a través de su Servicio Técnico **CERTIFICA** que el equipo en mención se encuentra totalmente revisados, controlados, calibrados y 100% operativos; cumpliendo con las especificaciones Técnicas de fábrica y los Estándares internacionales establecidos (DIN18723).

GEOPERU, ha registrado la Calibración en nuestro Servicio Técnico el **31 de DICIEMBRE del 2021;** sugiriéndose una recalibración en un periodo máximo de 06 meses, aproximadamente el **30 de JUNIO del 2022**.

- ***Nota: GEOPERU, no se responsabiliza por desajustes y/o descalibraciones en los equipos causados por un inadecuado transporte del mismo o mal uso por el operador.***

Fecha de emisión	Próxima Calibración:	Validez del Certificado:
31– DICIEMBRE - 2021	30 – JUNIO - 2022	6 MESES

ST.

C.I.T. PERU S.R.L. Constructora Inmobiliaria y Tecnología

AV. SOL N° 610 – CUSCO (Costado de Prefectura – Migraciones)
Correos: cusco@geoperusac.com
Telf.: (084) 265501 / 961031292 ; 970090986
www.geoperusac.com

ANEXO 2

Levantamiento Topográfico De Km 1326+000 Hasta 1327+600.

ANEXOS 2. levantamiento topográfico de km 1326+000 hasta 1327+600.

TABLA 2.1:

Levantamiento topográfico realizado en el KM 1326+000 al KM 1327+600 de la carretera PUNO - JULIACA

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1	**BM**		1.105			3817.869
2		0		3818.974	0.891	3818.083
3		0.5			0.892	3818.082
4		1			0.892	3818.082
5		1.5			0.893	3818.081
6		2			0.892	3818.082
7		2.5			0.894	3818.080
8		3			0.895	3818.079
9		3.5			0.896	3818.078
10		4			0.897	3818.077
11		4.5			0.896	3818.078
12		5			0.896	3818.078
13		5.5			0.896	3818.078
14		6			0.896	3818.078
15		6.5			0.894	3818.080
16		7			0.895	3818.079
17		7.5			0.892	3818.082
18		8			0.895	3818.079
19		8.5			0.895	3818.079
20		9			0.896	3818.078
21		9.5			0.900	3818.074
22		10			0.899	3818.075
23		10.5			0.898	3818.076
24		11			0.895	3818.079
25		11.5			0.897	3818.077
26		12			0.896	3818.078
27		12.5			0.895	3818.079
28		13			0.892	3818.082
29		13.5			0.892	3818.082

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
30		14			0.891	3818.083
31		14.5			0.890	3818.084
32		15			0.890	3818.084
33		15.5			0.891	3818.083
34		16			0.892	3818.082
35		16.5			0.895	3818.079
36		17			0.896	3818.078
37		17.5			0.897	3818.077
38		18			0.897	3818.077
39		18.5			0.896	3818.078
40		19			0.898	3818.076
41		19.5			0.899	3818.075
42		20			0.900	3818.074
43		20.5			0.904	3818.070
44		21			0.907	3818.067
45		21.5			0.908	3818.066
46		22			0.909	3818.065
47		22.5			0.909	3818.065
48		23			0.910	3818.064
49		23.5			0.911	3818.063
50		24			0.911	3818.063
51		24.5			0.913	3818.061
52		25			0.915	3818.059
53		25.5			0.918	3818.056
54		26			0.923	3818.051
55		26.5			0.921	3818.053
56		27			0.922	3818.052
57		27.5			0.922	3818.052
58		28			0.923	3818.051
59		28.5			0.925	3818.049
60		29			0.926	3818.048
61		29.5			0.927	3818.047
62		30			0.928	3818.046
63		30.5			0.929	3818.045
64		31			0.928	3818.046
65		31.5			0.929	3818.045
66		32			0.930	3818.044
67		32.5			0.931	3818.043
68		33			0.933	3818.041
69		33.5			0.935	3818.039
70		34			0.935	3818.039

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
71		34.5			0.935	3818.039
72		35			0.934	3818.040
73		35.5			0.935	3818.039
74		36			0.935	3818.039
75		36.5			0.936	3818.038
76		37			0.932	3818.042
77		37.5			0.934	3818.040
78		38			0.937	3818.037
79		38.5			0.938	3818.036
80		39			0.941	3818.033
81		39.5			0.943	3818.031
82		40			0.943	3818.031
83		40.5			0.944	3818.030
84		41			0.947	3818.027
85		41.5			0.948	3818.026
86		42			0.949	3818.025
87		42.5			0.949	3818.025
88		43			0.952	3818.022
89		43.5			0.954	3818.020
90		44			0.956	3818.018
91		44.5			0.962	3818.012
92		45			0.962	3818.012
93		45.5			0.963	3818.011
94		46			0.965	3818.009
95		46.5			0.965	3818.009
96		47			0.966	3818.008
97		47.5			0.969	3818.005
98		48			0.966	3818.008
99		48.5			0.968	3818.006
100		49			0.968	3818.006
101		49.5			0.968	3818.006
102		50			0.968	3818.006
103		50.5			0.968	3818.006
104		51			0.970	3818.004
105		51.5			0.970	3818.004
106		52			0.970	3818.004
107		52.5			0.971	3818.003
108		53			0.972	3818.002
109		53.5			0.973	3818.001
110		54			0.971	3818.003
111		54.5			0.969	3818.005

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
112		55			0.968	3818.006
113		55.5			0.968	3818.006
114		56			0.972	3818.002
115		56.5			0.972	3818.002
116		57			0.973	3818.001
117		57.5			0.975	3817.999
118		58			0.977	3817.997
119		58.5			0.981	3817.993
120		59			0.982	3817.992
121		59.5			0.984	3817.990
122		60			0.988	3817.986
123		60.5			0.987	3817.987
124		61			0.986	3817.988
125		61.5			0.987	3817.987
126		62			0.987	3817.987
127		62.5			0.989	3817.985
128		63			0.992	3817.982
129		63.5			0.994	3817.980
130		64			0.997	3817.977
131		64.5			0.997	3817.977
132		65			0.999	3817.975
133		65.5			0.999	3817.975
134		66			1.000	3817.974
135		66.5			0.997	3817.977
136		67			0.995	3817.979
137		67.5			0.999	3817.975
138		68			1.000	3817.974
139		68.5			0.999	3817.975
140		69			0.997	3817.977
141		69.5			0.997	3817.977
142		70			0.996	3817.978
143		70.5			0.995	3817.979
144		71			0.993	3817.981
145		71.5			0.992	3817.982
146		72			0.991	3817.983
147		72.5			0.992	3817.982
148		73			0.992	3817.982
149		73.5			0.990	3817.984
150		74			0.989	3817.985
151		74.5			0.988	3817.986
152		75			0.988	3817.986

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
153		75.5			0.987	3817.987
154		76			0.986	3817.988
155		76.5			0.985	3817.989
156		77			0.984	3817.990
157		77.5			0.980	3817.994
158		78			0.982	3817.992
159		78.5			0.983	3817.991
160		79			0.982	3817.992
161		79.5			0.982	3817.992
162		80			0.985	3817.989
163		80.5			0.987	3817.987
164		81			0.989	3817.985
165		81.5			0.990	3817.984
166		82			0.992	3817.982
167		82.5			0.994	3817.980
168		83			0.995	3817.979
169		83.5			0.998	3817.976
170		84			1.000	3817.974
171		84.5			1.001	3817.973
172		85			1.003	3817.971
173		85.5			1.005	3817.969
174		86			1.003	3817.971
175		86.5			1.005	3817.969
176		87			1.007	3817.967
177		87.5			1.006	3817.968
178		88			1.004	3817.970
179		88.5			1.005	3817.969
180		89			1.003	3817.971
181		89.5			1.007	3817.967
182		90			1.007	3817.967
183		90.5			1.007	3817.967
184		91			1.009	3817.965
185		91.5			1.010	3817.964
186		92			1.009	3817.965
187		92.5			1.009	3817.965
188		93			1.007	3817.967
189		93.5			1.009	3817.965
190		94			1.011	3817.963
191		94.5			1.012	3817.962
192		95			1.014	3817.960
193		95.5			1.015	3817.959

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
194		96			1.015	3817.959
195		96.5			1.014	3817.960
196		97			1.013	3817.961
197		97.5			1.013	3817.961
198		98			1.012	3817.962
199		98.5			1.011	3817.963
200		99			1.010	3817.964
201		99.5			1.010	3817.964
202	**PC1**	100	0.985	3818.948	1.011	3817.963
203		100.5			0.986	3817.962
204		101			0.989	3817.959
205		101.5			0.991	3817.957
206		102			0.990	3817.958
207		102.5			0.990	3817.958
208		103			0.989	3817.959
209		103.5			0.988	3817.960
210		104			0.987	3817.961
211		104.5			0.990	3817.958
212		105			0.992	3817.956
213		105.5			0.991	3817.957
214		106			0.993	3817.955
215		106.5			0.992	3817.956
216		107			0.989	3817.959
217		107.5			0.988	3817.960
218		108			0.987	3817.961
219		108.5			0.985	3817.963
220		109			0.984	3817.964
221		109.5			0.983	3817.965
222		110			0.982	3817.966
223		110.5			0.982	3817.966
224		111			0.984	3817.964
225		111.5			0.987	3817.961
226		112			0.986	3817.962
227		112.5			0.986	3817.962
228		113			0.987	3817.961
229		113.5			0.989	3817.959
230		114			0.990	3817.958
231		114.5			0.991	3817.957
232		115			0.993	3817.955
233		115.5			1.002	3817.946
234		116			1.003	3817.945

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
235		116.5			1.006	3817.942
236		117			1.007	3817.941
237		117.5			1.008	3817.940
238		118			1.008	3817.940
239		118.5			1.011	3817.937
240		119			1.010	3817.938
241		119.5			1.011	3817.937
242		120			1.009	3817.939
243		120.5			1.010	3817.938
244		121			1.012	3817.936
245		121.5			1.016	3817.932
246		122			1.018	3817.930
247		122.5			1.019	3817.929
248		123			1.023	3817.925
249		123.5			1.022	3817.926
250		124			1.024	3817.924
251		124.5			1.021	3817.927
252		125			1.020	3817.928
253		125.5			1.020	3817.928
254		126			1.021	3817.927
255		126.5			1.019	3817.929
256		127			1.019	3817.929
257		127.5			1.020	3817.928
258		128			1.019	3817.929
259		128.5			1.021	3817.927
260		129			1.022	3817.926
261		129.5			1.021	3817.927
262		130			1.023	3817.925
263		130.5			1.025	3817.923
264		131			1.026	3817.922
265		131.5			1.028	3817.920
266		132			1.027	3817.921
267		132.5			1.028	3817.920
268		133			1.029	3817.919
269		133.5			1.031	3817.917
270		134			1.031	3817.917
271		134.5			1.033	3817.915
272		135			1.036	3817.912
273		135.5			1.039	3817.909
274		136			1.040	3817.908
275		136.5			1.038	3817.910

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
276		137			1.036	3817.912
277		137.5			1.036	3817.912
278		138			1.037	3817.911
279		138.5			1.039	3817.909
280		139			1.038	3817.910
281		139.5			1.039	3817.909
282		140			1.043	3817.905
283		140.5			1.041	3817.907
284		141			1.041	3817.907
285		141.5			1.043	3817.905
286		142			1.042	3817.906
287		142.5			1.043	3817.905
288		143			1.044	3817.904
289		143.5			1.042	3817.906
290		144			1.041	3817.907
291		144.5			1.038	3817.910
292		145			1.036	3817.912
293		145.5			1.039	3817.909
294		146			1.039	3817.909
295		146.5			1.037	3817.911
296		147			1.036	3817.912
297		147.5			1.035	3817.913
298		148			1.034	3817.914
299		148.5			1.034	3817.914
300		149			1.037	3817.911
301		149.5			1.036	3817.912
302		150			1.037	3817.911
303		150.5			1.038	3817.910
304		151			1.039	3817.909
305		151.5			1.042	3817.906
306		152			1.041	3817.907
307		152.5			1.042	3817.906
308		153			1.044	3817.904
309		153.5			1.045	3817.903
310		154			1.048	3817.900
311		154.5			1.049	3817.899
312		155			1.052	3817.896
313		155.5			1.052	3817.896
314		156			1.054	3817.894
315		156.5			1.052	3817.896
316		157			1.054	3817.894

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
317		157.5			1.054	3817.894
318		158			1.055	3817.893
319		158.5			1.057	3817.891
320		159			1.059	3817.889
321		159.5			1.059	3817.889
322		160			1.060	3817.888
323		160.5			1.061	3817.887
324		161			1.059	3817.889
325		161.5			1.061	3817.887
326		162			1.062	3817.886
327		162.5			1.062	3817.886
328		163			1.061	3817.887
329		163.5			1.059	3817.889
330		164			1.058	3817.890
331		164.5			1.057	3817.891
332		165			1.056	3817.892
333		165.5			1.057	3817.891
334		166			1.055	3817.893
335		166.5			1.053	3817.895
336		167			1.052	3817.896
337		167.5			1.054	3817.894
338		168			1.053	3817.895
339		168.5			1.052	3817.896
340		169			1.052	3817.896
341		169.5			1.054	3817.894
342		170			1.055	3817.893
343		170.5			1.054	3817.894
344		171			1.054	3817.894
345		171.5			1.051	3817.897
346		172			1.050	3817.898
347		172.5			1.052	3817.896
348		173			1.054	3817.894
349		173.5			1.056	3817.892
350		174			1.058	3817.890
351		174.5			1.060	3817.888
352		175			1.062	3817.886
353		175.5			1.063	3817.885
354		176			1.066	3817.882
355		176.5			1.068	3817.880
356		177			1.070	3817.878
357		177.5			1.071	3817.877

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
358		178			1.072	3817.876
359		178.5			1.073	3817.875
360		179			1.075	3817.873
361		179.5			1.077	3817.871
362		180			1.081	3817.867
363		180.5			1.083	3817.865
364		181			1.084	3817.864
365		181.5			1.086	3817.862
366		182			1.087	3817.861
367		182.5			1.089	3817.859
368		183			1.090	3817.858
369		183.5			1.093	3817.855
370		184			1.095	3817.853
371		184.5			1.096	3817.852
372		185			1.098	3817.850
373		185.5			1.099	3817.849
374		186			1.099	3817.849
375		186.5			1.100	3817.848
376		187			1.102	3817.846
377		187.5			1.101	3817.847
378		188			1.101	3817.847
379		188.5			1.104	3817.844
380		189			1.107	3817.841
381		189.5			1.108	3817.840
382		190			1.109	3817.839
383		190.5			1.109	3817.839
384		191			1.111	3817.837
385		191.5			1.112	3817.836
386		192			1.111	3817.837
387		192.5			1.108	3817.840
388		193			1.107	3817.841
389		193.5			1.104	3817.844
390		194			1.107	3817.841
391		194.5			1.105	3817.843
392		195			1.100	3817.848
393		195.5			1.100	3817.848
394		196			1.101	3817.847
395		196.5			1.101	3817.847
396		197			1.100	3817.848
397		197.5			1.100	3817.848
398		198			1.099	3817.849

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
399		198.5			1.099	3817.849
400		199			1.098	3817.850
401		199.5			1.096	3817.852
402	**PC2**	200	0.967	3818.821	1.094	3817.854
403		200.5			0.970	3817.851
404		201			0.969	3817.852
405		201.5			0.967	3817.854
406		202			0.969	3817.852
407		202.5			0.971	3817.850
408		203			0.974	3817.847
409		203.5			0.976	3817.845
410		204			0.981	3817.840
411		204.5			0.983	3817.838
412		205			0.985	3817.836
413		205.5			0.984	3817.837
414		206			0.986	3817.835
415		206.5			0.987	3817.834
416		207			0.988	3817.833
417		207.5			0.989	3817.832
418		208			0.990	3817.831
419		208.5			0.992	3817.829
420		209			0.994	3817.827
421		209.5			0.996	3817.825
422		210			0.995	3817.826
423		210.5			0.996	3817.825
424		211			0.998	3817.823
425		211.5			0.999	3817.822
426		212			1.000	3817.821
427		212.5			1.001	3817.820
428		213			1.001	3817.820
429		213.5			1.000	3817.821
430		214			1.000	3817.821
431		214.5			0.999	3817.822
432		215			0.998	3817.823
433		215.5			0.998	3817.823
434		216			0.992	3817.829
435		216.5			0.988	3817.833
436		217			0.989	3817.832
437		217.5			0.989	3817.832
438		218			0.991	3817.830
439		218.5			0.992	3817.829

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
440		219			0.993	3817.828
441		219.5			0.991	3817.830
442		220			0.989	3817.832
443		220.5			0.992	3817.829
444		221			0.992	3817.829
445		221.5			0.992	3817.829
446		222			0.994	3817.827
447		222.5			0.994	3817.827
448		223			0.994	3817.827
449		223.5			0.991	3817.830
450		224			0.993	3817.828
451		224.5			0.994	3817.827
452		225			0.995	3817.826
453		225.5			0.996	3817.825
454		226			0.997	3817.824
455		226.5			0.997	3817.824
456		227			0.998	3817.823
457		227.5			0.999	3817.822
458		228			1.001	3817.820
459		228.5			1.003	3817.818
460		229			1.007	3817.814
461		229.5			1.006	3817.815
462		230			1.008	3817.813
463		230.5			1.009	3817.812
464		231			1.006	3817.815
465		231.5			1.003	3817.818
466		232			1.003	3817.818
467		232.5			1.007	3817.814
468		233			1.008	3817.813
469		233.5			1.008	3817.813
470		234			1.009	3817.812
471		234.5			1.011	3817.810
472		235			1.013	3817.808
473		235.5			1.017	3817.804
474		236			1.014	3817.807
475		236.5			1.016	3817.805
476		237			1.018	3817.803
477		237.5			1.018	3817.803
478		238			1.019	3817.802
479		238.5			1.021	3817.800
480		239			1.020	3817.801

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
481		239.5			1.019	3817.802
482		240			1.017	3817.804
483		240.5			1.018	3817.803
484		241			1.017	3817.804
485		241.5			1.016	3817.805
486		242			1.017	3817.804
487		242.5			1.015	3817.806
488		243			1.016	3817.805
489		243.5			1.017	3817.804
490		244			1.016	3817.805
491		244.5			1.016	3817.805
492		245			1.015	3817.806
493		245.5			1.016	3817.805
494		246			1.017	3817.804
495		246.5			1.014	3817.807
496		247			1.017	3817.804
497		247.5			1.016	3817.805
498		248			1.011	3817.810
499		248.5			1.010	3817.811
500		249			1.008	3817.813
501		249.5			1.006	3817.815
502		250			1.005	3817.816
503		250.5			1.004	3817.817
504		251			1.003	3817.818
505		251.5			1.001	3817.820
506		252			1.003	3817.818
507		252.5			1.001	3817.820
508		253			1.000	3817.821
509		253.5			1.001	3817.820
510		254			1.002	3817.819
511		254.5			1.005	3817.816
512		255			1.007	3817.814
513		255.5			1.008	3817.813
514		256			1.010	3817.811
515		256.5			1.012	3817.809
516		257			1.014	3817.807
517		257.5			1.013	3817.808
518		258			1.014	3817.807
519		258.5			1.015	3817.806
520		259			1.016	3817.805
521		259.5			1.018	3817.803

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
522		260			1.018	3817.803
523		260.5			1.018	3817.803
524		261			1.017	3817.804
525		261.5			1.018	3817.803
526		262			1.020	3817.801
527		262.5			1.020	3817.801
528		263			1.022	3817.799
529		263.5			1.021	3817.800
530		264			1.022	3817.799
531		264.5			1.022	3817.799
532		265			1.023	3817.798
533		265.5			1.022	3817.799
534		266			1.021	3817.800
535		266.5			1.020	3817.801
536		267			1.019	3817.802
537		267.5			1.018	3817.803
538		268			1.017	3817.804
539		268.5			1.016	3817.805
540		269			1.015	3817.806
541		269.5			1.015	3817.806
542		270			1.015	3817.806
543		270.5			1.018	3817.803
544		271			1.017	3817.804
545		271.5			1.018	3817.803
546		272			1.019	3817.802
547		272.5			1.017	3817.804
548		273			1.018	3817.803
549		273.5			1.020	3817.801
550		274			1.022	3817.799
551		274.5			1.021	3817.800
552		275			1.023	3817.798
553		275.5			1.022	3817.799
554		276			1.026	3817.795
555		276.5			1.023	3817.798
556		277			1.021	3817.800
557		277.5			1.021	3817.800
558		278			1.019	3817.802
559		278.5			1.017	3817.804
560		279			1.014	3817.807
561		279.5			1.011	3817.810
562		280			1.009	3817.812

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
563		280.5			1.010	3817.811
564		281			1.012	3817.809
565		281.5			1.011	3817.810
566		282			1.010	3817.811
567		282.5			1.009	3817.812
568		283			1.010	3817.811
569		283.5			1.008	3817.813
570		284			1.009	3817.812
571		284.5			1.007	3817.814
572		285			1.008	3817.813
573		285.5			1.006	3817.815
574		286			1.005	3817.816
575		286.5			1.009	3817.812
576		287			1.009	3817.812
577		287.5			1.014	3817.807
578		288			1.017	3817.804
579		288.5			1.016	3817.805
580		289			1.014	3817.807
581		289.5			1.015	3817.806
582		290			1.020	3817.801
583		290.5			1.018	3817.803
584		291			1.021	3817.800
585		291.5			1.020	3817.801
586		292			1.021	3817.800
587		292.5			1.022	3817.799
588		293			1.021	3817.800
589		293.5			1.024	3817.797
590		294			1.023	3817.798
591		294.5			1.026	3817.795
592		295			1.021	3817.800
593		295.5			1.024	3817.797
594		296			1.023	3817.798
595		296.5			1.022	3817.799
596		297			1.024	3817.797
597		297.5			1.026	3817.795
598		298			1.027	3817.794
599		298.5			1.027	3817.794
600		299			1.029	3817.792
601		299.5			1.030	3817.791
602	**PC3**	300	1.089	3818.883	1.027	3817.794
603		300.5			1.089	3817.794

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
604		301			1.090	3817.793
605		301.5			1.092	3817.791
606		302			1.093	3817.790
607		302.5			1.093	3817.790
608		303			1.095	3817.788
609		303.5			1.095	3817.788
610		304			1.092	3817.791
611		304.5			1.090	3817.793
612		305			1.091	3817.792
613		305.5			1.090	3817.793
614		306			1.088	3817.795
615		306.5			1.092	3817.791
616		307			1.097	3817.786
617		307.5			1.100	3817.783
618		308			1.105	3817.778
619		308.5			1.108	3817.775
620		309			1.111	3817.772
621		309.5			1.113	3817.770
622		310			1.116	3817.767
623		310.5			1.118	3817.765
624		311			1.117	3817.766
625		311.5			1.117	3817.766
626		312			1.112	3817.771
627		312.5			1.114	3817.769
628		313			1.110	3817.773
629		313.5			1.107	3817.776
630		314			1.105	3817.778
631		314.5			1.103	3817.780
632		315			1.100	3817.783
633		315.5			1.098	3817.785
634		316			1.099	3817.784
635		316.5			1.095	3817.788
636		317			1.093	3817.790
637		317.5			1.092	3817.791
638		318			1.091	3817.792
639		318.5			1.092	3817.791
640		319			1.090	3817.793
641		319.5			1.088	3817.795
642		320			1.089	3817.794
643		320.5			1.090	3817.793
644		321			1.092	3817.791

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
645		321.5			1.094	3817.789
646		322			1.095	3817.788
647		322.5			1.097	3817.786
648		323			1.100	3817.783
649		323.5			1.100	3817.783
650		324			1.101	3817.782
651		324.5			1.100	3817.783
652		325			1.101	3817.782
653		325.5			1.100	3817.783
654		326			1.101	3817.782
655		326.5			1.103	3817.780
656		327			1.102	3817.781
657		327.5			1.101	3817.782
658		328			1.100	3817.783
659		328.5			1.099	3817.784
660		329			1.097	3817.786
661		329.5			1.096	3817.787
662		330			1.093	3817.790
663		330.5			1.095	3817.788
664		331			1.095	3817.788
665		331.5			1.096	3817.787
666		332			1.094	3817.789
667		332.5			1.093	3817.790
668		333			1.093	3817.790
669		333.5			1.092	3817.791
670		334			1.091	3817.792
671		334.5			1.091	3817.792
672		335			1.091	3817.792
673		335.5			1.090	3817.793
674		336			1.090	3817.793
675		336.5			1.091	3817.792
676		337			1.089	3817.794
677		337.5			1.088	3817.795
678		338			1.087	3817.796
679		338.5			1.088	3817.795
680		339			1.089	3817.794
681		339.5			1.088	3817.795
682		340			1.090	3817.793
683		340.5			1.092	3817.791
684		341			1.088	3817.795
685		341.5			1.090	3817.793

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
686		342			1.091	3817.792
687		342.5			1.092	3817.791
688		343			1.087	3817.796
689		343.5			1.089	3817.794
690		344			1.092	3817.791
691		344.5			1.093	3817.790
692		345			1.094	3817.789
693		345.5			1.095	3817.788
694		346			1.094	3817.789
695		346.5			1.094	3817.789
696		347			1.096	3817.787
697		347.5			1.095	3817.788
698		348			1.093	3817.790
699		348.5			1.090	3817.793
700		349			1.091	3817.792
701		349.5			1.090	3817.793
702		350			1.090	3817.793
703		350.5			1.085	3817.798
704		351			1.085	3817.798
705		351.5			1.086	3817.797
706		352			1.091	3817.792
707		352.5			1.093	3817.790
708		353			1.092	3817.791
709		353.5			1.091	3817.792
710		354			1.091	3817.792
711		354.5			1.092	3817.791
712		355			1.091	3817.792
713		355.5			1.091	3817.792
714		356			1.091	3817.792
715		356.5			1.090	3817.793
716		357			1.088	3817.795
717		357.5			1.089	3817.794
718		358			1.096	3817.787
719		358.5			1.096	3817.787
720		359			1.094	3817.789
721		359.5			1.098	3817.785
722		360			1.097	3817.786
723		360.5			1.096	3817.787
724		361			1.094	3817.789
725		361.5			1.098	3817.785
726		362			1.097	3817.786

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
727		362.5			1.100	3817.783
728		363			1.101	3817.782
729		363.5			1.102	3817.781
730		364			1.102	3817.781
731		364.5			1.100	3817.783
732		365			1.098	3817.785
733		365.5			1.099	3817.784
734		366			1.098	3817.785
735		366.5			1.097	3817.786
736		367			1.098	3817.785
737		367.5			1.100	3817.783
738		368			1.103	3817.780
739		368.5			1.106	3817.777
740		369			1.108	3817.775
741		369.5			1.110	3817.773
742		370			1.110	3817.773
743		370.5			1.112	3817.771
744		371			1.114	3817.769
745		371.5			1.116	3817.767
746		372			1.117	3817.766
747		372.5			1.118	3817.765
748		373			1.118	3817.765
749		373.5			1.117	3817.766
750		374			1.117	3817.766
751		374.5			1.115	3817.768
752		375			1.112	3817.771
753		375.5			1.112	3817.771
754		376			1.113	3817.770
755		376.5			1.112	3817.771
756		377			1.117	3817.766
757		377.5			1.116	3817.767
758		378			1.115	3817.768
759		378.5			1.118	3817.765
760		379			1.119	3817.764
761		379.5			1.121	3817.762
762		380			1.122	3817.761
763		380.5			1.122	3817.761
764		381			1.119	3817.764
765		381.5			1.121	3817.762
766		382			1.120	3817.763
767		382.5			1.123	3817.760

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
768		383			1.125	3817.758
769		383.5			1.124	3817.759
770		384			1.125	3817.758
771		384.5			1.124	3817.759
772		385			1.126	3817.757
773		385.5			1.126	3817.757
774		386			1.127	3817.756
775		386.5			1.128	3817.755
776		387			1.128	3817.755
777		387.5			1.126	3817.757
778		388			1.128	3817.755
779		388.5			1.127	3817.756
780		389			1.129	3817.754
781		389.5			1.129	3817.754
782		390			1.130	3817.753
783		390.5			1.131	3817.752
784		391			1.128	3817.755
785		391.5			1.127	3817.756
786		392			1.126	3817.757
787		392.5			1.125	3817.758
788		393			1.130	3817.753
789		393.5			1.129	3817.754
790		394			1.131	3817.752
791		394.5			1.128	3817.755
792		395			1.129	3817.754
793		395.5			1.128	3817.755
794		396			1.128	3817.755
795		396.5			1.127	3817.756
796		397			1.130	3817.753
797		397.5			1.131	3817.752
798		398			1.130	3817.753
799		398.5			1.129	3817.754
800		399			1.129	3817.754
801		399.5			1.130	3817.753
802	**PC4**	400	1.151	3818.904	1.130	3817.753
803		400.5			1.151	3817.753
804		401			1.151	3817.753
805		401.5			1.152	3817.752
806		402			1.152	3817.752
807		402.5			1.152	3817.752
808		403			1.151	3817.753

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
809		403.5			1.151	3817.753
810		404			1.152	3817.752
811		404.5			1.153	3817.751
812		405			1.154	3817.750
813		405.5			1.155	3817.749
814		406			1.155	3817.749
815		406.5			1.156	3817.748
816		407			1.154	3817.750
817		407.5			1.153	3817.751
818		408			1.150	3817.754
819		408.5			1.148	3817.756
820		409			1.147	3817.757
821		409.5			1.145	3817.759
822		410			1.146	3817.758
823		410.5			1.148	3817.756
824		411			1.148	3817.756
825		411.5			1.148	3817.756
826		412			1.147	3817.757
827		412.5			1.147	3817.757
828		413			1.146	3817.758
829		413.5			1.145	3817.759
830		414			1.145	3817.759
831		414.5			1.145	3817.759
832		415			1.144	3817.760
833		415.5			1.144	3817.760
834		416			1.147	3817.757
835		416.5			1.149	3817.755
836		417			1.147	3817.757
837		417.5			1.145	3817.759
838		418			1.145	3817.759
839		418.5			1.144	3817.760
840		419			1.148	3817.756
841		419.5			1.153	3817.751
842		420			1.157	3817.747
843		420.5			1.160	3817.744
844		421			1.164	3817.740
845		421.5			1.167	3817.737
846		422			1.169	3817.735
847		422.5			1.172	3817.732
848		423			1.173	3817.731
849		423.5			1.175	3817.729

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
850		424			1.177	3817.727
851		424.5			1.179	3817.725
852		425			1.178	3817.726
853		425.5			1.178	3817.726
854		426			1.177	3817.727
855		426.5			1.177	3817.727
856		427			1.176	3817.728
857		427.5			1.175	3817.729
858		428			1.175	3817.729
859		428.5			1.174	3817.730
860		429			1.175	3817.729
861		429.5			1.176	3817.728
862		430			1.176	3817.728
863		430.5			1.177	3817.727
864		431			1.175	3817.729
865		431.5			1.174	3817.730
866		432			1.174	3817.730
867		432.5			1.174	3817.730
868		433			1.173	3817.731
869		433.5			1.173	3817.731
870		434			1.175	3817.729
871		434.5			1.177	3817.727
872		435			1.178	3817.726
873		435.5			1.179	3817.725
874		436			1.180	3817.724
875		436.5			1.181	3817.723
876		437			1.177	3817.727
877		437.5			1.175	3817.729
878		438			1.176	3817.728
879		438.5			1.178	3817.726
880		439			1.180	3817.724
881		439.5			1.181	3817.723
882		440			1.180	3817.724
883		440.5			1.179	3817.725
884		441			1.178	3817.726
885		441.5			1.177	3817.727
886		442			1.177	3817.727
887		442.5			1.176	3817.728
888		443			1.176	3817.728
889		443.5			1.176	3817.728
890		444			1.176	3817.728

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
891		444.5			1.176	3817.728
892		445			1.177	3817.727
893		445.5			1.177	3817.727
894		446			1.178	3817.726
895		446.5			1.180	3817.724
896		447			1.181	3817.723
897		447.5			1.183	3817.721
898		448			1.187	3817.717
899		448.5			1.191	3817.713
900		449			1.192	3817.712
901		449.5			1.193	3817.711
902		450			1.197	3817.707
903		450.5			1.200	3817.704
904		451			1.203	3817.701
905		451.5			1.205	3817.699
906		452			1.204	3817.700
907		452.5			1.204	3817.700
908		453			1.207	3817.697
909		453.5			1.209	3817.695
910		454			1.211	3817.693
911		454.5			1.214	3817.690
912		455			1.213	3817.691
913		455.5			1.213	3817.691
914		456			1.212	3817.692
915		456.5			1.211	3817.693
916		457			1.213	3817.691
917		457.5			1.214	3817.690
918		458			1.215	3817.689
919		458.5			1.216	3817.688
920		459			1.215	3817.689
921		459.5			1.214	3817.690
922		460			1.214	3817.690
923		460.5			1.214	3817.690
924		461			1.218	3817.686
925		461.5			1.219	3817.685
926		462			1.220	3817.684
927		462.5			1.222	3817.682
928		463			1.223	3817.681
929		463.5			1.225	3817.679
930		464			1.224	3817.680
931		464.5			1.223	3817.681

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
932		465			1.224	3817.680
933		465.5			1.224	3817.680
934		466			1.224	3817.680
935		466.5			1.225	3817.679
936		467			1.225	3817.679
937		467.5			1.226	3817.678
938		468			1.227	3817.677
939		468.5			1.228	3817.676
940		469			1.229	3817.675
941		469.5			1.230	3817.674
942		470			1.232	3817.672
943		470.5			1.234	3817.670
944		471			1.238	3817.666
945		471.5			1.241	3817.663
946		472			1.242	3817.662
947		472.5			1.244	3817.660
948		473			1.249	3817.655
949		473.5			1.251	3817.653
950		474			1.253	3817.651
951		474.5			1.254	3817.650
952		475			1.256	3817.648
953		475.5			1.258	3817.646
954		476			1.259	3817.645
955		476.5			1.259	3817.645
956		477			1.260	3817.644
957		477.5			1.260	3817.644
958		478			1.261	3817.643
959		478.5			1.261	3817.643
960		479			1.260	3817.644
961		479.5			1.258	3817.646
962		480			1.260	3817.644
963		480.5			1.261	3817.643
964		481			1.260	3817.644
965		481.5			1.258	3817.646
966		482			1.259	3817.645
967		482.5			1.259	3817.645
968		483			1.258	3817.646
969		483.5			1.258	3817.646
970		484			1.259	3817.645
971		484.5			1.260	3817.644
972		485			1.261	3817.643

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
973		485.5			1.262	3817.642
974		486			1.260	3817.644
975		486.5			1.259	3817.645
976		487			1.261	3817.643
977		487.5			1.263	3817.641
978		488			1.262	3817.642
979		488.5			1.262	3817.642
980		489			1.262	3817.642
981		489.5			1.263	3817.641
982		490			1.262	3817.642
983		490.5			1.262	3817.642
984		491			1.264	3817.640
985		491.5			1.266	3817.638
986		492			1.266	3817.638
987		492.5			1.267	3817.637
988		493			1.267	3817.637
989		493.5			1.267	3817.637
990		494			1.268	3817.636
991		494.5			1.269	3817.635
992		495			1.270	3817.634
993		495.5			1.271	3817.633
994		496			1.272	3817.632
995		496.5			1.274	3817.630
996		497			1.274	3817.630
997		497.5			1.275	3817.629
998		498			1.277	3817.627
999		498.5			1.278	3817.626
1000		499			1.278	3817.626
1001		499.5			1.278	3817.626
1002	**PC5**	500	1.145	3818.771	1.278	3817.626
1003		500.5			1.143	3817.628
1004		501			1.142	3817.629
1005		501.5			1.140	3817.631
1006		502			1.138	3817.633
1007		502.5			1.136	3817.635
1008		503			1.134	3817.637
1009		503.5			1.133	3817.638
1010		504			1.131	3817.640
1011		504.5			1.129	3817.642
1012		505			1.130	3817.641
1013		505.5			1.131	3817.640

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1014		506			1.132	3817.639
1015		506.5			1.130	3817.641
1016		507			1.128	3817.643
1017		507.5			1.132	3817.639
1018		508			1.134	3817.637
1019		508.5			1.135	3817.636
1020		509			1.134	3817.637
1021		509.5			1.134	3817.637
1022		510			1.134	3817.637
1023		510.5			1.133	3817.638
1024		511			1.133	3817.638
1025		511.5			1.134	3817.637
1026		512			1.135	3817.636
1027		512.5			1.136	3817.635
1028		513			1.137	3817.634
1029		513.5			1.138	3817.633
1030		514			1.140	3817.631
1031		514.5			1.142	3817.629
1032		515			1.144	3817.627
1033		515.5			1.147	3817.624
1034		516			1.148	3817.623
1035		516.5			1.150	3817.621
1036		517			1.152	3817.619
1037		517.5			1.153	3817.618
1038		518			1.155	3817.616
1039		518.5			1.157	3817.614
1040		519			1.159	3817.612
1041		519.5			1.160	3817.611
1042		520			1.162	3817.609
1043		520.5			1.163	3817.608
1044		521			1.163	3817.608
1045		521.5			1.161	3817.610
1046		522			1.162	3817.609
1047		522.5			1.162	3817.609
1048		523			1.161	3817.610
1049		523.5			1.162	3817.609
1050		524			1.162	3817.609
1051		524.5			1.162	3817.609
1052		525			1.161	3817.610
1053		525.5			1.160	3817.611
1054		526			1.157	3817.614

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1055		526.5			1.152	3817.619
1056		527			1.152	3817.619
1057		527.5			1.153	3817.618
1058		528			1.154	3817.617
1059		528.5			1.156	3817.615
1060		529			1.157	3817.614
1061		529.5			1.158	3817.613
1062		530			1.159	3817.612
1063		530.5			1.160	3817.611
1064		531			1.162	3817.609
1065		531.5			1.163	3817.608
1066		532			1.162	3817.609
1067		532.5			1.162	3817.609
1068		533			1.160	3817.611
1069		533.5			1.159	3817.612
1070		534			1.160	3817.611
1071		534.5			1.160	3817.611
1072		535			1.159	3817.612
1073		535.5			1.158	3817.613
1074		536			1.158	3817.613
1075		536.5			1.157	3817.614
1076		537			1.156	3817.615
1077		537.5			1.155	3817.616
1078		538			1.155	3817.616
1079		538.5			1.154	3817.617
1080		539			1.153	3817.618
1081		539.5			1.152	3817.619
1082		540			1.153	3817.618
1083		540.5			1.153	3817.618
1084		541			1.152	3817.619
1085		541.5			1.152	3817.619
1086		542			1.152	3817.619
1087		542.5			1.152	3817.619
1088		543			1.151	3817.620
1089		543.5			1.150	3817.621
1090		544			1.150	3817.621
1091		544.5			1.150	3817.621
1092		545			1.150	3817.621
1093		545.5			1.151	3817.620
1094		546			1.149	3817.622
1095		546.5			1.147	3817.624

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1096		547			1.145	3817.626
1097		547.5			1.143	3817.628
1098		548			1.143	3817.628
1099		548.5			1.142	3817.629
1100		549			1.140	3817.631
1101		549.5			1.139	3817.632
1102		550			1.137	3817.634
1103		550.5			1.134	3817.637
1104		551			1.135	3817.636
1105		551.5			1.135	3817.636
1106		552			1.135	3817.636
1107		552.5			1.134	3817.637
1108		553			1.134	3817.637
1109		553.5			1.134	3817.637
1110		554			1.134	3817.637
1111		554.5			1.133	3817.638
1112		555			1.133	3817.638
1113		555.5			1.133	3817.638
1114		556			1.131	3817.640
1115		556.5			1.129	3817.642
1116		557			1.129	3817.642
1117		557.5			1.128	3817.643
1118		558			1.126	3817.645
1119		558.5			1.124	3817.647
1120		559			1.123	3817.648
1121		559.5			1.122	3817.649
1122		560			1.121	3817.650
1123		560.5			1.121	3817.650
1124		561			1.121	3817.650
1125		561.5			1.121	3817.650
1126		562			1.119	3817.652
1127		562.5			1.117	3817.654
1128		563			1.115	3817.656
1129		563.5			1.113	3817.658
1130		564			1.115	3817.656
1131		564.5			1.119	3817.652
1132		565			1.120	3817.651
1133		565.5			1.120	3817.651
1134		566			1.122	3817.649
1135		566.5			1.124	3817.647
1136		567			1.125	3817.646

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1137		567.5			1.126	3817.645
1138		568			1.126	3817.645
1139		568.5			1.127	3817.644
1140		569			1.126	3817.645
1141		569.5			1.125	3817.646
1142		570			1.125	3817.646
1143		570.5			1.125	3817.646
1144		571			1.125	3817.646
1145		571.5			1.126	3817.645
1146		572			1.127	3817.644
1147		572.5			1.128	3817.643
1148		573			1.128	3817.643
1149		573.5			1.128	3817.643
1150		574			1.128	3817.643
1151		574.5			1.129	3817.642
1152		575			1.128	3817.643
1153		575.5			1.128	3817.643
1154		576			1.129	3817.642
1155		576.5			1.130	3817.641
1156		577			1.131	3817.640
1157		577.5			1.132	3817.639
1158		578			1.131	3817.640
1159		578.5			1.131	3817.640
1160		579			1.131	3817.640
1161		579.5			1.132	3817.639
1162		580			1.132	3817.639
1163		580.5			1.133	3817.638
1164		581			1.134	3817.637
1165		581.5			1.135	3817.636
1166		582			1.134	3817.637
1167		582.5			1.132	3817.639
1168		583			1.131	3817.640
1169		583.5			1.130	3817.641
1170		584			1.129	3817.642
1171		584.5			1.128	3817.643
1172		585			1.126	3817.645
1173		585.5			1.125	3817.646
1174		586			1.126	3817.645
1175		586.5			1.127	3817.644
1176		587			1.128	3817.643
1177		587.5			1.130	3817.641

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1178		588			1.128	3817.643
1179		588.5			1.125	3817.646
1180		589			1.126	3817.645
1181		589.5			1.127	3817.644
1182		590			1.128	3817.643
1183		590.5			1.130	3817.641
1184		591			1.131	3817.640
1185		591.5			1.132	3817.639
1186		592			1.134	3817.637
1187		592.5			1.136	3817.635
1188		593			1.137	3817.634
1189		593.5			1.138	3817.633
1190		594			1.139	3817.632
1191		594.5			1.140	3817.631
1192		595			1.141	3817.630
1193		595.5			1.142	3817.629
1194		596			1.142	3817.629
1195		596.5			1.143	3817.628
1196		597			1.142	3817.629
1197		597.5			1.141	3817.630
1198		598			1.141	3817.630
1199		598.5			1.142	3817.629
1200		599			1.141	3817.630
1201		599.5			1.139	3817.632
1202	**PC6**	600	1.172	3818.803	1.140	3817.631
1203		600.5			1.170	3817.633
1204		601			1.170	3817.633
1205		601.5			1.169	3817.634
1206		602			1.169	3817.634
1207		602.5			1.168	3817.635
1208		603			1.168	3817.635
1209		603.5			1.167	3817.636
1210		604			1.167	3817.636
1211		604.5			1.167	3817.636
1212		605			1.167	3817.636
1213		605.5			1.167	3817.636
1214		606			1.167	3817.636
1215		606.5			1.166	3817.637
1216		607			1.166	3817.637
1217		607.5			1.165	3817.638
1218		608			1.163	3817.640

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1219		608.5			1.161	3817.642
1220		609			1.162	3817.641
1221		609.5			1.163	3817.640
1222		610			1.165	3817.638
1223		610.5			1.166	3817.637
1224		611			1.166	3817.637
1225		611.5			1.167	3817.636
1226		612			1.169	3817.634
1227		612.5			1.170	3817.633
1228		613			1.171	3817.632
1229		613.5			1.172	3817.631
1230		614			1.173	3817.630
1231		614.5			1.175	3817.628
1232		615			1.177	3817.626
1233		615.5			1.180	3817.623
1234		616			1.180	3817.623
1235		616.5			1.181	3817.622
1236		617			1.181	3817.622
1237		617.5			1.182	3817.621
1238		618			1.181	3817.622
1239		618.5			1.179	3817.624
1240		619			1.176	3817.627
1241		619.5			1.173	3817.630
1242		620			1.171	3817.632
1243		620.5			1.169	3817.634
1244		621			1.167	3817.636
1245		621.5			1.166	3817.637
1246		622			1.165	3817.638
1247		622.5			1.164	3817.639
1248		623			1.163	3817.640
1249		623.5			1.162	3817.641
1250		624			1.161	3817.642
1251		624.5			1.159	3817.644
1252		625			1.156	3817.647
1253		625.5			1.152	3817.651
1254		626			1.152	3817.651
1255		626.5			1.151	3817.652
1256		627			1.151	3817.652
1257		627.5			1.150	3817.653
1258		628			1.150	3817.653
1259		628.5			1.151	3817.652

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1260		629			1.152	3817.651
1261		629.5			1.154	3817.649
1262		630			1.156	3817.647
1263		630.5			1.158	3817.645
1264		631			1.160	3817.643
1265		631.5			1.162	3817.641
1266		632			1.163	3817.640
1267		632.5			1.165	3817.638
1268		633			1.165	3817.638
1269		633.5			1.166	3817.637
1270		634			1.165	3817.638
1271		634.5			1.164	3817.639
1272		635			1.164	3817.639
1273		635.5			1.163	3817.640
1274		636			1.163	3817.640
1275		636.5			1.162	3817.641
1276		637			1.161	3817.642
1277		637.5			1.161	3817.642
1278		638			1.160	3817.643
1279		638.5			1.158	3817.645
1280		639			1.159	3817.644
1281		639.5			1.159	3817.644
1282		640			1.160	3817.643
1283		640.5			1.162	3817.641
1284		641			1.165	3817.638
1285		641.5			1.167	3817.636
1286		642			1.170	3817.633
1287		642.5			1.172	3817.631
1288		643			1.173	3817.630
1289		643.5			1.175	3817.628
1290		644			1.174	3817.629
1291		644.5			1.174	3817.629
1292		645			1.174	3817.629
1293		645.5			1.174	3817.629
1294		646			1.174	3817.629
1295		646.5			1.173	3817.630
1296		647			1.173	3817.630
1297		647.5			1.173	3817.630
1298		648			1.171	3817.632
1299		648.5			1.169	3817.634
1300		649			1.167	3817.636

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1301		649.5			1.166	3817.637
1302		650			1.164	3817.639
1303		650.5			1.162	3817.641
1304		651			1.161	3817.642
1305		651.5			1.160	3817.643
1306		652			1.159	3817.644
1307		652.5			1.157	3817.646
1308		653			1.157	3817.646
1309		653.5			1.157	3817.646
1310		654			1.156	3817.647
1311		654.5			1.155	3817.648
1312		655			1.153	3817.650
1313		655.5			1.151	3817.652
1314		656			1.151	3817.652
1315		656.5			1.152	3817.651
1316		657			1.153	3817.650
1317		657.5			1.154	3817.649
1318		658			1.154	3817.649
1319		658.5			1.154	3817.649
1320		659			1.153	3817.650
1321		659.5			1.152	3817.651
1322		660			1.155	3817.648
1323		660.5			1.157	3817.646
1324		661			1.158	3817.645
1325		661.5			1.159	3817.644
1326		662			1.160	3817.643
1327		662.5			1.162	3817.641
1328		663			1.164	3817.639
1329		663.5			1.165	3817.638
1330		664			1.168	3817.635
1331		664.5			1.172	3817.631
1332		665			1.172	3817.631
1333		665.5			1.173	3817.630
1334		666			1.175	3817.628
1335		666.5			1.178	3817.625
1336		667			1.178	3817.625
1337		667.5			1.179	3817.624
1338		668			1.180	3817.623
1339		668.5			1.182	3817.621
1340		669			1.183	3817.620
1341		669.5			1.184	3817.619

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1342		670			1.184	3817.619
1343		670.5			1.185	3817.618
1344		671			1.186	3817.617
1345		671.5			1.188	3817.615
1346		672			1.188	3817.615
1347		672.5			1.189	3817.614
1348		673			1.190	3817.613
1349		673.5			1.191	3817.612
1350		674			1.191	3817.612
1351		674.5			1.192	3817.611
1352		675			1.191	3817.612
1353		675.5			1.189	3817.614
1354		676			1.188	3817.615
1355		676.5			1.187	3817.616
1356		677			1.187	3817.616
1357		677.5			1.188	3817.615
1358		678			1.187	3817.616
1359		678.5			1.186	3817.617
1360		679			1.186	3817.617
1361		679.5			1.185	3817.618
1362		680			1.186	3817.617
1363		680.5			1.186	3817.617
1364		681			1.187	3817.616
1365		681.5			1.187	3817.616
1366		682			1.185	3817.618
1367		682.5			1.184	3817.619
1368		683			1.183	3817.620
1369		683.5			1.182	3817.621
1370		684			1.181	3817.622
1371		684.5			1.180	3817.623
1372		685			1.178	3817.625
1373		685.5			1.175	3817.628
1374		686			1.175	3817.628
1375		686.5			1.174	3817.629
1376		687			1.178	3817.625
1377		687.5			1.181	3817.622
1378		688			1.181	3817.622
1379		688.5			1.182	3817.621
1380		689			1.182	3817.621
1381		689.5			1.182	3817.621
1382		690			1.183	3817.620

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1383		690.5			1.184	3817.619
1384		691			1.184	3817.619
1385		691.5			1.183	3817.620
1386		692			1.184	3817.619
1387		692.5			1.186	3817.617
1388		693			1.187	3817.616
1389		693.5			1.188	3817.615
1390		694			1.188	3817.615
1391		694.5			1.189	3817.614
1392		695			1.189	3817.614
1393		695.5			1.189	3817.614
1394		696			1.187	3817.616
1395		696.5			1.186	3817.617
1396		697			1.187	3817.616
1397		697.5			1.188	3817.615
1398		698			1.186	3817.617
1399		698.5			1.185	3817.618
1400		699			1.187	3817.616
1401		699.5			1.188	3817.615
1402	**PC7**	700	1.242	3818.860	1.185	3817.618
1403		700.5			1.245	3817.615
1404		701			1.245	3817.615
1405		701.5			1.245	3817.615
1406		702			1.246	3817.614
1407		702.5			1.245	3817.615
1408		703			1.243	3817.617
1409		703.5			1.243	3817.617
1410		704			1.242	3817.618
1411		704.5			1.242	3817.618
1412		705			1.241	3817.619
1413		705.5			1.240	3817.620
1414		706			1.238	3817.622
1415		706.5			1.238	3817.622
1416		707			1.238	3817.622
1417		707.5			1.237	3817.623
1418		708			1.236	3817.624
1419		708.5			1.235	3817.625
1420		709			1.233	3817.627
1421		709.5			1.231	3817.629
1422		710			1.230	3817.630
1423		710.5			1.229	3817.631

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1424		711			1.228	3817.632
1425		711.5			1.227	3817.633
1426		712			1.225	3817.635
1427		712.5			1.225	3817.635
1428		713			1.224	3817.636
1429		713.5			1.225	3817.635
1430		714			1.225	3817.635
1431		714.5			1.225	3817.635
1432		715			1.224	3817.636
1433		715.5			1.225	3817.635
1434		716			1.225	3817.635
1435		716.5			1.224	3817.636
1436		717			1.223	3817.637
1437		717.5			1.224	3817.636
1438		718			1.224	3817.636
1439		718.5			1.224	3817.636
1440		719			1.223	3817.637
1441		719.5			1.223	3817.637
1442		720			1.222	3817.638
1443		720.5			1.224	3817.636
1444		721			1.226	3817.634
1445		721.5			1.227	3817.633
1446		722			1.228	3817.632
1447		722.5			1.228	3817.632
1448		723			1.229	3817.631
1449		723.5			1.229	3817.631
1450		724			1.230	3817.630
1451		724.5			1.232	3817.628
1452		725			1.235	3817.625
1453		725.5			1.236	3817.624
1454		726			1.238	3817.622
1455		726.5			1.239	3817.621
1456		727			1.241	3817.619
1457		727.5			1.240	3817.620
1458		728			1.239	3817.621
1459		728.5			1.237	3817.623
1460		729			1.235	3817.625
1461		729.5			1.230	3817.630
1462		730			1.228	3817.632
1463		730.5			1.228	3817.632
1464		731			1.227	3817.633

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1465		731.5			1.228	3817.632
1466		732			1.229	3817.631
1467		732.5			1.228	3817.632
1468		733			1.228	3817.632
1469		733.5			1.227	3817.633
1470		734			1.225	3817.635
1471		734.5			1.224	3817.636
1472		735			1.222	3817.638
1473		735.5			1.220	3817.640
1474		736			1.219	3817.641
1475		736.5			1.217	3817.643
1476		737			1.215	3817.645
1477		737.5			1.215	3817.645
1478		738			1.216	3817.644
1479		738.5			1.216	3817.644
1480		739			1.215	3817.645
1481		739.5			1.218	3817.642
1482		740			1.219	3817.641
1483		740.5			1.219	3817.641
1484		741			1.220	3817.640
1485		741.5			1.221	3817.639
1486		742			1.222	3817.638
1487		742.5			1.221	3817.639
1488		743			1.221	3817.639
1489		743.5			1.220	3817.640
1490		744			1.218	3817.642
1491		744.5			1.218	3817.642
1492		745			1.217	3817.643
1493		745.5			1.216	3817.644
1494		746			1.214	3817.646
1495		746.5			1.211	3817.649
1496		747			1.209	3817.651
1497		747.5			1.209	3817.651
1498		748			1.208	3817.652
1499		748.5			1.207	3817.653
1500		749			1.205	3817.655
1501		749.5			1.204	3817.656
1502		750			1.203	3817.657
1503		750.5			1.201	3817.659
1504		751			1.199	3817.661
1505		751.5			1.198	3817.662

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1506		752			1.196	3817.664
1507		752.5			1.194	3817.666
1508		753			1.192	3817.668
1509		753.5			1.191	3817.669
1510		754			1.190	3817.670
1511		754.5			1.189	3817.671
1512		755			1.188	3817.672
1513		755.5			1.188	3817.672
1514		756			1.187	3817.673
1515		756.5			1.188	3817.672
1516		757			1.188	3817.672
1517		757.5			1.188	3817.672
1518		758			1.188	3817.672
1519		758.5			1.190	3817.670
1520		759			1.192	3817.668
1521		759.5			1.192	3817.668
1522		760			1.193	3817.667
1523		760.5			1.194	3817.666
1524		761			1.196	3817.664
1525		761.5			1.197	3817.663
1526		762			1.198	3817.662
1527		762.5			1.199	3817.661
1528		763			1.201	3817.659
1529		763.5			1.201	3817.659
1530		764			1.202	3817.658
1531		764.5			1.201	3817.659
1532		765			1.201	3817.659
1533		765.5			1.203	3817.657
1534		766			1.205	3817.655
1535		766.5			1.203	3817.657
1536		767			1.202	3817.658
1537		767.5			1.200	3817.660
1538		768			1.198	3817.662
1539		768.5			1.198	3817.662
1540		769			1.199	3817.661
1541		769.5			1.199	3817.661
1542		770			1.200	3817.660
1543		770.5			1.200	3817.660
1544		771			1.201	3817.659
1545		771.5			1.200	3817.660
1546		772			1.200	3817.660

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1547		772.5			1.200	3817.660
1548		773			1.200	3817.660
1549		773.5			1.200	3817.660
1550		774			1.201	3817.659
1551		774.5			1.202	3817.658
1552		775			1.203	3817.657
1553		775.5			1.204	3817.656
1554		776			1.206	3817.654
1555		776.5			1.206	3817.654
1556		777			1.207	3817.653
1557		777.5			1.207	3817.653
1558		778			1.208	3817.652
1559		778.5			1.207	3817.653
1560		779			1.206	3817.654
1561		779.5			1.207	3817.653
1562		780			1.207	3817.653
1563		780.5			1.205	3817.655
1564		781			1.204	3817.656
1565		781.5			1.203	3817.657
1566		782			1.202	3817.658
1567		782.5			1.202	3817.658
1568		783			1.201	3817.659
1569		783.5			1.201	3817.659
1570		784			1.201	3817.659
1571		784.5			1.200	3817.660
1572		785			1.200	3817.660
1573		785.5			1.200	3817.660
1574		786			1.199	3817.661
1575		786.5			1.200	3817.660
1576		787			1.201	3817.659
1577		787.5			1.201	3817.659
1578		788			1.202	3817.658
1579		788.5			1.202	3817.658
1580		789			1.203	3817.657
1581		789.5			1.204	3817.656
1582		790			1.205	3817.655
1583		790.5			1.205	3817.655
1584		791			1.205	3817.655
1585		791.5			1.206	3817.654
1586		792			1.207	3817.653
1587		792.5			1.208	3817.652

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1588		793			1.208	3817.652
1589		793.5			1.210	3817.650
1590		794			1.212	3817.648
1591		794.5			1.211	3817.649
1592		795			1.211	3817.649
1593		795.5			1.211	3817.649
1594		796			1.210	3817.650
1595		796.5			1.211	3817.649
1596		797			1.211	3817.649
1597		797.5			1.211	3817.649
1598		798			1.211	3817.649
1599		798.5			1.212	3817.648
1600		799			1.213	3817.647
1601		799.5			1.213	3817.647
1602	**PC8**	800	0.975	3818.622	1.213	3817.647
1603		800.5			0.976	3817.646
1604		801			0.977	3817.645
1605		801.5			0.978	3817.644
1606		802			0.978	3817.644
1607		802.5			0.979	3817.643
1608		803			0.980	3817.642
1609		803.5			0.981	3817.641
1610		804			0.982	3817.640
1611		804.5			0.983	3817.639
1612		805			0.985	3817.637
1613		805.5			0.984	3817.638
1614		806			0.984	3817.638
1615		806.5			0.985	3817.637
1616		807			0.985	3817.637
1617		807.5			0.985	3817.637
1618		808			0.985	3817.637
1619		808.5			0.984	3817.638
1620		809			0.984	3817.638
1621		809.5			0.985	3817.637
1622		810			0.985	3817.637
1623		810.5			0.986	3817.636
1624		811			0.987	3817.635
1625		811.5			0.988	3817.634
1626		812			0.990	3817.632
1627		812.5			0.990	3817.632
1628		813			0.991	3817.631

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1629		813.5			0.991	3817.631
1630		814			0.991	3817.631
1631		814.5			0.991	3817.631
1632		815			0.992	3817.630
1633		815.5			0.992	3817.630
1634		816			0.993	3817.629
1635		816.5			0.993	3817.629
1636		817			0.994	3817.628
1637		817.5			0.994	3817.628
1638		818			0.994	3817.628
1639		818.5			0.995	3817.627
1640		819			0.995	3817.627
1641		819.5			0.996	3817.626
1642		820			0.997	3817.625
1643		820.5			0.998	3817.624
1644		821			0.999	3817.623
1645		821.5			1.001	3817.621
1646		822			1.004	3817.618
1647		822.5			1.008	3817.614
1648		823			1.010	3817.612
1649		823.5			1.011	3817.611
1650		824			1.013	3817.609
1651		824.5			1.015	3817.607
1652		825			1.018	3817.604
1653		825.5			1.018	3817.604
1654		826			1.019	3817.603
1655		826.5			1.018	3817.604
1656		827			1.017	3817.605
1657		827.5			1.019	3817.603
1658		828			1.023	3817.599
1659		828.5			1.027	3817.595
1660		829			1.029	3817.593
1661		829.5			1.028	3817.594
1662		830			1.030	3817.592
1663		830.5			1.033	3817.589
1664		831			1.035	3817.587
1665		831.5			1.036	3817.586
1666		832			1.037	3817.585
1667		832.5			1.039	3817.583
1668		833			1.040	3817.582
1669		833.5			1.041	3817.581

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1670		834			1.043	3817.579
1671		834.5			1.045	3817.577
1672		835			1.048	3817.574
1673		835.5			1.049	3817.573
1674		836			1.050	3817.572
1675		836.5			1.051	3817.571
1676		837			1.052	3817.570
1677		837.5			1.060	3817.562
1678		838			1.061	3817.561
1679		838.5			1.059	3817.563
1680		839			1.058	3817.564
1681		839.5			1.060	3817.562
1682		840			1.059	3817.563
1683		840.5			1.060	3817.562
1684		841			1.061	3817.561
1685		841.5			1.061	3817.561
1686		842			1.062	3817.560
1687		842.5			1.063	3817.559
1688		843			1.064	3817.558
1689		843.5			1.065	3817.557
1690		844			1.067	3817.555
1691		844.5			1.068	3817.554
1692		845			1.069	3817.553
1693		845.5			1.070	3817.552
1694		846			1.071	3817.551
1695		846.5			1.073	3817.549
1696		847			1.074	3817.548
1697		847.5			1.075	3817.547
1698		848			1.076	3817.546
1699		848.5			1.077	3817.545
1700		849			1.079	3817.543
1701		849.5			1.081	3817.541
1702		850			1.079	3817.543
1703		850.5			1.083	3817.539
1704		851			1.084	3817.538
1705		851.5			1.085	3817.537
1706		852			1.087	3817.535
1707		852.5			1.083	3817.539
1708		853			1.090	3817.532
1709		853.5			1.091	3817.531
1710		854			1.092	3817.530

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1711		854.5			1.094	3817.528
1712		855			1.098	3817.524
1713		855.5			1.096	3817.526
1714		856			1.098	3817.524
1715		856.5			1.099	3817.523
1716		857			1.101	3817.521
1717		857.5			1.103	3817.519
1718		858			1.105	3817.517
1719		858.5			1.109	3817.513
1720		859			1.113	3817.509
1721		859.5			1.115	3817.507
1722		860			1.119	3817.503
1723		860.5			1.118	3817.504
1724		861			1.119	3817.503
1725		861.5			1.120	3817.502
1726		862			1.121	3817.501
1727		862.5			1.120	3817.502
1728		863			1.121	3817.501
1729		863.5			1.122	3817.500
1730		864			1.123	3817.499
1731		864.5			1.124	3817.498
1732		865			1.124	3817.498
1733		865.5			1.124	3817.498
1734		866			1.125	3817.497
1735		866.5			1.125	3817.497
1736		867			1.126	3817.496
1737		867.5			1.127	3817.495
1738		868			1.127	3817.495
1739		868.5			1.128	3817.494
1740		869			1.128	3817.494
1741		869.5			1.129	3817.493
1742		870			1.129	3817.493
1743		870.5			1.130	3817.492
1744		871			1.131	3817.491
1745		871.5			1.131	3817.491
1746		872			1.132	3817.490
1747		872.5			1.132	3817.490
1748		873			1.133	3817.489
1749		873.5			1.133	3817.489
1750		874			1.133	3817.489
1751		874.5			1.133	3817.489

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1752		875			1.134	3817.488
1753		875.5			1.137	3817.485
1754		876			1.139	3817.483
1755		876.5			1.141	3817.481
1756		877			1.142	3817.480
1757		877.5			1.144	3817.478
1758		878			1.146	3817.476
1759		878.5			1.147	3817.475
1760		879			1.148	3817.474
1761		879.5			1.149	3817.473
1762		880			1.150	3817.472
1763		880.5			1.151	3817.471
1764		881			1.151	3817.471
1765		881.5			1.152	3817.470
1766		882			1.152	3817.470
1767		882.5			1.152	3817.470
1768		883			1.149	3817.473
1769		883.5			1.148	3817.474
1770		884			1.147	3817.475
1771		884.5			1.148	3817.474
1772		885			1.147	3817.475
1773		885.5			1.150	3817.472
1774		886			1.153	3817.469
1775		886.5			1.157	3817.465
1776		887			1.157	3817.465
1777		887.5			1.158	3817.464
1778		888			1.158	3817.464
1779		888.5			1.159	3817.463
1780		889			1.160	3817.462
1781		889.5			1.160	3817.462
1782		890			1.161	3817.461
1783		890.5			1.160	3817.462
1784		891			1.161	3817.461
1785		891.5			1.161	3817.461
1786		892			1.161	3817.461
1787		892.5			1.160	3817.462
1788		893			1.160	3817.462
1789		893.5			1.161	3817.461
1790		894			1.161	3817.461
1791		894.5			1.161	3817.461
1792		895			1.162	3817.460

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1793		895.5			1.164	3817.458
1794		896			1.166	3817.456
1795		896.5			1.168	3817.454
1796		897			1.170	3817.452
1797		897.5			1.172	3817.450
1798		898			1.174	3817.448
1799		898.5			1.176	3817.446
1800		899			1.178	3817.444
1801		899.5			1.180	3817.442
1802	**PC9**	900	1.085	3818.525	1.182	3817.440
1803		900.5			1.085	3817.440
1804		901			1.085	3817.440
1805		901.5			1.084	3817.441
1806		902			1.084	3817.441
1807		902.5			1.084	3817.441
1808		903			1.083	3817.442
1809		903.5			1.083	3817.442
1810		904			1.084	3817.441
1811		904.5			1.083	3817.442
1812		905			1.082	3817.443
1813		905.5			1.085	3817.440
1814		906			1.087	3817.438
1815		906.5			1.089	3817.436
1816		907			1.090	3817.435
1817		907.5			1.091	3817.434
1818		908			1.092	3817.433
1819		908.5			1.093	3817.432
1820		909			1.095	3817.430
1821		909.5			1.096	3817.429
1822		910			1.097	3817.428
1823		910.5			1.096	3817.429
1824		911			1.095	3817.430
1825		911.5			1.095	3817.430
1826		912			1.094	3817.431
1827		912.5			1.094	3817.431
1828		913			1.094	3817.431
1829		913.5			1.094	3817.431
1830		914			1.093	3817.432
1831		914.5			1.093	3817.432
1832		915			1.092	3817.433
1833		915.5			1.093	3817.432

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1834		916			1.094	3817.431
1835		916.5			1.094	3817.431
1836		917			1.095	3817.430
1837		917.5			1.094	3817.431
1838		918			1.094	3817.431
1839		918.5			1.094	3817.431
1840		919			1.094	3817.431
1841		919.5			1.095	3817.430
1842		920			1.095	3817.430
1843		920.5			1.094	3817.431
1844		921			1.092	3817.433
1845		921.5			1.090	3817.435
1846		922			1.088	3817.437
1847		922.5			1.087	3817.438
1848		923			1.085	3817.440
1849		923.5			1.082	3817.443
1850		924			1.080	3817.445
1851		924.5			1.077	3817.448
1852		925			1.075	3817.450
1853		925.5			1.078	3817.447
1854		926			1.080	3817.445
1855		926.5			1.081	3817.444
1856		927			1.082	3817.443
1857		927.5			1.084	3817.441
1858		928			1.085	3817.440
1859		928.5			1.086	3817.439
1860		929			1.087	3817.438
1861		929.5			1.088	3817.437
1862		930			1.090	3817.435
1863		930.5			1.089	3817.436
1864		931			1.089	3817.436
1865		931.5			1.088	3817.437
1866		932			1.087	3817.438
1867		932.5			1.087	3817.438
1868		933			1.088	3817.437
1869		933.5			1.089	3817.436
1870		934			1.088	3817.437
1871		934.5			1.088	3817.437
1872		935			1.088	3817.437
1873		935.5			1.087	3817.438
1874		936			1.087	3817.438

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1875		936.5			1.086	3817.439
1876		937			1.085	3817.440
1877		937.5			1.085	3817.440
1878		938			1.084	3817.441
1879		938.5			1.083	3817.442
1880		939			1.082	3817.443
1881		939.5			1.082	3817.443
1882		940			1.082	3817.443
1883		940.5			1.084	3817.441
1884		941			1.085	3817.440
1885		941.5			1.087	3817.438
1886		942			1.089	3817.436
1887		942.5			1.091	3817.434
1888		943			1.093	3817.432
1889		943.5			1.095	3817.430
1890		944			1.097	3817.428
1891		944.5			1.099	3817.426
1892		945			1.102	3817.423
1893		945.5			1.101	3817.424
1894		946			1.101	3817.424
1895		946.5			1.102	3817.423
1896		947			1.103	3817.422
1897		947.5			1.103	3817.422
1898		948			1.104	3817.421
1899		948.5			1.104	3817.421
1900		949			1.105	3817.420
1901		949.5			1.105	3817.420
1902		950			1.106	3817.419
1903		950.5			1.108	3817.417
1904		951			1.110	3817.415
1905		951.5			1.113	3817.412
1906		952			1.116	3817.409
1907		952.5			1.118	3817.407
1908		953			1.119	3817.406
1909		953.5			1.121	3817.404
1910		954			1.121	3817.404
1911		954.5			1.122	3817.403
1912		955			1.123	3817.402
1913		955.5			1.122	3817.403
1914		956			1.122	3817.403
1915		956.5			1.121	3817.404

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1916		957			1.121	3817.404
1917		957.5			1.122	3817.403
1918		958			1.121	3817.404
1919		958.5			1.120	3817.405
1920		959			1.119	3817.406
1921		959.5			1.119	3817.406
1922		960			1.118	3817.407
1923		960.5			1.117	3817.408
1924		961			1.116	3817.409
1925		961.5			1.115	3817.410
1926		962			1.113	3817.412
1927		962.5			1.112	3817.413
1928		963			1.111	3817.414
1929		963.5			1.110	3817.415
1930		964			1.109	3817.416
1931		964.5			1.109	3817.416
1932		965			1.108	3817.417
1933		965.5			1.105	3817.420
1934		966			1.103	3817.422
1935		966.5			1.100	3817.425
1936		967			1.098	3817.427
1937		967.5			1.095	3817.430
1938		968			1.092	3817.433
1939		968.5			1.089	3817.436
1940		969			1.086	3817.439
1941		969.5			1.083	3817.442
1942		970			1.080	3817.445
1943		970.5			1.083	3817.442
1944		971			1.086	3817.439
1945		971.5			1.089	3817.436
1946		972			1.092	3817.433
1947		972.5			1.096	3817.429
1948		973			1.099	3817.426
1949		973.5			1.102	3817.423
1950		974			1.108	3817.417
1951		974.5			1.112	3817.413
1952		975			1.117	3817.408
1953		975.5			1.118	3817.407
1954		976			1.119	3817.406
1955		976.5			1.120	3817.405
1956		977			1.121	3817.404

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1957		977.5			1.122	3817.403
1958		978			1.124	3817.401
1959		978.5			1.125	3817.400
1960		979			1.126	3817.399
1961		979.5			1.127	3817.398
1962		980			1.128	3817.397
1963		980.5			1.130	3817.395
1964		981			1.132	3817.393
1965		981.5			1.134	3817.391
1966		982			1.136	3817.389
1967		982.5			1.138	3817.387
1968		983			1.140	3817.385
1969		983.5			1.142	3817.383
1970		984			1.144	3817.381
1971		984.5			1.146	3817.379
1972		985			1.149	3817.376
1973		985.5			1.148	3817.377
1974		986			1.150	3817.375
1975		986.5			1.151	3817.374
1976		987			1.152	3817.373
1977		987.5			1.153	3817.372
1978		988			1.154	3817.371
1979		988.5			1.155	3817.370
1980		989			1.156	3817.369
1981		989.5			1.157	3817.368
1982		990			1.158	3817.367
1983		990.5			1.159	3817.366
1984		991			1.160	3817.365
1985		991.5			1.161	3817.364
1986		992			1.162	3817.363
1987		992.5			1.163	3817.362
1988		993			1.164	3817.361
1989		993.5			1.165	3817.360
1990		994			1.166	3817.359
1991		994.5			1.167	3817.358
1992		995			1.169	3817.356
1993		995.5			1.168	3817.357
1994		996			1.168	3817.357
1995		996.5			1.167	3817.358
1996		997			1.166	3817.359
1997		997.5			1.166	3817.359

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
1998		998			1.167	3817.358
1999		998.5			1.166	3817.359
2000		999			1.166	3817.359
2001		999.5			1.165	3817.360
2002	**PC10**	1000	1.01	3818.370	1.165	3817.360
2003		1000.5			1.011	3817.359
2004		1001			1.012	3817.358
2005		1001.5			1.013	3817.357
2006		1002			1.015	3817.355
2007		1002.5			1.016	3817.354
2008		1003			1.017	3817.353
2009		1003.5			1.018	3817.352
2010		1004			1.019	3817.351
2011		1004.5			1.020	3817.350
2012		1005			1.021	3817.349
2013		1005.5			1.020	3817.350
2014		1006			1.021	3817.349
2015		1006.5			1.021	3817.349
2016		1007			1.020	3817.350
2017		1007.5			1.021	3817.349
2018		1008			1.020	3817.350
2019		1008.5			1.021	3817.349
2020		1009			1.022	3817.348
2021		1009.5			1.022	3817.348
2022		1010			1.022	3817.348
2023		1010.5			1.021	3817.349
2024		1011			1.021	3817.349
2025		1011.5			1.020	3817.350
2026		1012			1.020	3817.350
2027		1012.5			1.019	3817.351
2028		1013			1.018	3817.352
2029		1013.5			1.017	3817.353
2030		1014			1.016	3817.354
2031		1014.5			1.016	3817.354
2032		1015			1.015	3817.355
2033		1015.5			1.015	3817.355
2034		1016			1.016	3817.354
2035		1016.5			1.017	3817.353
2036		1017			1.017	3817.353
2037		1017.5			1.017	3817.353
2038		1018			1.018	3817.352

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2039		1018.5			1.018	3817.352
2040		1019			1.018	3817.352
2041		1019.5			1.019	3817.351
2042		1020			1.019	3817.351
2043		1020.5			1.018	3817.352
2044		1021			1.019	3817.351
2045		1021.5			1.019	3817.351
2046		1022			1.019	3817.351
2047		1022.5			1.018	3817.352
2048		1023			1.018	3817.352
2049		1023.5			1.018	3817.352
2050		1024			1.019	3817.351
2051		1024.5			1.019	3817.351
2052		1025			1.019	3817.351
2053		1025.5			1.018	3817.352
2054		1026			1.017	3817.353
2055		1026.5			1.018	3817.352
2056		1027			1.018	3817.352
2057		1027.5			1.017	3817.353
2058		1028			1.017	3817.353
2059		1028.5			1.017	3817.353
2060		1029			1.016	3817.354
2061		1029.5			1.016	3817.354
2062		1030			1.016	3817.354
2063		1030.5			1.016	3817.354
2064		1031			1.017	3817.353
2065		1031.5			1.017	3817.353
2066		1032			1.017	3817.353
2067		1032.5			1.018	3817.352
2068		1033			1.018	3817.352
2069		1033.5			1.018	3817.352
2070		1034			1.018	3817.352
2071		1034.5			1.019	3817.351
2072		1035			1.019	3817.351
2073		1035.5			1.020	3817.350
2074		1036			1.021	3817.349
2075		1036.5			1.022	3817.348
2076		1037			1.018	3817.352
2077		1037.5			1.017	3817.353
2078		1038			1.018	3817.352
2079		1038.5			1.020	3817.350

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2080		1039			1.022	3817.348
2081		1039.5			1.024	3817.346
2082		1040			1.026	3817.344
2083		1040.5			1.030	3817.340
2084		1041			1.031	3817.339
2085		1041.5			1.031	3817.339
2086		1042			1.032	3817.338
2087		1042.5			1.033	3817.337
2088		1043			1.033	3817.337
2089		1043.5			1.034	3817.336
2090		1044			1.035	3817.335
2091		1044.5			1.035	3817.335
2092		1045			1.036	3817.334
2093		1045.5			1.037	3817.333
2094		1046			1.038	3817.332
2095		1046.5			1.038	3817.332
2096		1047			1.039	3817.331
2097		1047.5			1.039	3817.331
2098		1048			1.040	3817.330
2099		1048.5			1.040	3817.330
2100		1049			1.041	3817.329
2101		1049.5			1.042	3817.328
2102		1050			1.043	3817.327
2103		1050.5			1.045	3817.325
2104		1051			1.047	3817.323
2105		1051.5			1.050	3817.320
2106		1052			1.053	3817.317
2107		1052.5			1.056	3817.314
2108		1053			1.057	3817.313
2109		1053.5			1.060	3817.310
2110		1054			1.062	3817.308
2111		1054.5			1.065	3817.305
2112		1055			1.068	3817.302
2113		1055.5			1.067	3817.303
2114		1056			1.069	3817.301
2115		1056.5			1.070	3817.300
2116		1057			1.071	3817.299
2117		1057.5			1.072	3817.298
2118		1058			1.073	3817.297
2119		1058.5			1.074	3817.296
2120		1059			1.075	3817.295

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2121		1059.5			1.076	3817.294
2122		1060			1.077	3817.293
2123		1060.5			1.077	3817.293
2124		1061			1.076	3817.294
2125		1061.5			1.075	3817.295
2126		1062			1.075	3817.295
2127		1062.5			1.076	3817.294
2128		1063			1.076	3817.294
2129		1063.5			1.077	3817.293
2130		1064			1.076	3817.294
2131		1064.5			1.076	3817.294
2132		1065			1.075	3817.295
2133		1065.5			1.077	3817.293
2134		1066			1.077	3817.293
2135		1066.5			1.077	3817.293
2136		1067			1.078	3817.292
2137		1067.5			1.079	3817.291
2138		1068			1.080	3817.290
2139		1068.5			1.080	3817.290
2140		1069			1.081	3817.289
2141		1069.5			1.081	3817.289
2142		1070			1.082	3817.288
2143		1070.5			1.083	3817.287
2144		1071			1.084	3817.286
2145		1071.5			1.086	3817.284
2146		1072			1.089	3817.281
2147		1072.5			1.090	3817.280
2148		1073			1.092	3817.278
2149		1073.5			1.093	3817.277
2150		1074			1.095	3817.275
2151		1074.5			1.097	3817.273
2152		1075			1.099	3817.271
2153		1075.5			1.098	3817.272
2154		1076			1.099	3817.271
2155		1076.5			1.100	3817.270
2156		1077			1.101	3817.269
2157		1077.5			1.102	3817.268
2158		1078			1.103	3817.267
2159		1078.5			1.105	3817.265
2160		1079			1.106	3817.264
2161		1079.5			1.107	3817.263

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2162		1080			1.108	3817.262
2163		1080.5			1.107	3817.263
2164		1081			1.107	3817.263
2165		1081.5			1.108	3817.262
2166		1082			1.108	3817.262
2167		1082.5			1.109	3817.261
2168		1083			1.109	3817.261
2169		1083.5			1.108	3817.262
2170		1084			1.109	3817.261
2171		1084.5			1.110	3817.260
2172		1085			1.110	3817.260
2173		1085.5			1.111	3817.259
2174		1086			1.111	3817.259
2175		1086.5			1.112	3817.258
2176		1087			1.112	3817.258
2177		1087.5			1.113	3817.257
2178		1088			1.114	3817.256
2179		1088.5			1.114	3817.256
2180		1089			1.114	3817.256
2181		1089.5			1.115	3817.255
2182		1090			1.115	3817.255
2183		1090.5			1.118	3817.252
2184		1091			1.120	3817.250
2185		1091.5			1.121	3817.249
2186		1092			1.122	3817.248
2187		1092.5			1.122	3817.248
2188		1093			1.122	3817.248
2189		1093.5			1.123	3817.247
2190		1094			1.123	3817.247
2191		1094.5			1.124	3817.246
2192		1095			1.125	3817.245
2193		1095.5			1.126	3817.244
2194		1096			1.128	3817.242
2195		1096.5			1.130	3817.240
2196		1097			1.133	3817.237
2197		1097.5			1.134	3817.236
2198		1098			1.137	3817.233
2199		1098.5			1.139	3817.231
2200		1099			1.141	3817.229
2201		1099.5			1.142	3817.228
2202	**PC11**	1100	0.848	3818.075	1.143	3817.227

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2203		1100.5			0.848	3817.227
2204		1101			0.849	3817.226
2205		1101.5			0.850	3817.225
2206		1102			0.847	3817.228
2207		1102.5			0.846	3817.229
2208		1103			0.845	3817.230
2209		1103.5			0.847	3817.228
2210		1104			0.850	3817.225
2211		1104.5			0.855	3817.220
2212		1105			0.858	3817.217
2213		1105.5			0.859	3817.216
2214		1106			0.860	3817.215
2215		1106.5			0.861	3817.214
2216		1107			0.862	3817.213
2217		1107.5			0.863	3817.212
2218		1108			0.864	3817.211
2219		1108.5			0.865	3817.210
2220		1109			0.866	3817.209
2221		1109.5			0.867	3817.208
2222		1110			0.868	3817.207
2223		1110.5			0.868	3817.207
2224		1111			0.869	3817.206
2225		1111.5			0.869	3817.206
2226		1112			0.868	3817.207
2227		1112.5			0.869	3817.206
2228		1113			0.870	3817.205
2229		1113.5			0.869	3817.206
2230		1114			0.870	3817.205
2231		1114.5			0.870	3817.205
2232		1115			0.871	3817.204
2233		1115.5			0.870	3817.205
2234		1116			0.871	3817.204
2235		1116.5			0.871	3817.204
2236		1117			0.870	3817.205
2237		1117.5			0.870	3817.205
2238		1118			0.869	3817.206
2239		1118.5			0.870	3817.205
2240		1119			0.871	3817.204
2241		1119.5			0.871	3817.204
2242		1120			0.872	3817.203
2243		1120.5			0.872	3817.203

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2244		1121			0.872	3817.203
2245		1121.5			0.871	3817.204
2246		1122			0.871	3817.204
2247		1122.5			0.871	3817.204
2248		1123			0.870	3817.205
2249		1123.5			0.871	3817.204
2250		1124			0.870	3817.205
2251		1124.5			0.870	3817.205
2252		1125			0.870	3817.205
2253		1125.5			0.870	3817.205
2254		1126			0.871	3817.204
2255		1126.5			0.871	3817.204
2256		1127			0.872	3817.203
2257		1127.5			0.872	3817.203
2258		1128			0.873	3817.202
2259		1128.5			0.873	3817.202
2260		1129			0.874	3817.201
2261		1129.5			0.874	3817.201
2262		1130			0.875	3817.200
2263		1130.5			0.876	3817.199
2264		1131			0.877	3817.198
2265		1131.5			0.878	3817.197
2266		1132			0.879	3817.196
2267		1132.5			0.880	3817.195
2268		1133			0.881	3817.194
2269		1133.5			0.882	3817.193
2270		1134			0.883	3817.192
2271		1134.5			0.884	3817.191
2272		1135			0.885	3817.190
2273		1135.5			0.886	3817.189
2274		1136			0.887	3817.188
2275		1136.5			0.888	3817.187
2276		1137			0.889	3817.186
2277		1137.5			0.890	3817.185
2278		1138			0.891	3817.184
2279		1138.5			0.892	3817.183
2280		1139			0.893	3817.182
2281		1139.5			0.895	3817.180
2282		1140			0.897	3817.178
2283		1140.5			0.897	3817.178
2284		1141			0.896	3817.179

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2285		1141.5			0.895	3817.180
2286		1142			0.894	3817.181
2287		1142.5			0.894	3817.181
2288		1143			0.893	3817.182
2289		1143.5			0.893	3817.182
2290		1144			0.893	3817.182
2291		1144.5			0.892	3817.183
2292		1145			0.892	3817.183
2293		1145.5			0.892	3817.183
2294		1146			0.891	3817.184
2295		1146.5			0.891	3817.184
2296		1147			0.891	3817.184
2297		1147.5			0.890	3817.185
2298		1148			0.890	3817.185
2299		1148.5			0.891	3817.184
2300		1149			0.891	3817.184
2301		1149.5			0.890	3817.185
2302		1150			0.890	3817.185
2303		1150.5			0.891	3817.184
2304		1151			0.891	3817.184
2305		1151.5			0.892	3817.183
2306		1152			0.893	3817.182
2307		1152.5			0.894	3817.181
2308		1153			0.895	3817.180
2309		1153.5			0.896	3817.179
2310		1154			0.897	3817.178
2311		1154.5			0.898	3817.177
2312		1155			0.899	3817.176
2313		1155.5			0.899	3817.176
2314		1156			0.900	3817.175
2315		1156.5			0.901	3817.174
2316		1157			0.901	3817.174
2317		1157.5			0.902	3817.173
2318		1158			0.903	3817.172
2319		1158.5			0.904	3817.171
2320		1159			0.904	3817.171
2321		1159.5			0.905	3817.170
2322		1160			0.905	3817.170
2323		1160.5			0.906	3817.169
2324		1161			0.906	3817.169
2325		1161.5			0.906	3817.169

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2326		1162			0.907	3817.168
2327		1162.5			0.908	3817.167
2328		1163			0.907	3817.168
2329		1163.5			0.907	3817.168
2330		1164			0.908	3817.167
2331		1164.5			0.908	3817.167
2332		1165			0.908	3817.167
2333		1165.5			0.910	3817.165
2334		1166			0.911	3817.164
2335		1166.5			0.912	3817.163
2336		1167			0.915	3817.160
2337		1167.5			0.916	3817.159
2338		1168			0.918	3817.157
2339		1168.5			0.919	3817.156
2340		1169			0.920	3817.155
2341		1169.5			0.922	3817.153
2342		1170			0.925	3817.150
2343		1170.5			0.927	3817.148
2344		1171			0.931	3817.144
2345		1171.5			0.934	3817.141
2346		1172			0.936	3817.139
2347		1172.5			0.938	3817.137
2348		1173			0.940	3817.135
2349		1173.5			0.941	3817.134
2350		1174			0.943	3817.132
2351		1174.5			0.944	3817.131
2352		1175			0.945	3817.130
2353		1175.5			0.947	3817.128
2354		1176			0.949	3817.126
2355		1176.5			0.951	3817.124
2356		1177			0.953	3817.122
2357		1177.5			0.956	3817.119
2358		1178			0.959	3817.116
2359		1178.5			0.960	3817.115
2360		1179			0.963	3817.112
2361		1179.5			0.966	3817.109
2362		1180			0.968	3817.107
2363		1180.5			0.966	3817.109
2364		1181			0.967	3817.108
2365		1181.5			0.967	3817.108
2366		1182			0.967	3817.108

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2367		1182.5			0.967	3817.108
2368		1183			0.966	3817.109
2369		1183.5			0.966	3817.109
2370		1184			0.966	3817.109
2371		1184.5			0.965	3817.110
2372		1185			0.965	3817.110
2373		1185.5			0.966	3817.109
2374		1186			0.968	3817.107
2375		1186.5			0.970	3817.105
2376		1187			0.971	3817.104
2377		1187.5			0.972	3817.103
2378		1188			0.973	3817.102
2379		1188.5			0.974	3817.101
2380		1189			0.975	3817.100
2381		1189.5			0.974	3817.101
2382		1190			0.975	3817.100
2383		1190.5			0.976	3817.099
2384		1191			0.977	3817.098
2385		1191.5			0.979	3817.096
2386		1192			0.980	3817.095
2387		1192.5			0.981	3817.094
2388		1193			0.982	3817.093
2389		1193.5			0.983	3817.092
2390		1194			0.984	3817.091
2391		1194.5			0.984	3817.091
2392		1195			0.985	3817.090
2393		1195.5			0.987	3817.088
2394		1196			0.989	3817.086
2395		1196.5			0.991	3817.084
2396		1197			0.993	3817.082
2397		1197.5			0.995	3817.080
2398		1198			0.997	3817.078
2399		1198.5			0.999	3817.076
2400		1199			1.000	3817.075
2401		1199.5			1.003	3817.072
2402	**PC12**	1200	0.925	3817.995	1.005	3817.070
2403		1200.5			0.925	3817.070
2404		1201			0.926	3817.069
2405		1201.5			0.925	3817.070
2406		1202			0.925	3817.070
2407		1202.5			0.926	3817.069

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2408		1203			0.927	3817.068
2409		1203.5			0.930	3817.065
2410		1204			0.930	3817.065
2411		1204.5			0.931	3817.064
2412		1205			0.932	3817.063
2413		1205.5			0.928	3817.067
2414		1206			0.929	3817.066
2415		1206.5			0.931	3817.064
2416		1207			0.935	3817.060
2417		1207.5			0.935	3817.060
2418		1208			0.936	3817.059
2419		1208.5			0.936	3817.059
2420		1209			0.937	3817.058
2421		1209.5			0.938	3817.057
2422		1210			0.938	3817.057
2423		1210.5			0.939	3817.056
2424		1211			0.939	3817.056
2425		1211.5			0.940	3817.055
2426		1212			0.941	3817.054
2427		1212.5			0.939	3817.056
2428		1213			0.943	3817.052
2429		1213.5			0.940	3817.055
2430		1214			0.942	3817.053
2431		1214.5			0.943	3817.052
2432		1215			0.942	3817.053
2433		1215.5			0.947	3817.048
2434		1216			0.948	3817.047
2435		1216.5			0.948	3817.047
2436		1217			0.949	3817.046
2437		1217.5			0.949	3817.046
2438		1218			0.950	3817.045
2439		1218.5			0.950	3817.045
2440		1219			0.951	3817.044
2441		1219.5			0.951	3817.044
2442		1220			0.952	3817.043
2443		1220.5			0.951	3817.044
2444		1221			0.952	3817.043
2445		1221.5			0.952	3817.043
2446		1222			0.953	3817.042
2447		1222.5			0.953	3817.042
2448		1223			0.952	3817.043

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2449		1223.5			0.952	3817.043
2450		1224			0.953	3817.042
2451		1224.5			0.954	3817.041
2452		1225			0.953	3817.042
2453		1225.5			0.952	3817.043
2454		1226			0.951	3817.044
2455		1226.5			0.950	3817.045
2456		1227			0.949	3817.046
2457		1227.5			0.952	3817.043
2458		1228			0.954	3817.041
2459		1228.5			0.955	3817.040
2460		1229			0.955	3817.040
2461		1229.5			0.955	3817.040
2462		1230			0.955	3817.040
2463		1230.5			0.956	3817.039
2464		1231			0.957	3817.038
2465		1231.5			0.958	3817.037
2466		1232			0.959	3817.036
2467		1232.5			0.960	3817.035
2468		1233			0.960	3817.035
2469		1233.5			0.959	3817.036
2470		1234			0.958	3817.037
2471		1234.5			0.957	3817.038
2472		1235			0.956	3817.039
2473		1235.5			0.955	3817.040
2474		1236			0.957	3817.038
2475		1236.5			0.959	3817.036
2476		1237			0.962	3817.033
2477		1237.5			0.964	3817.031
2478		1238			0.967	3817.028
2479		1238.5			0.968	3817.027
2480		1239			0.969	3817.026
2481		1239.5			0.970	3817.025
2482		1240			0.971	3817.024
2483		1240.5			0.971	3817.024
2484		1241			0.971	3817.024
2485		1241.5			0.972	3817.023
2486		1242			0.972	3817.023
2487		1242.5			0.972	3817.023
2488		1243			0.973	3817.022
2489		1243.5			0.973	3817.022

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2490		1244			0.973	3817.022
2491		1244.5			0.974	3817.021
2492		1245			0.973	3817.022
2493		1245.5			0.974	3817.021
2494		1246			0.974	3817.021
2495		1246.5			0.975	3817.020
2496		1247			0.974	3817.021
2497		1247.5			0.975	3817.020
2498		1248			0.975	3817.020
2499		1248.5			0.975	3817.020
2500		1249			0.974	3817.021
2501		1249.5			0.975	3817.020
2502		1250			0.976	3817.019
2503		1250.5			0.977	3817.018
2504		1251			0.979	3817.016
2505		1251.5			0.981	3817.014
2506		1252			0.983	3817.012
2507		1252.5			0.985	3817.010
2508		1253			0.987	3817.008
2509		1253.5			0.989	3817.006
2510		1254			0.991	3817.004
2511		1254.5			0.993	3817.002
2512		1255			0.994	3817.001
2513		1255.5			0.995	3817.000
2514		1256			0.996	3816.999
2515		1256.5			0.997	3816.998
2516		1257			0.995	3817.000
2517		1257.5			0.998	3816.997
2518		1258			0.999	3816.996
2519		1258.5			1.000	3816.995
2520		1259			0.999	3816.996
2521		1259.5			1.002	3816.993
2522		1260			1.002	3816.993
2523		1260.5			1.003	3816.992
2524		1261			1.004	3816.991
2525		1261.5			1.005	3816.990
2526		1262			1.005	3816.990
2527		1262.5			1.007	3816.988
2528		1263			1.008	3816.987
2529		1263.5			1.008	3816.987
2530		1264			1.009	3816.986

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2531		1264.5			1.009	3816.986
2532		1265			1.010	3816.985
2533		1265.5			1.011	3816.984
2534		1266			1.011	3816.984
2535		1266.5			1.012	3816.983
2536		1267			1.008	3816.987
2537		1267.5			1.013	3816.982
2538		1268			1.013	3816.982
2539		1268.5			1.014	3816.981
2540		1269			1.014	3816.981
2541		1269.5			1.013	3816.982
2542		1270			1.015	3816.980
2543		1270.5			1.017	3816.978
2544		1271			1.019	3816.976
2545		1271.5			1.020	3816.975
2546		1272			1.021	3816.974
2547		1272.5			1.022	3816.973
2548		1273			1.023	3816.972
2549		1273.5			1.024	3816.971
2550		1274			1.025	3816.970
2551		1274.5			1.026	3816.969
2552		1275			1.024	3816.971
2553		1275.5			1.027	3816.968
2554		1276			1.028	3816.967
2555		1276.5			1.028	3816.967
2556		1277			1.029	3816.966
2557		1277.5			1.029	3816.966
2558		1278			1.030	3816.965
2559		1278.5			1.031	3816.964
2560		1279			1.031	3816.964
2561		1279.5			1.028	3816.967
2562		1280			1.029	3816.966
2563		1280.5			1.031	3816.964
2564		1281			1.031	3816.964
2565		1281.5			1.030	3816.965
2566		1282			1.029	3816.966
2567		1282.5			1.030	3816.965
2568		1283			1.031	3816.964
2569		1283.5			1.031	3816.964
2570		1284			1.032	3816.963
2571		1284.5			1.032	3816.963

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2572		1285			1.032	3816.963
2573		1285.5			1.030	3816.965
2574		1286			1.033	3816.962
2575		1286.5			1.033	3816.962
2576		1287			1.034	3816.961
2577		1287.5			1.034	3816.961
2578		1288			1.034	3816.961
2579		1288.5			1.032	3816.963
2580		1289			1.032	3816.963
2581		1289.5			1.035	3816.960
2582		1290			1.035	3816.960
2583		1290.5			1.032	3816.963
2584		1291			1.034	3816.961
2585		1291.5			1.034	3816.961
2586		1292			1.034	3816.961
2587		1292.5			1.035	3816.960
2588		1293			1.035	3816.960
2589		1293.5			1.035	3816.960
2590		1294			1.036	3816.959
2591		1294.5			1.037	3816.958
2592		1295			1.038	3816.957
2593		1295.5			1.038	3816.957
2594		1296			1.035	3816.960
2595		1296.5			1.038	3816.957
2596		1297			1.038	3816.957
2597		1297.5			1.038	3816.957
2598		1298			1.039	3816.956
2599		1298.5			1.039	3816.956
2600		1299			1.040	3816.955
2601		1299.5			1.040	3816.955
2602	**PC13**	1300	1.11	3818.065	1.040	3816.955
2603		1300.5			1.109	3816.956
2604		1301			1.106	3816.959
2605		1301.5			1.102	3816.963
2606		1302			1.097	3816.968
2607		1302.5			1.091	3816.974
2608		1303			1.085	3816.980
2609		1303.5			1.079	3816.986
2610		1304			1.072	3816.993
2611		1304.5			1.068	3816.997
2612		1305			1.061	3817.004

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2613		1305.5			1.057	3817.008
2614		1306			1.052	3817.013
2615		1306.5			1.049	3817.016
2616		1307			1.047	3817.018
2617		1307.5			1.045	3817.020
2618		1308			1.043	3817.022
2619		1308.5			1.040	3817.025
2620		1309			1.036	3817.029
2621		1309.5			1.032	3817.033
2622		1310			1.028	3817.037
2623		1310.5			1.029	3817.036
2624		1311			1.032	3817.033
2625		1311.5			1.032	3817.033
2626		1312			1.032	3817.033
2627		1312.5			1.032	3817.033
2628		1313			1.031	3817.034
2629		1313.5			1.030	3817.035
2630		1314			1.030	3817.035
2631		1314.5			1.030	3817.035
2632		1315			1.029	3817.036
2633		1315.5			1.030	3817.035
2634		1316			1.030	3817.035
2635		1316.5			1.030	3817.035
2636		1317			1.031	3817.034
2637		1317.5			1.031	3817.034
2638		1318			1.032	3817.033
2639		1318.5			1.032	3817.033
2640		1319			1.032	3817.033
2641		1319.5			1.032	3817.033
2642		1320			1.032	3817.033
2643		1320.5			1.031	3817.034
2644		1321			1.031	3817.034
2645		1321.5			1.031	3817.034
2646		1322			1.033	3817.032
2647		1322.5			1.034	3817.031
2648		1323			1.035	3817.030
2649		1323.5			1.036	3817.029
2650		1324			1.037	3817.028
2651		1324.5			1.038	3817.027
2652		1325			1.034	3817.031
2653		1325.5			1.028	3817.037

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2654		1326			1.026	3817.039
2655		1326.5			1.026	3817.039
2656		1327			1.025	3817.040
2657		1327.5			1.025	3817.040
2658		1328			1.025	3817.040
2659		1328.5			1.024	3817.041
2660		1329			1.024	3817.041
2661		1329.5			1.023	3817.042
2662		1330			1.023	3817.042
2663		1330.5			1.027	3817.038
2664		1331			1.029	3817.036
2665		1331.5			1.032	3817.033
2666		1332			1.033	3817.032
2667		1332.5			1.034	3817.031
2668		1333			1.035	3817.030
2669		1333.5			1.036	3817.029
2670		1334			1.037	3817.028
2671		1334.5			1.038	3817.027
2672		1335			1.039	3817.026
2673		1335.5			1.040	3817.025
2674		1336			1.043	3817.022
2675		1336.5			1.046	3817.019
2676		1337			1.048	3817.017
2677		1337.5			1.050	3817.015
2678		1338			1.052	3817.013
2679		1338.5			1.056	3817.009
2680		1339			1.060	3817.005
2681		1339.5			1.063	3817.002
2682		1340			1.067	3816.998
2683		1340.5			1.070	3816.995
2684		1341			1.071	3816.994
2685		1341.5			1.072	3816.993
2686		1342			1.072	3816.993
2687		1342.5			1.073	3816.992
2688		1343			1.069	3816.996
2689		1343.5			1.075	3816.990
2690		1344			1.076	3816.989
2691		1344.5			1.076	3816.989
2692		1345			1.078	3816.987
2693		1345.5			1.079	3816.986
2694		1346			1.080	3816.985

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2695		1346.5			1.080	3816.985
2696		1347			1.083	3816.982
2697		1347.5			1.084	3816.981
2698		1348			1.085	3816.980
2699		1348.5			1.084	3816.981
2700		1349			1.088	3816.977
2701		1349.5			1.089	3816.976
2702		1350			1.091	3816.974
2703		1350.5			1.090	3816.975
2704		1351			1.091	3816.974
2705		1351.5			1.092	3816.973
2706		1352			1.093	3816.972
2707		1352.5			1.094	3816.971
2708		1353			1.095	3816.970
2709		1353.5			1.095	3816.970
2710		1354			1.097	3816.968
2711		1354.5			1.098	3816.967
2712		1355			1.099	3816.966
2713		1355.5			1.100	3816.965
2714		1356			1.101	3816.964
2715		1356.5			1.101	3816.964
2716		1357			1.097	3816.968
2717		1357.5			1.102	3816.963
2718		1358			1.102	3816.963
2719		1358.5			1.103	3816.962
2720		1359			1.101	3816.964
2721		1359.5			1.102	3816.963
2722		1360			1.105	3816.960
2723		1360.5			1.106	3816.959
2724		1361			1.106	3816.959
2725		1361.5			1.107	3816.958
2726		1362			1.108	3816.957
2727		1362.5			1.109	3816.956
2728		1363			1.110	3816.955
2729		1363.5			1.111	3816.954
2730		1364			1.112	3816.953
2731		1364.5			1.113	3816.952
2732		1365			1.114	3816.951
2733		1365.5			1.115	3816.950
2734		1366			1.116	3816.949
2735		1366.5			1.117	3816.948

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2736		1367			1.118	3816.947
2737		1367.5			1.119	3816.946
2738		1368			1.120	3816.945
2739		1368.5			1.121	3816.944
2740		1369			1.122	3816.943
2741		1369.5			1.122	3816.943
2742		1370			1.122	3816.943
2743		1370.5			1.120	3816.945
2744		1371			1.119	3816.946
2745		1371.5			1.119	3816.946
2746		1372			1.117	3816.948
2747		1372.5			1.118	3816.947
2748		1373			1.119	3816.946
2749		1373.5			1.118	3816.947
2750		1374			1.117	3816.948
2751		1374.5			1.116	3816.949
2752		1375			1.115	3816.950
2753		1375.5			1.116	3816.949
2754		1376			1.115	3816.950
2755		1376.5			1.114	3816.951
2756		1377			1.113	3816.952
2757		1377.5			1.114	3816.951
2758		1378			1.115	3816.950
2759		1378.5			1.113	3816.952
2760		1379			1.112	3816.953
2761		1379.5			1.111	3816.954
2762		1380			1.110	3816.955
2763		1380.5			1.112	3816.953
2764		1381			1.115	3816.950
2765		1381.5			1.118	3816.947
2766		1382			1.120	3816.945
2767		1382.5			1.123	3816.942
2768		1383			1.125	3816.940
2769		1383.5			1.126	3816.939
2770		1384			1.128	3816.937
2771		1384.5			1.129	3816.936
2772		1385			1.130	3816.935
2773		1385.5			1.131	3816.934
2774		1386			1.132	3816.933
2775		1386.5			1.133	3816.932
2776		1387			1.133	3816.932

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2777		1387.5			1.133	3816.932
2778		1388			1.135	3816.930
2779		1388.5			1.136	3816.929
2780		1389			1.137	3816.928
2781		1389.5			1.139	3816.926
2782		1390			1.142	3816.923
2783		1390.5			1.140	3816.925
2784		1391			1.139	3816.926
2785		1391.5			1.138	3816.927
2786		1392			1.138	3816.927
2787		1392.5			1.137	3816.928
2788		1393			1.137	3816.928
2789		1393.5			1.136	3816.929
2790		1394			1.135	3816.930
2791		1394.5			1.134	3816.931
2792		1395			1.133	3816.932
2793		1395.5			1.132	3816.933
2794		1396			1.133	3816.932
2795		1396.5			1.134	3816.931
2796		1397			1.135	3816.930
2797		1397.5			1.136	3816.929
2798		1398			1.136	3816.929
2799		1398.5			1.137	3816.928
2800		1399			1.138	3816.927
2801		1399.5			1.138	3816.927
2802	**PC14**	1400	1.085	3818.012	1.138	3816.927
2803		1400.5			1.084	3816.928
2804		1401			1.083	3816.929
2805		1401.5			1.084	3816.928
2806		1402			1.083	3816.929
2807		1402.5			1.082	3816.930
2808		1403			1.082	3816.930
2809		1403.5			1.083	3816.929
2810		1404			1.084	3816.928
2811		1404.5			1.083	3816.929
2812		1405			1.082	3816.930
2813		1405.5			1.081	3816.931
2814		1406			1.080	3816.932
2815		1406.5			1.079	3816.933
2816		1407			1.079	3816.933
2817		1407.5			1.080	3816.932

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2818		1408			1.078	3816.934
2819		1408.5			1.078	3816.934
2820		1409			1.077	3816.935
2821		1409.5			1.076	3816.936
2822		1410			1.075	3816.937
2823		1410.5			1.076	3816.936
2824		1411			1.077	3816.935
2825		1411.5			1.078	3816.934
2826		1412			1.079	3816.933
2827		1412.5			1.080	3816.932
2828		1413			1.081	3816.931
2829		1413.5			1.080	3816.932
2830		1414			1.080	3816.932
2831		1414.5			1.081	3816.931
2832		1415			1.080	3816.932
2833		1415.5			1.079	3816.933
2834		1416			1.079	3816.933
2835		1416.5			1.080	3816.932
2836		1417			1.080	3816.932
2837		1417.5			1.081	3816.931
2838		1418			1.081	3816.931
2839		1418.5			1.082	3816.930
2840		1419			1.083	3816.929
2841		1419.5			1.084	3816.928
2842		1420			1.085	3816.927
2843		1420.5			1.085	3816.927
2844		1421			1.086	3816.926
2845		1421.5			1.086	3816.926
2846		1422			1.085	3816.927
2847		1422.5			1.084	3816.928
2848		1423			1.083	3816.929
2849		1423.5			1.083	3816.929
2850		1424			1.082	3816.930
2851		1424.5			1.081	3816.931
2852		1425			1.080	3816.932
2853		1425.5			1.079	3816.933
2854		1426			1.078	3816.934
2855		1426.5			1.077	3816.935
2856		1427			1.077	3816.935
2857		1427.5			1.076	3816.936
2858		1428			1.075	3816.937

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2859		1428.5			1.074	3816.938
2860		1429			1.073	3816.939
2861		1429.5			1.073	3816.939
2862		1430			1.072	3816.940
2863		1430.5			1.072	3816.940
2864		1431			1.071	3816.941
2865		1431.5			1.071	3816.941
2866		1432			1.070	3816.942
2867		1432.5			1.071	3816.941
2868		1433			1.071	3816.941
2869		1433.5			1.072	3816.940
2870		1434			1.073	3816.939
2871		1434.5			1.072	3816.940
2872		1435			1.070	3816.942
2873		1435.5			1.069	3816.943
2874		1436			1.069	3816.943
2875		1436.5			1.068	3816.944
2876		1437			1.068	3816.944
2877		1437.5			1.067	3816.945
2878		1438			1.067	3816.945
2879		1438.5			1.066	3816.946
2880		1439			1.066	3816.946
2881		1439.5			1.065	3816.947
2882		1440			1.065	3816.947
2883		1440.5			1.065	3816.947
2884		1441			1.064	3816.948
2885		1441.5			1.063	3816.949
2886		1442			1.063	3816.949
2887		1442.5			1.062	3816.950
2888		1443			1.061	3816.951
2889		1443.5			1.062	3816.950
2890		1444			1.062	3816.950
2891		1444.5			1.064	3816.948
2892		1445			1.063	3816.949
2893		1445.5			1.062	3816.950
2894		1446			1.062	3816.950
2895		1446.5			1.063	3816.949
2896		1447			1.062	3816.950
2897		1447.5			1.064	3816.948
2898		1448			1.064	3816.948
2899		1448.5			1.063	3816.949

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2900		1449			1.062	3816.950
2901		1449.5			1.062	3816.950
2902		1450			1.063	3816.949
2903		1450.5			1.063	3816.949
2904		1451			1.062	3816.950
2905		1451.5			1.061	3816.951
2906		1452			1.062	3816.950
2907		1452.5			1.063	3816.949
2908		1453			1.064	3816.948
2909		1453.5			1.065	3816.947
2910		1454			1.065	3816.947
2911		1454.5			1.065	3816.947
2912		1455			1.066	3816.946
2913		1455.5			1.067	3816.945
2914		1456			1.068	3816.944
2915		1456.5			1.067	3816.945
2916		1457			1.066	3816.946
2917		1457.5			1.068	3816.944
2918		1458			1.068	3816.944
2919		1458.5			1.069	3816.943
2920		1459			1.068	3816.944
2921		1459.5			1.069	3816.943
2922		1460			1.068	3816.944
2923		1460.5			1.068	3816.944
2924		1461			1.068	3816.944
2925		1461.5			1.067	3816.945
2926		1462			1.068	3816.944
2927		1462.5			1.069	3816.943
2928		1463			1.070	3816.942
2929		1463.5			1.071	3816.941
2930		1464			1.071	3816.941
2931		1464.5			1.072	3816.940
2932		1465			1.072	3816.940
2933		1465.5			1.073	3816.939
2934		1466			1.072	3816.940
2935		1466.5			1.073	3816.939
2936		1467			1.075	3816.937
2937		1467.5			1.076	3816.936
2938		1468			1.077	3816.935
2939		1468.5			1.079	3816.933
2940		1469			1.081	3816.931

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2941		1469.5			1.083	3816.929
2942		1470			1.084	3816.928
2943		1470.5			1.082	3816.930
2944		1471			1.083	3816.929
2945		1471.5			1.082	3816.930
2946		1472			1.081	3816.931
2947		1472.5			1.079	3816.933
2948		1473			1.080	3816.932
2949		1473.5			1.081	3816.931
2950		1474			1.082	3816.930
2951		1474.5			1.083	3816.929
2952		1475			1.084	3816.928
2953		1475.5			1.085	3816.927
2954		1476			1.086	3816.926
2955		1476.5			1.087	3816.925
2956		1477			1.086	3816.926
2957		1477.5			1.085	3816.927
2958		1478			1.084	3816.928
2959		1478.5			1.084	3816.928
2960		1479			1.083	3816.929
2961		1479.5			1.084	3816.928
2962		1480			1.085	3816.927
2963		1480.5			1.085	3816.927
2964		1481			1.086	3816.926
2965		1481.5			1.087	3816.925
2966		1482			1.089	3816.923
2967		1482.5			1.092	3816.920
2968		1483			1.095	3816.917
2969		1483.5			1.096	3816.916
2970		1484			1.097	3816.915
2971		1484.5			1.099	3816.913
2972		1485			1.100	3816.912
2973		1485.5			1.101	3816.911
2974		1486			1.102	3816.910
2975		1486.5			1.103	3816.909
2976		1487			1.104	3816.908
2977		1487.5			1.104	3816.908
2978		1488			1.105	3816.907
2979		1488.5			1.106	3816.906
2980		1489			1.108	3816.904
2981		1489.5			1.108	3816.904

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
2982		1490			1.109	3816.903
2983		1490.5			1.110	3816.902
2984		1491			1.110	3816.902
2985		1491.5			1.109	3816.903
2986		1492			1.108	3816.904
2987		1492.5			1.107	3816.905
2988		1493			1.106	3816.906
2989		1493.5			1.105	3816.907
2990		1494			1.104	3816.908
2991		1494.5			1.103	3816.909
2992		1495			1.102	3816.910
2993		1495.5			1.103	3816.909
2994		1496			1.102	3816.910
2995		1496.5			1.101	3816.911
2996		1497			1.100	3816.912
2997		1497.5			1.099	3816.913
2998		1498			1.098	3816.914
2999		1498.5			1.097	3816.915
3000		1499			1.096	3816.916
3001		1499.5			1.095	3816.917
3002	**PC15**	1500	1.24	3818.157	1.095	3816.917
3003		1500.5			1.241	3816.916
3004		1501			1.242	3816.915
3005		1501.5			1.243	3816.914
3006		1502			1.244	3816.913
3007		1502.5			1.244	3816.913
3008		1503			1.243	3816.914
3009		1503.5			1.242	3816.915
3010		1504			1.241	3816.916
3011		1504.5			1.240	3816.917
3012		1505			1.240	3816.917
3013		1505.5			1.241	3816.916
3014		1506			1.242	3816.915
3015		1506.5			1.243	3816.914
3016		1507			1.242	3816.915
3017		1507.5			1.242	3816.915
3018		1508			1.240	3816.917
3019		1508.5			1.239	3816.918
3020		1509			1.238	3816.919
3021		1509.5			1.237	3816.920
3022		1510			1.238	3816.919

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
3023		1510.5			1.236	3816.921
3024		1511			1.235	3816.922
3025		1511.5			1.234	3816.923
3026		1512			1.232	3816.925
3027		1512.5			1.230	3816.927
3028		1513			1.228	3816.929
3029		1513.5			1.225	3816.932
3030		1514			1.223	3816.934
3031		1514.5			1.220	3816.937
3032		1515			1.219	3816.938
3033		1515.5			1.218	3816.939
3034		1516			1.215	3816.942
3035		1516.5			1.214	3816.943
3036		1517			1.211	3816.946
3037		1517.5			1.209	3816.948
3038		1518			1.208	3816.949
3039		1518.5			1.207	3816.950
3040		1519			1.205	3816.952
3041		1519.5			1.203	3816.954
3042		1520			1.200	3816.957
3043		1520.5			1.201	3816.956
3044		1521			1.203	3816.954
3045		1521.5			1.204	3816.953
3046		1522			1.205	3816.952
3047		1522.5			1.205	3816.952
3048		1523			1.205	3816.952
3049		1523.5			1.205	3816.952
3050		1524			1.204	3816.953
3051		1524.5			1.203	3816.954
3052		1525			1.202	3816.955
3053		1525.5			1.202	3816.955
3054		1526			1.202	3816.955
3055		1526.5			1.202	3816.955
3056		1527			1.202	3816.955
3057		1527.5			1.201	3816.956
3058		1528			1.201	3816.956
3059		1528.5			1.200	3816.957
3060		1529			1.200	3816.957
3061		1529.5			1.200	3816.957
3062		1530			1.200	3816.957
3063		1530.5			1.201	3816.956

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
3064		1531			1.201	3816.956
3065		1531.5			1.202	3816.955
3066		1532			1.202	3816.955
3067		1532.5			1.202	3816.955
3068		1533			1.202	3816.955
3069		1533.5			1.201	3816.956
3070		1534			1.201	3816.956
3071		1534.5			1.200	3816.957
3072		1535			1.199	3816.958
3073		1535.5			1.198	3816.959
3074		1536			1.197	3816.960
3075		1536.5			1.196	3816.961
3076		1537			1.195	3816.962
3077		1537.5			1.194	3816.963
3078		1538			1.193	3816.964
3079		1538.5			1.194	3816.963
3080		1539			1.195	3816.962
3081		1539.5			1.195	3816.962
3082		1540			1.195	3816.962
3083		1540.5			1.196	3816.961
3084		1541			1.196	3816.961
3085		1541.5			1.194	3816.963
3086		1542			1.193	3816.964
3087		1542.5			1.192	3816.965
3088		1543			1.191	3816.966
3089		1543.5			1.190	3816.967
3090		1544			1.199	3816.958
3091		1544.5			1.200	3816.957
3092		1545			1.201	3816.956
3093		1545.5			1.201	3816.956
3094		1546			1.202	3816.955
3095		1546.5			1.203	3816.954
3096		1547			1.204	3816.953
3097		1547.5			1.205	3816.952
3098		1548			1.206	3816.951
3099		1548.5			1.205	3816.952
3100		1549			1.205	3816.952
3101		1549.5			1.204	3816.953
3102		1550			1.204	3816.953
3103		1550.5			1.203	3816.954
3104		1551			1.205	3816.952

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
3105		1551.5			1.206	3816.951
3106		1552			1.208	3816.949
3107		1552.5			1.209	3816.948
3108		1553			1.210	3816.947
3109		1553.5			1.211	3816.946
3110		1554			1.210	3816.947
3111		1554.5			1.211	3816.946
3112		1555			1.212	3816.945
3113		1555.5			1.213	3816.944
3114		1556			1.213	3816.944
3115		1556.5			1.214	3816.943
3116		1557			1.215	3816.942
3117		1557.5			1.215	3816.942
3118		1558			1.216	3816.941
3119		1558.5			1.215	3816.942
3120		1559			1.217	3816.940
3121		1559.5			1.218	3816.939
3122		1560			1.219	3816.938
3123		1560.5			1.220	3816.937
3124		1561			1.221	3816.936
3125		1561.5			1.222	3816.935
3126		1562			1.223	3816.934
3127		1562.5			1.224	3816.933
3128		1563			1.225	3816.932
3129		1563.5			1.226	3816.931
3130		1564			1.226	3816.931
3131		1564.5			1.227	3816.930
3132		1565			1.229	3816.928
3133		1565.5			1.229	3816.928
3134		1566			1.230	3816.927
3135		1566.5			1.231	3816.926
3136		1567			1.232	3816.925
3137		1567.5			1.233	3816.924
3138		1568			1.233	3816.924
3139		1568.5			1.235	3816.922
3140		1569			1.236	3816.921
3141		1569.5			1.237	3816.920
3142		1570			1.238	3816.919
3143		1570.5			1.236	3816.921
3144		1571			1.233	3816.924
3145		1571.5			1.230	3816.927

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
3146		1572			1.225	3816.932
3147		1572.5			1.224	3816.933
3148		1573			1.223	3816.934
3149		1573.5			1.220	3816.937
3150		1574			1.221	3816.936
3151		1574.5			1.220	3816.937
3152		1575			1.216	3816.941
3153		1575.5			1.214	3816.943
3154		1576			1.213	3816.944
3155		1576.5			1.211	3816.946
3156		1577			1.209	3816.948
3157		1577.5			1.208	3816.949
3158		1578			1.207	3816.950
3159		1578.5			1.206	3816.951
3160		1579			1.204	3816.953
3161		1579.5			1.202	3816.955
3162		1580			1.200	3816.957
3163		1580.5			1.198	3816.959
3164		1581			1.197	3816.960
3165		1581.5			1.196	3816.961
3166		1582			1.195	3816.962
3167		1582.5			1.194	3816.963
3168		1583			1.193	3816.964
3169		1583.5			1.193	3816.964
3170		1584			1.192	3816.965
3171		1584.5			1.192	3816.965
3172		1585			1.193	3816.964
3173		1585.5			1.192	3816.965
3174		1586			1.192	3816.965
3175		1586.5			1.191	3816.966
3176		1587			1.190	3816.967
3177		1587.5			1.189	3816.968
3178		1588			1.188	3816.969
3179		1588.5			1.187	3816.970
3180		1589			1.186	3816.971
3181		1589.5			1.185	3816.972
3182		1590			1.185	3816.972
3183		1590.5			1.186	3816.971
3184		1591			1.187	3816.970
3185		1591.5			1.188	3816.969
3186		1592			1.189	3816.968

LEVANTAMIENTO TOPOGRAFICO KM 1326+000 HASTA 1327+600						
N°	**ESTACIÓN**	**DISTANCIA (m)**	**VISTA ATRAS**	**ALTURA DEL INSTRU-MENTO**	**VISTA ADELANTE**	**COTA**
3187		1592.5			1.189	3816.968
3188		1593			1.190	3816.967
3189		1593.5			1.191	3816.966
3190		1594			1.192	3816.965
3191		1594.5			1.191	3816.966
3192		1595			1.192	3816.965
3193		1595.5			1.193	3816.964
3194		1596			1.194	3816.963
3195		1596.5			1.195	3816.962
3196		1597			1.195	3816.962
3197		1597.5			1.196	3816.961
3198		1598			1.197	3816.960
3199		1598.5			1.199	3816.958
3200		1599			1.200	3816.957
3201		1599.5			1.202	3816.955
3202		1600			1.205	3816.952

Fuente: Elaboración Propia

ANEXO 3

Cálculo de IRI mediante el Programa del Banco Mundial.

ANEXO 3. Cálculo de IRI mediante programa del Banco Mundial en su Publicación N° 46 “Directrices para realizar y calibrar mediciones de rugosidad de carreteras”

Para el cálculo de agruparon los datos de la nivelación topográfica cada 11m, y se introdujeron al programa.

FIGURA 3.1: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 0m a 11m.*

N°	Dist	Cota	Y'
1	0.00	3818.083	
2	0.50	3818.082	-2.00
3	1.00	3818.082	0.00
4	1.50	3818.081	-2.00
5	2.00	3818.082	2.00
6	2.50	3818.080	-4.00
7	3.00	3818.079	-2.00
8	3.50	3818.078	-2.00
9	4.00	3818.077	-2.00
10	4.50	3818.078	2.00
11	5.00	3818.078	0.00
12	5.50	3818.078	0.00
13	6.00	3818.078	0.00
14	6.50	3818.080	4.00
15	7.00	3818.079	-2.00
16	7.50	3818.082	6.00
17	8.00	3818.079	-6.00
18	8.50	3818.079	0.00
19	9.00	3818.078	-2.00
20	9.50	3818.074	-8.00
21	10.00	3818.075	2.00
22	10.50	3818.076	2.00
23	11.00	3818.079	6.00

IRI 2.1659

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.36363636
z2' = **z4'** = 0

Y' = $(Y_i - Y_{i-1})$ / dx = slope input (8)

and

Z_j' = Z_j from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.35934	0.02128394	0	-0.02521	0.009167022	0.000992	0	0.037038	-0.07407694	-0.424245445	RS1 =	1.07805	IRI =	1.07805
	z2	-0.92852	0.337642	0.9001616	0	-3.39137	1.233225091	0.062802	0	4.319885	-8.63977	-7.068902725				
	z3	0.063863	-0.02322	0.006615445	0	0.24029	-0.087378036	0.003863	0	0.695847	-1.3916946	-1.50229564				
	z4	3.743294	-1.3612	0.4186779	0	-46.6788	16.97412	-0.11453	0	42.93555	-85.8711	-70.2581778				
2da Iteracion	z1	0.988173	-0.41923	0.02128394	-0.15045	-0.02521	0.037871836	0.000992	-0.06972	0.037038	0	-0.601528381	RS2 =	0.526249	IRI =	0.80215
	z2	-0.92852	0.393919	0.9001616	-6.36315	-3.39137	5.094838861	0.062802	-4.41233	4.319885	0	-5.286728139				
	z3	0.063863	-0.02709	0.006615445	-0.04676	0.24029	-0.360986018	0.003863	-0.63293	0.695847	0	-1.127777578				
	z4	3.743294	-1.58808	0.4186779	-2.95959	-46.6788	70.12540277	-0.11453	8.046325	42.93555	0	73.62405883				
3ra Iteracion	z1	0.988173	-0.59441	0.02128394	-0.11252	-0.02521	0.028430495	0.000992	0.073058	0.037038	-0.07407694	-0.679524406	RS3 =	0.330423	IRI =	0.644907
	z2	-0.92852	0.558529	0.9001616	-4.75891	-3.39137	3.824709316	0.062802	4.623714	4.319885	-8.63977	-4.391727173				
	z3	0.063863	-0.03842	0.006615445	-0.03497	0.24029	-0.270993223	0.003863	0.726131	0.695847	-1.3916946	-1.009946913				
	z4	3.743294	-2.2517	0.4186779	-2.21344	-46.6788	52.64333783	-0.11453	-8.4318	42.93555	-85.8711	-46.12469871				
4ta Iteracion	z1	0.988173	-0.67149	0.02128394	-0.09347	-0.02521	0.025460065	0.000992	-0.04577	0.037038	0.07407694	-0.71119402	RS4 =	1.332846	IRI =	0.816892
	z2	-0.92852	0.630949	0.9001616	-3.95326	-3.39137	3.425102654	0.062802	-2.89671	4.319885	8.639770002	5.845849674				
	z3	0.063863	-0.0434	0.006615445	-0.02905	0.24029	-0.24267974	0.003863	-0.45431	0.695847	1.3916946	0.621651844				
	z4	3.743294	-2.54366	0.4186779	-1.83872	-46.6788	47.14314028	-0.11453	5.282436	42.93555	85.87110002	133.9142973				
5ta Iteracion	z1	0.988173	-0.70278	0.02128394	0.124423	-0.02521	-0.015671414	0.000992	0.132885	0.037038	-0.14815388	-0.609299728	RS5 =	0.710705	IRI =	0.795655
	z2	-0.92852	0.660355	0.9001616	5.262209	-3.39137	-2.108250791	0.062802	8.410042	4.319885	-17.27954	-5.055184863				
	z3	0.063863	-0.04542	0.006615445	0.038673	0.24029	0.149376473	0.003863	1.320754	0.695847	-2.7833892	-1.320005137				
	z4	3.743294	-2.66221	0.4186779	2.447528	-46.6788	-29.01798073	-0.11453	-15.3365	42.93555	-171.7422	-216.3114093				

FIGURA 3.2: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 11m a 22m.*

N°	Dist	Cota	Y'
1	11.00	3818.079	
2	11.50	3818.077	-4.00
3	12.00	3818.078	2.00
4	12.50	3818.079	2.00
5	13.00	3818.082	6.00
6	13.50	3818.082	0.00
7	14.00	3818.083	2.00
8	14.50	3818.084	2.00
9	15.00	3818.084	0.00
10	15.50	3818.083	-2.00
11	16.00	3818.082	-2.00
12	16.50	3818.079	-6.00
13	17.00	3818.078	-2.00
14	17.50	3818.077	-2.00
15	18.00	3818.077	0.00
16	18.50	3818.078	2.00
17	19.00	3818.076	-4.00
18	19.50	3818.075	-2.00
19	20.00	3818.074	-2.00
20	20.50	3818.070	-8.00
21	21.00	3818.067	-6.00
22	21.50	3818.066	-2.00
23	22.00	3818.065	-2.00

IRI 2.4993

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -1.27272727
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.25767	0.02128394	0	-0.02521	0.032084576	0.000992	0	0.037038	-0.14815388	-1.373743649	RS1 =	1.796749	IRI =	1.796749
	z2	-0.92852	1.181748	0.9001616	0	-3.39137	4.316287818	0.062802	0	4.319885	-17.27954	-11.78150454				
	z3	0.063863	-0.08128	0.006615445	0	0.24029	-0.305823127	0.009863	0	0.695847	-2.7833892	-3.17049284				
	z4	3.743294	-4.76419	0.4186779	0	-46.6788	59.40942	-0.11453	0	42.93555	-171.7422	-117.0969724				
2da Iteracion	z1	0.988173	-1.3575	0.02128394	-0.25076	-0.02521	0.079325937	0.000992	-0.1162	0.037038	0.07407694	-1.570447188	RS2 =	0.879744	IRI =	1.338246
	z2	-0.92852	1.275543	0.9001616	-10.6053	-3.39137	10.75231113	0.062802	-7.35389	4.319885	8.639769998	2.70848069				
	z3	0.063863	-0.08773	0.006615445	-0.07794	0.24029	-0.761836456	0.009863	-1.15489	0.695847	1.3916946	-0.690703467				
	z4	3.743294	-5.14233	0.4186779	-4.93266	-46.6788	147.9948963	-0.11453	13.41054	42.93555	85.87109998	237.2015568				
3ra Iteracion	z1	0.988173	-1.55187	0.02128394	0.057647	-0.02521	0.017412158	0.000992	0.235379	0.037038	0.07407694	-1.167357781	RS3 =	4.65015	IRI =	2.442214
	z2	-0.92852	1.458185	0.9001616	2.43807	-3.39137	2.342430327	0.062802	14.89665	4.319885	8.639770002	29.77510987				
	z3	0.063863	-0.10029	0.006615445	0.017918	0.24029	-0.16596886	0.009863	2.339443	0.695847	1.3916946	3.482792719				
	z4	3.743294	-5.87865	0.4186779	1.133981	-46.6788	32.24122972	-0.11453	-27.1655	42.93555	85.87110002	86.2021332				
4ta Iteracion	z1	0.988173	-1.15355	0.02128394	0.633732	-0.02521	-0.087798801	0.000992	0.08554	0.037038	0.22223082	-0.29984762	RS4 =	6.284419	IRI =	3.402766
	z2	-0.92852	1.08391	0.9001616	26.80241	-3.39137	-11.81143526	0.062802	5.413638	4.319885	25.91931	47.40783359				
	z3	0.063863	-0.07455	0.006615445	0.196976	0.24029	0.836878869	0.009863	0.850184	0.695847	4.1750838	5.984571053				
	z4	3.743294	-4.36976	0.4186779	12.46618	-46.6788	-162.5726892	-0.11453	-9.87231	42.93555	257.6133	93.26471995				
5ta Iteracion	z1	0.988173	-0.2963	0.02128394	1.009025	-0.02521	-0.150866907	0.000992	0.092548	0.037038	0	0.654405467	RS5 =	1.997939	IRI =	3.1218
	z2	-0.92852	0.278413	0.9001616	42.67471	-3.39137	-20.29588875	0.062802	5.85718	4.319885	0	28.51441606				
	z3	0.063863	-0.01915	0.006615445	0.313624	0.24029	1.438030184	0.009863	0.91984	0.695847	0	2.652344942				
	z4	3.743294	-1.12242	0.4186779	19.84861	-46.6788	-279.3527748	-0.11453	-10.6812	42.93555	0	-271.3077318				

FIGURA 3.3: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 22m a 33m.*

N°	Dist	Cota	Y'
1	22.00	3818.065	
2	22.50	3818.065	0.00
3	23.00	3818.064	-2.00
4	23.50	3818.063	-2.00
5	24.00	3818.063	0.00
6	24.50	3818.061	-4.00
7	25.00	3818.059	-4.00
8	25.50	3818.056	-6.00
9	26.00	3818.051	-10.00
10	26.50	3818.053	4.00
11	27.00	3818.052	-2.00
12	27.50	3818.052	0.00
13	28.00	3818.051	-2.00
14	28.50	3818.049	-4.00
15	29.00	3818.048	-2.00
16	29.50	3818.047	-2.00
17	30.00	3818.046	-2.00
18	30.50	3818.045	-2.00
19	31.00	3818.046	2.00
20	31.50	3818.045	-2.00
21	32.00	3818.044	-2.00
22	32.50	3818.043	-2.00
23	33.00	3818.041	-4.00

IRI	2.1513

ya = cota N° 23 **a=11/dx+1=** 0.5

y1 = cota N° 1

z1' = z3' = (ya-y1)/11 = -2.18181818

z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.15601	0.02128394	0	-0.02521	0.055002131	0.000992	0	0.037038	0	-2.101011033	RS1 =	1.437405	IRI =	1.437405
	z2	-0.92852	2.025853	0.9001616	0	-3.39137	7.399350545	0.062802	0	4.319885	0	9.425203636				
	z3	0.063863	-0.13934	0.006615445	0	0.24029	-0.524268218	0.009863	0	0.695847	0	-0.66360624				
	z4	3.743294	-8.16719	0.4186779	0	-46.6788	101.84472	-0.11453	0	42.93555	0	93.67753309				
2da Iteracion	z1	0.988173	-2.07616	0.02128394	0.200605	-0.02521	0.016729055	0.000992	0.092958	0.037038	-0.07407694	-1.839946399	RS2 =	1.14088	IRI =	1.289142
	z2	-0.92852	1.950822	0.9001616	8.484206	-3.39137	2.250533631	0.062802	5.883106	4.319885	-8.63977	9.928897898				
	z3	0.063863	-0.13418	0.006615445	0.062352	0.24029	-0.159457678	0.009863	0.923912	0.695847	-1.3916946	-0.699066243				
	z4	3.743294	-7.8647	0.4186779	3.946124	-46.6788	30.97636286	-0.11453	-10.7284	42.93555	-85.8711	-69.54174349				
3ra Iteracion	z1	0.988173	-1.81818	0.02128394	0.211326	-0.02521	0.017622978	0.000992	-0.06901	0.037038	-0.07407694	-1.732320116	RS3 =	0.565042	IRI =	1.047776
	z2	-0.92852	1.70842	0.9001616	8.937613	-3.39137	2.370791586	0.062802	-4.36734	4.319885	-8.63977	0.009716247				
	z3	0.063863	-0.1175	0.006615445	0.065684	0.24029	-0.167978348	0.009863	-0.68587	0.695847	-1.3916946	-2.297361808				
	z4	3.743294	-6.88746	0.4186779	4.15701	-46.6788	32.63159432	-0.11453	7.964275	42.93555	-85.8711	-48.00568076				
4ta Iteracion	z1	0.988173	-1.71183	0.02128394	0.000207	-0.02521	0.057914906	0.000992	-0.04764	0.037038	0	-1.701346569	RS4 =	0.565282	IRI =	0.927152
	z2	-0.92852	1.608487	0.9001616	0.008746	-3.39137	7.791201618	0.062802	-3.01484	4.319885	0	6.393597834				
	z3	0.063863	-0.11063	0.006615445	6.43E-05	0.24029	-0.55203215	0.009863	-0.47346	0.695847	0	-1.13606415				
	z4	3.743294	-6.48458	0.4186779	0.004068	-46.6788	107.2381613	-0.11453	5.497855	42.93555	0	106.2555012				
5ta Iteracion	z1	0.988173	-1.68122	0.02128394	0.136081	-0.02521	0.028639393	0.000992	0.105439	0.037038	-0.14815388	-1.55921868	RS5 =	0.515548	IRI =	0.844831
	z2	-0.92852	1.579728	0.9001616	5.755271	-3.39137	3.852812741	0.062802	6.673023	4.319885	-17.27954	0.581294428				
	z3	0.063863	-0.10865	0.006615445	0.042296	0.24029	-0.2729844	0.009863	1.047964	0.695847	-2.7833892	-2.074766637				
	z4	3.743294	-6.36864	0.4186779	2.676858	-46.6788	53.03014533	-0.11453	-12.1689	42.93555	-171.7422	-134.5727588				

FIGURA 3.4: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 33m a 44m.*

N°	Dist	Cota	Y'
1	33.00	3818.041	
2	33.50	3818.039	-4.00
3	34.00	3818.039	0.00
4	34.50	3818.039	0.00
5	35.00	3818.040	2.00
6	35.50	3818.039	-2.00
7	36.00	3818.039	0.00
8	36.50	3818.038	-2.00
9	37.00	3818.042	8.00
10	37.50	3818.040	-4.00
11	38.00	3818.037	-6.00
12	38.50	3818.036	-2.00
13	39.00	3818.033	-6.00
14	39.50	3818.031	-4.00
15	40.00	3818.031	0.00
16	40.50	3818.030	-2.00
17	41.00	3818.027	-6.00
18	41.50	3818.026	-2.00
19	42.00	3818.025	-2.00
20	42.50	3818.025	0.00
21	43.00	3818.022	-6.00
22	43.50	3818.020	-4.00
23	44.00	3818.018	-4.00

IRI **2.9937**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.09090909
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.06618	0.02128394	0	-0.02521	0.052710375	0.000992	0	0.037038	-0.14815388	-2.161622786	**RS1 =**	1.257722	**IRI =**	1.257722
	z2	-0.92852	1.941443	0.9001616	0	-3.39137	7.091044273	0.062802	0	4.319885	-17.27954	-8.247053181				
	z3	0.063863	-0.13353	0.006615445	0	0.24029	-0.502423709	0.009863	0	0.695847	-2.7833892	-3.41934518				
	z4	3.743294	-7.82689	0.4186779	0	-46.6788	97.60119	-0.11453	0	42.93555	-171.7422	-81.96789745				
2da Iteracion	z1	0.988173	-2.13606	0.02128394	-0.17553	-0.02521	0.086199333	0.000992	-0.08134	0.037038	0	-2.306725175	**RS2 =**	0.484063	**IRI =**	0.870893
	z2	-0.92852	2.007101	0.9001616	-7.42368	-3.39137	11.59626124	0.062802	-5.14772	4.319885	0	1.031961153				
	z3	0.063863	-0.13805	0.006615445	-0.05456	0.24029	-0.821633086	0.009863	-0.80842	0.695847	0	-1.822662433				
	z4	3.743294	-8.09159	0.4186779	-3.45286	-46.6788	159.6110324	-0.11453	9.387382	42.93555	0	157.4539655				
3ra Iteracion	z1	0.988173	-2.27944	0.02128394	0.021964	-0.02521	0.045948062	0.000992	0.156244	0.037038	0	-2.055286415	**RS3 =**	3.02975	**IRI =**	1.590512
	z2	-0.92852	2.141831	0.9001616	0.928932	-3.39137	6.181320873	0.062802	9.888372	4.319885	0	19.14045589				
	z3	0.063863	-0.14731	0.006615445	0.006827	0.24029	-0.437966827	0.009863	1.552918	0.695847	0	0.974463142				
	z4	3.743294	-8.63475	0.4186779	0.432059	-46.6788	85.07974986	-0.11453	-18.0324	42.93555	0	58.84462754				
4ta Iteracion	z1	0.988173	-2.03098	0.02128394	0.407384	-0.02521	-0.024565543	0.000992	0.058392	0.037038	0.07407694	-1.515689719	**RS4 =**	3.717269	**IRI =**	2.122201
	z2	-0.92852	1.908366	0.9001616	17.2295	-3.39137	-3.304764092	0.062802	3.695541	4.319885	8.639769938	28.16841651				
	z3	0.063863	-0.13126	0.006615445	0.126623	0.24029	0.234153359	0.009863	0.580366	0.695847	1.3916946	2.201579032				
	z4	3.743294	-7.69354	0.4186779	8.013686	-46.6788	-45.48679935	-0.11453	-6.73919	42.93555	85.87109938	33.96525834				
5ta Iteracion	z1	0.988173	-1.49776	0.02128394	0.599535	-0.02521	-0.055500288	0.000992	0.033704	0.037038	-0.07407694	-0.994101258	**RS5 =**	0.555961	**IRI =**	1.808953
	z2	-0.92852	1.407342	0.9001616	25.35613	-3.39137	-7.46636688	0.062802	2.133075	4.319885	-8.63977	12.79040709				
	z3	0.063863	-0.0968	0.006615445	0.186347	0.24029	0.529016545	0.009863	0.334988	0.695847	-1.3916946	-0.438139857				
	z4	3.743294	-5.67367	0.4186779	11.79349	-46.6788	-102.7671334	-0.11453	-3.88987	42.93555	-85.8711	-186.4082867				

FIGURA 3.5: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 44m a 55m.*

N°	Dist	Cota	Y'
1	44.00	3818.018	
2	44.50	3818.012	-12.00
3	45.00	3818.012	0.00
4	45.50	3818.011	-2.00
5	46.00	3818.009	-4.00
6	46.50	3818.009	0.00
7	47.00	3818.008	-2.00
8	47.50	3818.005	-6.00
9	48.00	3818.008	6.00
10	48.50	3818.006	-4.00
11	49.00	3818.006	0.00
12	49.50	3818.006	0.00
13	50.00	3818.006	0.00
14	50.50	3818.006	0.00
15	51.00	3818.004	-4.00
16	51.50	3818.004	0.00
17	52.00	3818.004	0.00
18	52.50	3818.003	-2.00
19	53.00	3818.002	-2.00
20	53.50	3818.001	-2.00
21	54.00	3818.003	4.00
22	54.50	3818.005	4.00
23	55.00	3818.006	2.00

IRI **2.3648**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.09090909
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.07801	0.02128394	0	-0.02521	0.027501065	0.000992	0	0.037038	-0.44446164	-1.494967156	RS1 =	7.187004	IRI =	7.187004
	z2	-0.92852	1.012927	0.9001616	0	-3.39137	3.699675273	0.062802	0	4.319885	-51.83862	-47.12601818				
	z3	0.063863	-0.06967	0.006615445	0	0.24029	-0.262134109	0.003863	0	0.695847	-8.3501676	-8.68197072				
	z4	3.743294	-4.08359	0.4186779	0	-46.6788	50.92236	-0.11453	0	42.93555	-515.2266	-468.3878334				
2da Iteracion	z1	0.988173	-1.47729	0.02128394	-1.00303	-0.02521	0.218866491	0.000992	-0.46479	0.037038	0	-2.726235559	RS2 =	4.386744	IRI =	5.786874
	z2	-0.92852	1.388101	0.9001616	-42.421	-3.39137	29.44376636	0.062802	-29.4155	4.319885	0	-41.00470279				
	z3	0.063863	-0.09547	0.006615445	-0.31176	0.24029	-2.086187271	0.003863	-4.61956	0.695847	0	-7.112979646				
	z4	3.743294	-5.5961	0.4186779	-19.7306	-46.6788	405.2642353	-0.11453	53.64216	42.93555	0	433.5796748				
3ra Iteracion	z1	0.988173	-2.69399	0.02128394	-0.87274	-0.02521	0.179313309	0.000992	0.430248	0.037038	-0.07407694	-3.031248553	RS3 =	3.761266	IRI =	5.111671
	z2	-0.92852	2.531353	0.9001616	-36.9109	-3.39137	24.12273867	0.062802	27.22953	4.319885	-8.63977	8.332990789				
	z3	0.063863	-0.17411	0.006615445	-0.27126	0.24029	-1.709175034	0.003863	4.276258	0.695847	-1.3916946	0.730017307				
	z4	3.743294	-10.2051	0.4186779	-17.1678	-46.6788	332.0255677	-0.11453	-49.6558	42.93555	-85.8711	169.125848				
4ta Iteracion	z1	0.988173	-2.9954	0.02128394	0.177359	-0.02521	-0.018403233	0.000992	0.167826	0.037038	-0.14815388	-2.816768934	RS4 =	1.73837	IRI =	4.268346
	z2	-0.92852	2.814563	0.9001616	7.501038	-3.39137	-2.475758064	0.062802	10.62139	4.319885	-17.27954	1.181688733				
	z3	0.063863	-0.19359	0.006615445	0.055126	0.24029	0.175415567	0.003863	1.668034	0.695847	-2.7833892	-1.078398487				
	z4	3.743294	-11.3469	0.4186779	3.488839	-46.6788	-34.07635376	-0.11453	-19.3692	42.93555	-171.7422	-233.0457238				
5ta Iteracion	z1	0.988173	-2.78345	0.02128394	0.025151	-0.02521	0.027185682	0.000992	-0.23126	0.037038	0	-2.962372606	RS5 =	0.232719	IRI =	3.461221
	z2	-0.92852	2.615415	0.9001616	1.063711	-3.39137	3.657247198	0.062802	-14.6357	4.319885	0	-7.299287602				
	z3	0.063863	-0.17989	0.006615445	0.007817	0.24029	-0.259127941	0.003863	-2.29846	0.695847	0	-2.729653991				
	z4	3.743294	-10.544	0.4186779	0.494747	-46.6788	50.33837965	-0.11453	26.68958	42.93555	0	66.97871718				

FIGURA 3.6: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 55m a 66m.*

N°	Dist	Cota	Y'
1	55.00	3818.006	
2	55.50	3818.006	0.00
3	56.00	3818.002	-8.00
4	56.50	3818.002	0.00
5	57.00	3818.001	-2.00
6	57.50	3817.999	-4.00
7	58.00	3817.997	-4.00
8	58.50	3817.993	-8.00
9	59.00	3817.992	-2.00
10	59.50	3817.990	-4.00
11	60.00	3817.986	-8.00
12	60.50	3817.987	2.00
13	61.00	3817.988	2.00
14	61.50	3817.987	-2.00
15	62.00	3817.987	0.00
16	62.50	3817.985	-4.00
17	63.00	3817.982	-6.00
18	63.50	3817.980	-4.00
19	64.00	3817.977	-6.00
20	64.50	3817.977	0.00
21	65.00	3817.975	-4.00
22	65.50	3817.975	0.00
23	66.00	3817.974	-2.00

IRI **2.0636**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.90909091
z2' = **z4'** = 0

$$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.87468	0.02128394	0	-0.02521	0.073336175	0.000992	0	0.037038	0	-2.801348044	RS1 =	1.91654	IRI =	1.91654
	z2	-0.92852	2.701137	0.9001616	0	-3.39137	9.865800727	0.062802	0	4.319885	0	12.56693818				
	z3	0.063863	-0.18578	0.006615445	0	0.24029	-0.699024291	0.009863	0	0.695847	0	-0.88480832				
	z4	3.743294	-10.8896	0.4186779	0	-46.6788	135.79296	-0.11453	0	42.93555	0	124.9033775				
2da Iteracion	z1	0.988173	-2.76822	0.02128394	0.267474	-0.02521	0.022305407	0.000992	0.123944	0.037038	-0.29630776	-2.650800372	RS2 =	1.992474	IRI =	1.954507
	z2	-0.92852	2.601096	0.9001616	11.31228	-3.39137	3.000711507	0.062802	7.844141	4.319885	-34.55908	-9.800856142				
	z3	0.063863	-0.1789	0.006615445	0.083136	0.24029	-0.212610237	0.009863	1.231882	0.695847	-5.5667784	-4.643273925				
	z4	3.743294	-10.4863	0.4186779	5.261499	-46.6788	41.30181715	-0.11453	-14.3046	42.93555	-343.4844	-321.7119247				
3ra Iteracion	z1	0.988173	-2.61945	0.02128394	-0.2086	-0.02521	0.117053732	0.000992	-0.31924	0.037038	0	-3.030235714	RS3 =	1.492562	IRI =	1.800525
	z2	-0.92852	2.461311	0.9001616	-8.82235	-3.39137	15.74705525	0.062802	-20.204	4.319885	0	-10.81803467				
	z3	0.063863	-0.16929	0.006615445	-0.06484	0.24029	-1.115730434	0.009863	-3.17294	0.695847	0	-4.522797978				
	z4	3.743294	-9.92273	0.4186779	-4.1034	-46.6788	216.7425942	-0.11453	36.84409	42.93555	0	239.5605575				
4ta Iteracion	z1	0.988173	-2.9944	0.02128394	-0.23025	-0.02521	0.114016616	0.000992	0.23772	0.037038	-0.07407694	-2.946987038	RS4 =	2.566133	IRI =	1.991927
	z2	-0.92852	2.813622	0.9001616	-9.73798	-3.39137	15.33847686	0.062802	15.0448	4.319885	-8.63977	14.81915288				
	z3	0.063863	-0.19352	0.006615445	-0.07157	0.24029	-1.086781317	0.009863	2.362709	0.695847	-1.3916946	-0.380853642				
	z4	3.743294	-11.3431	0.4186779	-4.52927	-46.6788	211.1189179	-0.11453	-27.4357	42.93555	-85.8711	81.93978594				
5ta Iteracion	z1	0.988173	-2.91213	0.02128394	0.31541	-0.02521	0.009601058	0.000992	0.08131	0.037038	-0.14815388	-2.653964798	RS5 =	0.497037	IRI =	1.692949
	z2	-0.92852	2.736325	0.9001616	13.33963	-3.39137	1.291615234	0.062802	5.145955	4.319885	-17.27954	5.233987618				
	z3	0.063863	-0.1882	0.006615445	0.098035	0.24029	-0.091515169	0.009863	0.808146	0.695847	-2.7833892	-2.15692739				
	z4	3.743294	-11.0314	0.4186779	6.204452	-46.6788	17.77780239	-0.11453	-9.38416	42.93555	-171.7422	-168.1755469				

FIGURA 3.7: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 66m a 77m.*

N°	Dist	Cota	Y'
1	66.00	3817.974	
2	66.50	3817.977	6.00
3	67.00	3817.979	4.00
4	67.50	3817.975	-8.00
5	68.00	3817.974	-2.00
6	68.50	3817.975	2.00
7	69.00	3817.977	4.00
8	69.50	3817.977	0.00
9	70.00	3817.978	2.00
10	70.50	3817.979	2.00
11	71.00	3817.981	4.00
12	71.50	3817.982	2.00
13	72.00	3817.983	2.00
14	72.50	3817.982	-2.00
15	73.00	3817.982	0.00
16	73.50	3817.984	4.00
17	74.00	3817.985	2.00
18	74.50	3817.986	2.00
19	75.00	3817.986	0.00
20	75.50	3817.987	2.00
21	76.00	3817.988	2.00
22	76.50	3817.989	2.00
23	77.00	3817.990	2.00

IRI 2.7421

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 1.454545455
z2' = **z4'** = 0

$Y' = (Y_1 - Y_{i-1}) / dx = \text{slope input}$ (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	1.437342	0.02128394	0	-0.02521	-0.036668087	0.000992	0	0.037038	0.22223082	1.622904842	RS1 =	2.994583	IRI =	2.994583
	z2	-0.92852	-1.35057	0.9001616	0	-3.39137	-4.932900364	0.062802	0	4.319885	25.91931	19.63584091				
	z3	0.063863	0.092892	0.006615445	0	0.24029	0.349512145	0.009863	0	0.695847	4.1750838	4.61748796				
	z4	3.743294	5.444791	0.4186779	0	-46.6788	-67.89648	-0.11453	0	42.93555	257.6133	195.1616113				
2da Iteracion	z1	0.988173	1.60371	0.02128394	0.417928	-0.02521	-0.116403685	0.000992	0.193662	0.037038	0.14815388	2.247050601	RS2 =	3.804233	IRI =	3.399408
	z2	-0.92852	-1.50689	0.9001616	17.67543	-3.39137	-15.65960553	0.062802	12.25648	4.319885	17.27954	30.04494644				
	z3	0.063863	0.103644	0.006615445	0.1299	0.24029	1.109534335	0.009863	1.924817	0.695847	2.7833892	6.051283875				
	z4	3.743294	6.07501	0.4186779	8.221093	-46.6788	-215.5389355	-0.11453	-22.3509	42.93555	171.7422	-51.85153598				
3ra Iteracion	z1	0.988173	2.220474	0.02128394	0.639475	-0.02521	-0.152548691	0.000992	-0.05145	0.037038	-0.29630776	2.359639311	RS3 =	6.641488	IRI =	4.480101
	z2	-0.92852	-2.08642	0.9001616	27.04531	-3.39137	-20.52213654	0.062802	-3.25636	4.319885	-34.55908	-33.37869497				
	z3	0.063863	0.143504	0.006615445	0.198761	0.24029	1.454060582	0.009863	-0.5114	0.695847	-5.5667784	-4.281848258				
	z4	3.743294	8.411371	0.4186779	12.57916	-46.6788	-282.4668513	-0.11453	5.938302	42.93555	-343.4844	-599.0224228				
4ta Iteracion	z1	0.988173	2.331731	0.02128394	-0.71043	-0.02521	0.10794244	0.000992	-0.59442	0.037038	-0.07407694	1.060746674	RS4 =	9.459412	IRI =	5.724929
	z2	-0.92852	-2.19096	0.9001616	-30.0462	-3.39137	14.52132744	0.062802	-37.6196	4.319885	-8.63977	-63.9752334				
	z3	0.063863	0.150694	0.006615445	-0.22081	0.24029	-1.028883605	0.009863	-5.90797	0.695847	-1.3916946	-8.398665336				
	z4	3.743294	8.832824	0.4186779	-13.9749	-46.6788	199.8716669	-0.11453	68.6031	42.93555	-85.8711	177.4615715				
5ta Iteracion	z1	0.988173	1.048201	0.02128394	-1.36165	-0.02521	0.211724558	0.000992	0.176098	0.037038	0.07407694	0.148455419	RS5 =	0.619892	IRI =	4.703922
	z2	-0.92852	-0.98492	0.9001616	-57.588	-3.39137	28.48297326	0.062802	11.14488	4.319885	8.639770002	-10.3053424				
	z3	0.063863	0.067743	0.006615445	-0.42322	0.24029	-2.018111934	0.009863	1.750247	0.695847	1.3916946	0.768347461				
	z4	3.743294	3.970687	0.4186779	-26.785	-46.6788	392.0398715	-0.11453	-20.3238	42.93555	85.87110002	434.7728375				

FIGURA 3.8: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 77m a 88m.*

N°	Dist	Cota	Y'
1	77.00	3817.990	
2	77.50	3817.994	8.00
3	78.00	3817.992	-4.00
4	78.50	3817.991	-2.00
5	79.00	3817.992	2.00
6	79.50	3817.992	0.00
7	80.00	3817.989	-6.00
8	80.50	3817.987	-4.00
9	81.00	3817.985	-4.00
10	81.50	3817.984	-2.00
11	82.00	3817.982	-4.00
12	82.50	3817.980	-4.00
13	83.00	3817.979	-2.00
14	83.50	3817.976	-6.00
15	84.00	3817.974	-4.00
16	84.50	3817.973	-2.00
17	85.00	3817.971	-4.00
18	85.50	3817.969	-4.00
19	86.00	3817.971	4.00
20	86.50	3817.969	-4.00
21	87.00	3817.967	-4.00
22	87.50	3817.968	2.00
23	88.00	3817.970	4.00

(Ctrl)

IRI 2.9140

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.81818182
z2' = **z4'** = 0

$$Y' = (Y_1 - Y_{1-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.79668	0.02128394	0	-0.02521	0.045835109	0.000992	0	0.037038	0.29630776	-1.454534767	RS1 =	6.468308	IRI =	6.468308
	z2	-0.92852	1.688211	0.9001616	0	-3.39137	6.166125455	0.062802	0	4.319885	34.55908	42.41341636				
	z3	0.063863	-0.11612	0.006615445	0	0.24029	-0.436890182	0.009863	0	0.695847	5.5667784	5.0137732				
	z4	3.743294	-6.80599	0.4186779	0	-46.6788	84.8706	-0.11453	0	42.93555	343.4844	421.5490109				
2da Iteracion	z1	0.988173	-1.43733	0.02128394	0.902725	-0.02521	-0.126393763	0.000992	0.41831	0.037038	-0.14815388	-0.390844543	RS2 =	3.157508	IRI =	4.812908
	z2	-0.92852	1.350559	0.9001616	38.17893	-3.39137	-17.003555	0.062802	26.47398	4.319885	-17.27954	31.72037441				
	z3	0.063863	-0.09289	0.006615445	0.280584	0.24029	1.204757557	0.009863	4.157603	0.695847	-2.7833892	2.766663647				
	z4	3.743294	-5.44475	0.4186779	17.75756	-46.6788	-234.0370669	-0.11453	-48.2779	42.93555	-171.7422	-441.7444007				
3ra Iteracion	z1	0.988173	-0.38622	0.02128394	0.675135	-0.02521	-0.069745682	0.000992	-0.43835	0.037038	-0.07407694	-0.293260241	RS3 =	4.605534	IRI =	4.743783
	z2	-0.92852	0.362905	0.9001616	28.55346	-3.39137	-9.382777325	0.062802	-27.7423	4.319885	-8.63977	-16.84846501				
	z3	0.063863	-0.02496	0.006615445	0.209844	0.24029	0.664800501	0.009863	-4.35678	0.695847	-1.3916946	-4.898793979				
	z4	3.743294	-1.46305	0.4186779	13.28062	-46.6788	-129.144622	-0.11453	50.59082	42.93555	-85.8711	-152.6073267				
4ta Iteracion	z1	0.988173	-0.28979	0.02128394	-0.3586	-0.02521	0.123495216	0.000992	-0.15143	0.037038	0.07407694	-0.602256094	RS4 =	0.818484	IRI =	3.762459
	z2	-0.92852	0.272297	0.9001616	-15.1663	-3.39137	16.61361804	0.062802	-9.58399	4.319885	8.639770002	0.775348675				
	z3	0.063863	-0.01873	0.006615445	-0.11146	0.24029	-1.177129246	0.009863	-1.50512	0.695847	1.3916946	-1.420740523				
	z4	3.743294	-1.09776	0.4186779	-7.05408	-46.6788	228.6699714	-0.11453	17.47737	42.93555	85.87110002	323.8666015				
5ta Iteracion	z1	0.988173	-0.59513	0.02128394	0.016502	-0.02521	0.035815888	0.000992	0.321378	0.037038	0	-0.221436496	RS5 =	3.040907	IRI =	3.618148
	z2	-0.92852	0.559204	0.9001616	0.697939	-3.39137	4.818255366	0.062802	20.33936	4.319885	0	26.41476232				
	z3	0.063863	-0.03846	0.006615445	0.005129	0.24029	-0.341389172	0.009863	3.194193	0.695847	0	2.81947072				
	z4	3.743294	-2.25442	0.4186779	0.324621	-46.6788	66.31850534	-0.11453	-37.0909	42.93555	0	27.29785015				

FIGURA 3.9: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 88m a 99m.*

N°	Dist	Cota	Y'
1	88.00	3817.970	
2	88.50	3817.969	-2.00
3	89.00	3817.971	4.00
4	89.50	3817.967	-8.00
5	90.00	3817.967	0.00
6	90.50	3817.967	0.00
7	91.00	3817.965	-4.00
8	91.50	3817.964	-2.00
9	92.00	3817.965	2.00
10	92.50	3817.965	0.00
11	93.00	3817.967	4.00
12	93.50	3817.965	-4.00
13	94.00	3817.963	-4.00
14	94.50	3817.962	-2.00
15	95.00	3817.960	-4.00
16	95.50	3817.959	-2.00
17	96.00	3817.959	0.00
18	96.50	3817.960	2.00
19	97.00	3817.961	2.00
20	97.50	3817.961	0.00
21	98.00	3817.962	2.00
22	98.50	3817.963	2.00
23	99.00	3817.964	2.00

IRI	2.1097

ya = cota N° 23 **a=11/dx+1=** 0.5

y1 = cota N° 1

z1' = **z3'** = (ya-y1)/11 = -0.54545455

z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.539	0.02128394	0	-0.02521	0.013750533	0.000992	0	0.037038	-0.07407694	-0.599329698	RS1 =	0.958266	IRI =	0.958266
	z2	-0.92852	0.506463	0.9001616	0	-3.39137	1.849837636	0.062802	0	4.319885	-8.63977	-6.283469093				
	z3	0.063863	-0.03483	0.006615445	0	0.24029	-0.131067055	0.009863	0	0.695847	-1.3916946	-1.55759616				
	z4	3.743294	-2.0418	0.4186779	0	-46.6788	25.46118	-0.11453	0	42.93555	-85.8711	-62.45171674				
2da Iteracion	z1	0.988173	-0.59224	0.02128394	-0.13374	-0.02521	0.039265924	0.000992	-0.06197	0.037038	0.14815388	-0.60053029	RS2 =	2.313861	IRI =	1.636064
	z2	-0.92852	0.556487	0.9001616	-5.65614	-3.39137	5.282383333	0.062802	-3.92207	4.319885	17.27954	13.54020085				
	z3	0.063863	-0.03828	0.006615445	-0.04157	0.24029	-0.374274158	0.009863	-0.61594	0.695847	2.7833892	1.713330651				
	z4	3.743294	-2.24347	0.4186779	-2.63075	-46.6788	72.70676637	-0.11453	7.152289	42.93555	171.7422	246.7270386				
3ra Iteracion	z1	0.988173	-0.59343	0.02128394	0.288189	-0.02521	-0.043191884	0.000992	0.244831	0.037038	-0.29630776	-0.399907148	RS3 =	2.270563	IRI =	1.847564
	z2	-0.92852	0.557602	0.9001616	12.18837	-3.39137	-5.810536458	0.062802	15.49487	4.319885	-34.55908	-12.12877556				
	z3	0.063863	-0.03835	0.006615445	0.089574	0.24029	0.411695537	0.009863	2.43339	0.695847	-5.5667784	-2.670470402				
	z4	3.743294	-2.24796	0.4186779	5.668983	-46.6788	-79.97627021	-0.11453	-28.2564	42.93555	-343.4844	-448.2960875				
4ta Iteracion	z1	0.988173	-0.39518	0.02128394	-0.25815	-0.02521	0.067320716	0.000992	-0.44485	0.037038	0	-1.030856345	RS4 =	4.138007	IRI =	2.420175
	z2	-0.92852	0.37132	0.9001616	-10.9179	-3.39137	9.056550538	0.062802	-28.1537	4.319885	0	-29.64373024				
	z3	0.063863	-0.02554	0.006615445	-0.08024	0.24029	-0.641686265	0.009863	-4.4214	0.695847	0	-5.168863743				
	z4	3.743294	-1.49697	0.4186779	-5.07805	-46.6788	124.6544339	-0.11453	51.34115	42.93555	0	169.4205679				
5ta Iteracion	z1	0.988173	-1.01866	0.02128394	-0.63094	-0.02521	0.130303488	0.000992	0.168119	0.037038	0	-1.351177161	RS5 =	1.518153	IRI =	2.23977
	z2	-0.92852	0.957167	0.9001616	-26.6841	-3.39137	17.52952426	0.062802	10.63989	4.319885	0	2.442437825				
	z3	0.063863	-0.06583	0.006615445	-0.19611	0.24029	-1.242024201	0.009863	1.670941	0.695847	0	0.166976331				
	z4	3.743294	-3.8588	0.4186779	-12.4112	-46.6788	241.276512	-0.11453	-19.4029	42.93555	0	205.6036314				

FIGURA 3.10: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 99m a 110m.*

N°	Dist	Cota	Y'
1	99.00	3817.964	
2	99.50	3817.964	0.00
3	100.00	3817.963	-2.00
4	100.50	3817.962	-2.00
5	101.00	3817.959	-6.00
6	101.50	3817.957	-4.00
7	102.00	3817.958	2.00
8	102.50	3817.958	0.00
9	103.00	3817.959	2.00
10	103.50	3817.960	2.00
11	104.00	3817.961	2.00
12	104.50	3817.958	-6.00
13	105.00	3817.956	-4.00
14	105.50	3817.957	2.00
15	106.00	3817.955	-4.00
16	106.50	3817.956	2.00
17	107.00	3817.959	6.00
18	107.50	3817.960	2.00
19	108.00	3817.961	2.00
20	108.50	3817.963	4.00
21	109.00	3817.964	2.00
22	109.50	3817.965	2.00
23	110.00	3817.966	2.00

IRI 2.2063

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 0.181818182
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input}$ (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.179668	0.02128394	0	-0.02521	-0.004583511	0.000992	0	0.037038	0	0.175084253	RS1 =	0.119784	IRI =	0.119784
	z2	-0.92852	-0.16882	0.9001616	0	-3.39137	-0.616612546	0.062802	0	4.319885	0	-0.785433637				
	z3	0.063863	0.011612	0.006615445	0	0.24029	0.043689018	0.009863	0	0.695847	0	0.05530052				
	z4	3.743294	0.680599	0.4186779	0	-46.6788	-8.487060002	-0.11453	0	42.93555	0	-7.806461092				
2da Iteracion	z1	0.988173	0.173013	0.02128394	-0.01672	-0.02521	-0.001394088	0.000992	-0.00775	0.037038	-0.07407694	0.073078848	RS2 =	1.522492	IRI =	0.821138
	z2	-0.92852	-0.16257	0.9001616	-0.70702	-3.39137	-0.187544469	0.062802	-0.49026	4.319885	-8.63977	-10.18715899				
	z3	0.063863	0.011181	0.006615445	-0.0052	0.24029	0.01328814	0.009863	-0.07699	0.695847	-1.3916946	-1.449413629				
	z4	3.743294	0.655392	0.4186779	-0.32884	-46.6788	-2.581363573	-0.11453	0.894036	42.93555	-85.8711	-87.23187969				
3ra Iteracion	z1	0.988173	0.072215	0.02128394	-0.21682	-0.02521	0.036538718	0.000992	-0.08656	0.037038	-0.07407694	-0.268708214	RS3 =	2.394331	IRI =	1.345536
	z2	-0.92852	-0.06785	0.9001616	-9.17009	-3.39137	4.915496451	0.062802	-5.47831	4.319885	-8.63977	-18.44052548				
	z3	0.063863	0.004667	0.006615445	-0.06739	0.24029	-0.348279021	0.009863	-0.86034	0.695847	-1.3916946	-2.663039273				
	z4	3.743294	0.273556	0.4186779	-4.26514	-46.6788	67.65693241	-0.11453	9.99024	42.93555	-85.8711	-12.21551055				
4ta Iteracion	z1	0.988173	-0.26553	0.02128394	-0.39249	-0.02521	0.067133383	0.000992	-0.01212	0.037038	-0.22223082	-0.825236249	RS4 =	4.249379	IRI =	2.071496
	z2	-0.92852	0.2495	0.9001616	-16.5935	-3.39137	9.031348835	0.062802	-0.76715	4.319885	-25.91931	-34.00506868				
	z3	0.063863	-0.01716	0.006615445	-0.12199	0.24029	-0.639900642	0.009863	-0.12048	0.695847	-4.1750838	-5.074614978				
	z4	3.743294	-1.00585	0.4186779	-7.72064	-46.6788	124.3075575	-0.11453	1.398983	42.93555	-257.6133	-140.6332543				
5ta Iteracion	z1	0.988173	-0.81548	0.02128394	-0.72376	-0.02521	0.127927542	0.000992	-0.13955	0.037038	-0.14815388	-1.699016811	RS5 =	3.968431	IRI =	2.450883
	z2	-0.92852	0.766245	0.9001616	-30.6101	-3.39137	17.20989192	0.062802	-8.832	4.319885	-17.27954	-38.74546327				
	z3	0.063863	-0.0527	0.006615445	-0.22496	0.24029	-1.219377203	0.009863	-1.38702	0.695847	-2.7833892	-5.667448126				
	z4	3.743294	-3.0891	0.4186779	-14.2372	-46.6788	236.8770899	-0.11453	16.10604	42.93555	-171.7422	63.91465474				

FIGURA 3.11: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 110m a 121m.*

N°	Dist	Cota	Y'
1	110.00	3817.966	
2	110.50	3817.966	0.00
3	111.00	3817.964	-4.00
4	111.50	3817.961	-6.00
5	112.00	3817.962	2.00
6	112.50	3817.962	0.00
7	113.00	3817.961	-2.00
8	113.50	3817.959	-4.00
9	114.00	3817.958	-2.00
10	114.50	3817.957	-2.00
11	115.00	3817.955	-4.00
12	115.50	3817.946	-18.00
13	116.00	3817.945	-2.00
14	116.50	3817.942	-6.00
15	117.00	3817.941	-2.00
16	117.50	3817.940	-2.00
17	118.00	3817.940	0.00
18	118.50	3817.937	-6.00
19	119.00	3817.938	2.00
20	119.50	3817.937	-2.00
21	120.00	3817.939	4.00
22	120.50	3817.938	-2.00
23	121.00	3817.936	-4.00

IRI	2.7893

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -2.72727273
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.69502	0.02128394	0	-0.02521	0.068752664	0.000992	0	0.037038	0	-2.626263791	RS1 =	1.796756	IRI =	1.796756
	z2	-0.92852	2.532316	0.9001616	0	-3.39137	9.249188182	0.062802	0	4.319885	0	11.78150455				
	z3	0.063863	-0.17417	0.006615445	0	0.24029	-0.655335273	0.009863	0	0.695847	0	-0.8295078				
	z4	3.743294	-10.209	0.4186779	0	-46.6788	127.3059	-0.11453	0	42.93555	0	117.0969164				
2da Iteracion	z1	0.988173	-2.5952	0.02128394	0.250757	-0.02521	0.020911319	0.000992	0.116197	0.037038	-0.14815388	-2.355490704	RS2 =	0.437887	IRI =	1.117321
	z2	-0.92852	2.438528	0.9001616	10.60526	-3.39137	2.813167038	0.062802	7.353882	4.319885	-17.27954	5.93129487				
	z3	0.063863	-0.16772	0.006615445	0.07794	0.24029	-0.199322097	0.009863	1.154889	0.695847	-2.7833892	-1.917603754				
	z4	3.743294	-9.83088	0.4186779	4.932656	-46.6788	38.72045358	-0.11453	-13.4105	42.93555	-171.7422	-151.3305044				
3ra Iteracion	z1	0.988173	-2.32763	0.02128394	0.126241	-0.02521	0.048341467	0.000992	-0.15017	0.037038	-0.22223082	-2.525447393	RS3 =	3.714132	IRI =	1.982925
	z2	-0.92852	2.187111	0.9001616	5.339124	-3.39137	6.503301927	0.062802	-9.50381	4.319885	-25.91931	-21.39358178				
	z3	0.063863	-0.15043	0.006615445	0.039238	0.24029	-0.460780239	0.009863	-1.49252	0.695847	-4.1750838	-6.239579538				
	z4	3.743294	-8.81729	0.4186779	2.483302	-46.6788	89.51149965	-0.11453	17.33114	42.93555	-257.6133	-157.1046514				
4ta Iteracion	z1	0.988173	-2.49558	0.02128394	-0.45534	-0.02521	0.157295495	0.000992	-0.1559	0.037038	0.07407694	-2.875442983	RS4 =	0.915547	IRI =	1.716081
	z2	-0.92852	2.344918	0.9001616	-19.2577	-3.39137	21.16071662	0.062802	-9.86643	4.319885	8.639770002	3.021289655				
	z3	0.063863	-0.16128	0.006615445	-0.14153	0.24029	-1.499306071	0.009863	-1.54947	0.695847	1.3916946	-1.959895741				
	z4	3.743294	-9.45349	0.4186779	-8.95702	-46.6788	291.2562725	-0.11453	17.99243	42.93555	85.87110002	376.7092865				
5ta Iteracion	z1	0.988173	-2.84143	0.02128394	0.064305	-0.02521	0.049407619	0.000992	0.373815	0.037038	0	-2.353906849	RS5 =	5.434679	IRI =	2.4598
	z2	-0.92852	2.669895	0.9001616	2.719649	-3.39137	6.64672966	0.062802	23.65797	4.319885	0	35.6942457				
	z3	0.063863	-0.18364	0.006615445	0.019987	0.24029	-0.470942564	0.009863	3.715363	0.695847	0	3.080772595				
	z4	3.743294	-10.7636	0.4186779	1.264947	-46.6788	91.48564012	-0.11453	-43.1427	42.93555	0	38.84429015				

FIGURA 3.12: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 121m a 132m.*

N°	Dist	Cota	Y'
1	121.00	3817.936	
2	121.50	3817.932	-8.00
3	122.00	3817.930	-4.00
4	122.50	3817.929	-2.00
5	123.00	3817.925	-8.00
6	123.50	3817.926	2.00
7	124.00	3817.924	-4.00
8	124.50	3817.927	6.00
9	125.00	3817.928	2.00
10	125.50	3817.928	0.00
11	126.00	3817.927	-2.00
12	126.50	3817.929	4.00
13	127.00	3817.929	0.00
14	127.50	3817.928	-2.00
15	128.00	3817.929	2.00
16	128.50	3817.927	-4.00
17	129.00	3817.926	-2.00
18	129.50	3817.927	2.00
19	130.00	3817.925	-4.00
20	130.50	3817.923	-4.00
21	131.00	3817.922	-2.00
22	131.50	3817.920	-4.00
23	132.00	3817.921	2.00

IRI	2.5518

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.36363636
z2' = **z4'** = 0

$Y' = (Y_1 - Y_{1-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_1 = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.34751	0.02128394	0	-0.02521	0.034376332	0.000992	0	0.037038	-0.29630776	-1.609439655	RS1 =	4.372093	IRI =	4.372093
	z2	-0.92852	1.266158	0.9001616	0	-3.39137	4.624594091	0.062802	0	4.319885	-34.55908	-28.66832773				
	z3	0.063863	-0.08709	0.006615445	0	0.24029	-0.327667636	0.009863	0	0.695847	-5.5667784	-5.9815323				
	z4	3.743294	-5.10449	0.4186779	0	-46.6788	63.65295	-0.11453	0	42.93555	-343.4844	-284.9359418				
2da Iteracion	z1	0.988173	-1.5904	0.02128394	-0.61017	-0.02521	0.150790302	0.000992	-0.28275	0.037038	-0.14815388	-2.480689512	RS2 =	4.84267	IRI =	4.607381
	z2	-0.92852	1.49439	0.9001616	-25.8061	-3.39137	20.28558321	0.062802	-17.8945	4.319885	-17.27954	-39.20014706				
	z3	0.063863	-0.10278	0.006615445	-0.18965	0.24029	-1.437300004	0.009863	-2.81023	0.695847	-2.7833892	-7.323359027				
	z4	3.743294	-6.02461	0.4186779	-12.0028	-46.6788	279.2109294	-0.11453	32.63232	42.93555	-171.7422	122.0736455				
3ra Iteracion	z1	0.988173	-2.45135	0.02128394	-0.83433	-0.02521	0.184616828	0.000992	0.121136	0.037038	-0.07407694	-3.05400765	RS3 =	0.688808	IRI =	3.30119
	z2	-0.92852	2.30336	0.9001616	-35.2865	-3.39137	24.83621278	0.062802	7.666429	4.319885	-8.63977	-9.12023561				
	z3	0.063863	-0.15842	0.006615445	-0.25933	0.24029	-1.759727011	0.009863	1.203973	0.695847	-1.3916946	-2.365199645				
	z4	3.743294	-9.28595	0.4186779	-16.4122	-46.6788	341.845831	-0.11453	-13.9805	42.93555	-85.8711	216.2960492				
4ta Iteracion	z1	0.988173	-3.01789	0.02128394	-0.19411	-0.02521	0.059625051	0.000992	0.214634	0.037038	-0.29630776	-3.234050103	RS4 =	1.023176	IRI =	2.731686
	z2	-0.92852	2.835695	0.9001616	-8.20969	-3.39137	8.021264753	0.062802	13.58375	4.319885	-34.55908	-18.32805306				
	z3	0.063863	-0.19504	0.006615445	-0.06033	0.24029	-0.568332877	0.009863	2.133259	0.695847	-5.5667784	-4.25722586				
	z4	3.743294	-11.432	0.4186779	-3.81844	-46.6788	110.4047521	-0.11453	-24.7713	42.93555	-343.4844	-273.1014642				
5ta Iteracion	z1	0.988173	-3.1958	0.02128394	-0.39009	-0.02521	0.107321726	0.000992	-0.271	0.037038	0.07407694	-3.675497627	RS5 =	1.022928	IRI =	2.389935
	z2	-0.92852	3.002867	0.9001616	-16.4982	-3.39137	14.43782381	0.062802	-17.1512	4.319885	8.639770002	-7.56897652				
	z3	0.063863	-0.20654	0.006615445	-0.12125	0.24029	-1.022967099	0.009863	-2.69351	0.695847	1.3916946	-2.652570057				
	z4	3.743294	-12.106	0.4186779	-7.67355	-46.6788	198.7223222	-0.11453	31.27697	42.93555	85.87110002	296.0908436				

FIGURA 3.13: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 132m a 143m.*

N°	Dist	Cota	Y'
1	132.00	3817.921	
2	132.50	3817.920	-2.00
3	133.00	3817.919	-2.00
4	133.50	3817.917	-4.00
5	134.00	3817.917	0.00
6	134.50	3817.915	-4.00
7	135.00	3817.912	-6.00
8	135.50	3817.909	-6.00
9	136.00	3817.908	-2.00
10	136.50	3817.910	4.00
11	137.00	3817.912	4.00
12	137.50	3817.912	0.00
13	138.00	3817.911	-2.00
14	138.50	3817.909	-4.00
15	139.00	3817.910	2.00
16	139.50	3817.909	-2.00
17	140.00	3817.905	-8.00
18	140.50	3817.907	4.00
19	141.00	3817.907	0.00
20	141.50	3817.905	-4.00
21	142.00	3817.906	2.00
22	142.50	3817.905	-2.00
23	143.00	3817.904	-2.00

IRI	2.4561

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -1.54545455
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.52718	0.02128394	0	-0.02521	0.038953843	0.000992	0	0.037038	-0.07407694	-1.562293088	RS1 =	0.299456	IRI =	0.299456
	z2	-0.92852	1.434979	0.9001616	0	-3.39137	5.241206636	0.062802	0	4.319885	-8.63977	-1.963584089				
	z3	0.063863	-0.0987	0.006615445	0	0.24029	-0.371356655	0.009863	0	0.695847	-1.3916946	-1.86174902				
	z4	3.743294	-5.78509	0.4186779	0	-46.6788	72.14001	-0.11453	0	42.93555	-85.8711	-19.51618071				
2da Iteracion	z1	0.988173	-1.54382	0.02128394	-0.04179	-0.02521	0.046933408	0.000992	-0.01937	0.037038	-0.07407694	-1.632117945	RS2 =	0.512181	IRI =	0.405818
	z2	-0.92852	1.450614	0.9001616	-1.76754	-3.39137	6.313877911	0.062802	-1.22565	4.319885	-8.63977	-3.868469697				
	z3	0.063863	-0.09977	0.006615445	-0.01299	0.24029	-0.447358927	0.009863	-0.19248	0.695847	-1.3916946	-2.144298485				
	z4	3.743294	-5.84812	0.4186779	-0.82211	-46.6788	86.90426599	-0.11453	2.235093	42.93555	-85.8711	-3.401973086				
3ra Iteracion	z1	0.988173	-1.61281	0.02128394	-0.08234	-0.02521	0.054056285	0.000992	-0.00338	0.037038	-0.14815388	-1.792624102	RS3 =	1.669394	IRI =	0.82701
	z2	-0.92852	1.515448	0.9001616	-3.48225	-3.39137	7.272107408	0.062802	-0.21365	4.319885	-17.27954	-12.18788243				
	z3	0.063863	-0.10423	0.006615445	-0.02559	0.24029	-0.515252625	0.009863	-0.03355	0.695847	-2.7833892	-3.462018418				
	z4	3.743294	-6.1095	0.4186779	-1.61964	-46.6788	100.0933444	-0.11453	0.389611	42.93555	-171.7422	-78.98838432				
4ta Iteracion	z1	0.988173	-1.77142	0.02128394	-0.25941	-0.02521	0.087275096	0.000992	-0.07838	0.037038	0	-2.021934739	RS4 =	0.215899	IRI =	0.674233
	z2	-0.92852	1.66448	0.9001616	-10.9711	-3.39137	11.74098194	0.062802	-4.9606	4.319885	0	-2.526204092				
	z3	0.063863	-0.11448	0.006615445	-0.08063	0.24029	-0.831887021	0.009863	-0.77904	0.695847	0	-1.806035264				
	z4	3.743294	-6.71032	0.4186779	-5.1028	-46.6788	161.6029692	-0.11453	9.046153	42.93555	0	158.8360057				
5ta Iteracion	z1	0.988173	-1.99802	0.02128394	-0.05377	-0.02521	0.045528903	0.000992	0.157616	0.037038	-0.14815388	-1.996797674	RS5 =	0.200146	IRI =	0.579415
	z2	-0.92852	1.877399	0.9001616	-2.27399	-3.39137	6.124932008	0.062802	9.975166	4.319885	-17.27954	-1.576034736				
	z3	0.063863	-0.12913	0.006615445	-0.01671	0.24029	-0.433971491	0.009863	1.566549	0.695847	-2.7833892	-1.796651302				
	z4	3.743294	-7.5687	0.4186779	-1.05767	-46.6788	84.30361307	-0.11453	-18.1907	42.93555	-171.7422	-114.2556584				

FIGURA 3.14: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 143m a 154m.*

N°	Dist	Cota	Y'
1	143.00	3817.904	
2	143.50	3817.906	4.00
3	144.00	3817.907	2.00
4	144.50	3817.910	6.00
5	145.00	3817.912	4.00
6	145.50	3817.909	-6.00
7	146.00	3817.909	0.00
8	146.50	3817.911	4.00
9	147.00	3817.912	2.00
10	147.50	3817.913	2.00
11	148.00	3817.914	2.00
12	148.50	3817.914	0.00
13	149.00	3817.911	-6.00
14	149.50	3817.912	2.00
15	150.00	3817.911	-2.00
16	150.50	3817.910	-2.00
17	151.00	3817.909	-2.00
18	151.50	3817.906	-6.00
19	152.00	3817.907	2.00
20	152.50	3817.906	-2.00
21	153.00	3817.904	-4.00
22	153.50	3817.903	-2.00
23	154.00	3817.900	-6.00

IRI	2.8657

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.36363636
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.35934	0.02128394	0	-0.02521	0.009167022	0.000992	0	0.037038	0.14815388	-0.202014625	RS1 =	2.874803	IRI =	2.874803
	z2	-0.92852	0.337642	0.9001616	0	-3.39137	1.233225091	0.062802	0	4.319885	17.27954	18.85040727				
	z3	0.063863	-0.02322	0.006615445	0	0.24029	-0.087378036	0.009863	0	0.695847	2.7833892	2.67278816				
	z4	3.743294	-1.3612	0.4186779	0	-46.6788	16.97412	-0.11453	0	42.93555	171.7422	187.3551222				
2da Iteracion	z1	0.988173	-0.19963	0.02128394	0.401211	-0.02521	-0.067379145	0.000992	0.185916	0.037038	0.07407694	0.394198973	RS2 =	3.599365	IRI =	3.237084
	z2	-0.92852	0.187574	0.9001616	16.96841	-3.39137	-9.064410909	0.062802	11.76621	4.319885	8.639769998	28.49756023				
	z3	0.063863	-0.0129	0.006615445	0.124704	0.24029	0.642243198	0.009863	1.847824	0.695847	1.3916946	3.993563934				
	z4	3.743294	-0.7562	0.4186779	7.892249	-46.6788	-124.7626241	-0.11453	-21.4569	42.93555	85.87109998	-53.21233947				
3ra Iteracion	z1	0.988173	0.389537	0.02128394	0.60654	-0.02521	-0.100674991	0.000992	-0.0528	0.037038	0.22223082	1.064829372	RS3 =	3.758749	IRI =	3.410972
	z2	-0.92852	-0.36602	0.9001616	25.65241	-3.39137	-13.54364892	0.062802	-3.34182	4.319885	25.91931	34.32022665				
	z3	0.063863	0.025175	0.006615445	0.188524	0.24029	0.95961188	0.009863	-0.52482	0.695847	4.1750838	4.823578278				
	z4	3.743294	1.475603	0.4186779	11.9313	-46.6788	-186.414892	-0.11453	6.094148	42.93555	257.6133	90.69945787				
4ta Iteracion	z1	0.988173	1.052235	0.02128394	0.73047	-0.02521	-0.12159908	0.000992	0.090003	0.037038	0.14815388	1.899262329	RS4 =	3.232769	IRI =	3.366421
	z2	-0.92852	-0.98871	0.9001616	30.89375	-3.39137	-16.35853384	0.062802	5.696077	4.319885	17.27954	36.5221226				
	z3	0.063863	0.068003	0.006615445	0.227044	0.24029	1.159055695	0.009863	0.89454	0.695847	2.7833892	5.132031671				
	z4	3.743294	3.985969	0.4186779	14.36912	-46.6788	-225.1589904	-0.11453	-10.3874	42.93555	171.7422	-45.4490651				
5ta Iteracion	z1	0.988173	1.876799	0.02128394	0.777335	-0.02521	-0.129374977	0.000992	-0.0451	0.037038	-0.22223082	2.257428195	RS5 =	5.284685	IRI =	3.750074
	z2	-0.92852	-1.7635	0.9001616	32.87581	-3.39137	-17.40461312	0.062802	-2.85428	4.319885	-25.91931	-15.06588345				
	z3	0.063863	0.121293	0.006615445	0.24161	0.24029	1.233173837	0.009863	-0.44825	0.695847	-4.1750838	-3.027256371				
	z4	3.743294	7.109497	0.4186779	15.29101	-46.6788	-239.5572339	-0.11453	5.205059	42.93555	-257.6133	-469.5649723				

FIGURA 3.15: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 154m a 165m.*

N°	Dist	Cota	Y'
1	154.00	3817.900	
2	154.50	3817.899	-2.00
3	155.00	3817.896	-6.00
4	155.50	3817.896	0.00
5	156.00	3817.894	-4.00
6	156.50	3817.896	4.00
7	157.00	3817.894	-4.00
8	157.50	3817.894	0.00
9	158.00	3817.893	-2.00
10	158.50	3817.891	-4.00
11	159.00	3817.889	-4.00
12	159.50	3817.889	0.00
13	160.00	3817.888	-2.00
14	160.50	3817.887	-2.00
15	161.00	3817.889	4.00
16	161.50	3817.887	-4.00
17	162.00	3817.886	-2.00
18	162.50	3817.886	0.00
19	163.00	3817.887	2.00
20	163.50	3817.889	4.00
21	164.00	3817.890	2.00
22	164.50	3817.891	2.00
23	165.00	3817.892	2.00

IRI **1.9586**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.72727273
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input}$ (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.71867	0.02128394	0	-0.02521	0.018334044	0.000992	0	0.037038	-0.07407694	-0.774413951	RS1 =	0.838483	IRI =	0.838483
	z2	-0.92852	0.675284	0.9001616	0	-3.39137	2.466450182	0.062802	0	4.319885	-8.63977	-5.498035456				
	z3	0.063863	-0.04645	0.006615445	0	0.24029	-0.174756073	0.009863	0	0.695847	-1.3916946	-1.61289668				
	z4	3.743294	-2.7224	0.4186779	0	-46.6788	33.94824	-0.11453	0	42.93555	-85.8711	-54.64525565				
2da Iteracion	z1	0.988173	-0.76525	0.02128394	-0.11702	-0.02521	0.040660012	0.000992	-0.05423	0.037038	-0.22223082	-1.118070778	RS2 =	4.069353	IRI =	2.453918
	z2	-0.92852	0.719056	0.9001616	-4.94912	-3.39137	5.469927802	0.062802	-3.43181	4.319885	-25.91931	-28.11126016				
	z3	0.063863	-0.04946	0.006615445	-0.03637	0.24029	-0.387562298	0.009863	-0.53895	0.695847	-4.1750838	-5.187423319				
	z4	3.743294	-2.89886	0.4186779	-2.30191	-46.6788	75.28812995	-0.11453	6.258253	42.93555	-257.6133	-181.2676817				
3ra Iteracion	z1	0.988173	-1.10485	0.02128394	-0.59832	-0.02521	0.130771363	0.000992	-0.17987	0.037038	0	-1.752268943	RS3 =	1.539372	IRI =	2.149069
	z2	-0.92852	1.038147	0.9001616	-25.3047	-3.39137	17.59246663	0.062802	-11.3839	4.319885	0	-18.05797681				
	z3	0.063863	-0.0714	0.006615445	-0.18597	0.24029	-1.246483874	0.009863	-1.78779	0.695847	0	-3.291641154				
	z4	3.743294	-4.18527	0.4186779	-11.7696	-46.6788	242.1428512	-0.11453	20.7597	42.93555	0	246.9477196				
4ta Iteracion	z1	0.988173	-1.73154	0.02128394	-0.38434	-0.02521	0.082980002	0.000992	0.24505	0.037038	-0.14815388	-1.936012809	RS4 =	0.565876	IRI =	1.753271
	z2	-0.92852	1.62701	0.9001616	-16.2551	-3.39137	11.16316977	0.062802	15.50873	4.319885	-17.27954	-5.235728588				
	z3	0.063863	-0.11191	0.006615445	-0.11946	0.24029	-0.790947136	0.009863	2.435566	0.695847	-2.7833892	-1.37013716				
	z4	3.743294	-6.55926	0.4186779	-7.56048	-46.6788	153.6499578	-0.11453	-28.2817	42.93555	-171.7422	-60.49368807				
5ta Iteracion	z1	0.988173	-1.91312	0.02128394	-0.11144	-0.02521	0.034540212	0.000992	-0.06003	0.037038	0.14815388	-1.90188673	RS5 =	3.60114	IRI =	2.122845
	z2	-0.92852	1.797619	0.9001616	-4.713	-3.39137	4.646640691	0.062802	-3.7991	4.319885	17.27954	15.2116931				
	z3	0.063863	-0.12364	0.006615445	-0.03464	0.24029	-0.32922971	0.009863	-0.59663	0.695847	2.7833892	1.699252838				
	z4	3.743294	-7.24707	0.4186779	-2.19208	-46.6788	63.95639958	-0.11453	6.928046	42.93555	171.7422	233.1874963				

FIGURA 3.16: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 165m a 176m.*

N°	Dist	Cota	Y'
1	165.00	3817.892	
2	165.50	3817.891	-2.00
3	166.00	3817.893	4.00
4	166.50	3817.895	4.00
5	167.00	3817.896	2.00
6	167.50	3817.894	-4.00
7	168.00	3817.895	2.00
8	168.50	3817.896	2.00
9	169.00	3817.896	0.00
10	169.50	3817.894	-4.00
11	170.00	3817.893	-2.00
12	170.50	3817.894	2.00
13	171.00	3817.894	0.00
14	171.50	3817.897	6.00
15	172.00	3817.898	2.00
16	172.50	3817.896	-4.00
17	173.00	3817.894	-4.00
18	173.50	3817.892	-4.00
19	174.00	3817.890	-4.00
20	174.50	3817.888	-4.00
21	175.00	3817.886	-4.00
22	175.50	3817.885	-2.00
23	176.00	3817.882	-6.00

IRI | **3.1714**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.90909091
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.89834	0.02128394	0	-0.02521	0.022917555	0.000992	0	0.037038	-0.07407694	-0.949498204	RS1 =	0.718699	IRI =	0.718699
	z2	-0.92852	0.844105	0.9001616	0	-3.39137	3.083062727	0.062802	0	4.319885	-8.63977	-4.712601816				
	z3	0.063863	-0.05806	0.006615445	0	0.24029	-0.218445091	0.009863	0	0.695847	-1.3916946	-1.6681972				
	z4	3.743294	-3.40299	0.4186779	0	-46.6788	42.4353	-0.11453	0	42.93555	-85.8711	-46.83879452				
2da Iteracion	z1	0.988173	-0.93827	0.02128394	-0.1003	-0.02521	0.0420541	0.000992	-0.04648	0.037038	0.14815388	-0.894841866	RS2 =	2.723611	IRI =	1.721155
	z2	-0.92852	0.881624	0.9001616	-4.2421	-3.39137	5.657472269	0.062802	-2.94155	4.319885	17.27954	16.63497883				
	z3	0.063863	-0.06064	0.006615445	-0.03118	0.24029	-0.400850438	0.009863	-0.46196	0.695847	2.7833892	1.828768711				
	z4	3.743294	-3.55425	0.4186779	-1.97306	-46.6788	77.86949349	-0.11453	5.364218	42.93555	171.7422	249.448598				
3ra Iteracion	z1	0.988173	-0.88426	0.02128394	0.354058	-0.02521	-0.046101997	0.000992	0.247532	0.037038	0.14815388	-0.180616569	RS3 =	5.916572	IRI =	3.119627
	z2	-0.92852	0.830875	0.9001616	14.97417	-3.39137	-6.202029516	0.062802	15.66579	4.319885	17.27954	42.54834317				
	z3	0.063863	-0.05715	0.006615445	0.110048	0.24029	0.439434102	0.009863	2.460232	0.695847	2.7833892	5.735955269				
	z4	3.743294	-3.34966	0.4186779	6.964698	-46.6788	-85.36478379	-0.11453	-28.5681	42.93555	171.7422	61.4243324				
4ta Iteracion	z1	0.988173	-0.17848	0.02128394	0.905596	-0.02521	-0.144539475	0.000992	0.060952	0.037038	0.07407694	0.717545864	RS4 =	2.928189	IRI =	3.071768
	z2	-0.92852	0.167705	0.9001616	38.30038	-3.39137	-19.45274088	0.062802	3.857551	4.319885	8.639769998	31.5126698				
	z3	0.063863	-0.01153	0.006615445	0.281476	0.24029	1.378290397	0.009863	0.605809	0.695847	1.3916946	3.645734993				
	z4	3.743294	-0.6761	0.4186779	17.81405	-46.6788	-267.7476809	-0.11453	-7.03463	42.93555	85.87109998	-171.7732587				
5ta Iteracion	z1	0.988173	0.709059	0.02128394	0.670714	-0.02521	-0.091906464	0.000992	-0.17045	0.037038	-0.14815388	0.969259225	RS5 =	4.316466	IRI =	3.320707
	z2	-0.92852	-0.66625	0.9001616	28.3665	-3.39137	-12.36403264	0.062802	-10.7876	4.319885	-17.27954	-12.73097769				
	z3	0.063863	0.045825	0.006615445	0.20847	0.24029	0.876032203	0.009863	-1.69414	0.695847	-2.7833892	-3.347206528				
	z4	3.743294	2.685985	0.4186779	13.19366	-46.6788	-170.1786439	-0.11453	19.67235	42.93555	-171.7422	-306.3688508				

FIGURA 3.17: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 176m a 187m.*

N°	Dist	Cota	Y'
1	176.00	3817.882	
2	176.50	3817.880	-4.00
3	177.00	3817.878	-4.00
4	177.50	3817.877	-2.00
5	178.00	3817.876	-2.00
6	178.50	3817.875	-2.00
7	179.00	3817.873	-4.00
8	179.50	3817.871	-4.00
9	180.00	3817.867	-8.00
10	180.50	3817.865	-4.00
11	181.00	3817.864	-2.00
12	181.50	3817.862	-4.00
13	182.00	3817.861	-2.00
14	182.50	3817.859	-4.00
15	183.00	3817.858	-2.00
16	183.50	3817.855	-6.00
17	184.00	3817.853	-4.00
18	184.50	3817.852	-2.00
19	185.00	3817.850	-4.00
20	185.50	3817.849	-2.00
21	186.00	3817.849	0.00
22	186.50	3817.848	-2.00
23	187.00	3817.846	-4.00

IRI **1.5385**

ya = cota N° 23 **a=11/dx+1=** 0.5

y1 = cota N° 1

z1' = z3' = (ya-y1)/11 = -3.27272727

z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-3.23402	0.02128394	0	-0.02521	0.082503196	0.000992	0	0.037038	-0.14815388	-3.299670429	RS1 =	0.479128	IRI =	0.479128
	z2	-0.92852	3.03878	0.9001616	0	-3.39137	11.09902582	0.062802	0	4.319885	-17.27954	-3.141734549				
	z3	0.063863	-0.20901	0.006615445	0	0.24029	-0.786402327	0.009863	0	0.695847	-2.7833892	-3.778798561				
	z4	3.743294	-12.2508	0.4186779	0	-46.6788	152.76708	-0.11453	0	42.93555	-171.7422	-31.2259004				
2da Iteracion	z1	0.988173	-3.26064	0.02128394	-0.06687	-0.02521	0.095260904	0.000992	-0.03099	0.037038	-0.14815388	-3.411391679	RS2 =	0.819486	IRI =	0.649307
	z2	-0.92852	3.063797	0.9001616	-2.82807	-3.39137	12.8153003	0.062802	-1.96104	4.319885	-17.27954	-6.189550406				
	z3	0.063863	-0.21073	0.006615445	-0.02078	0.24029	-0.908005995	0.009863	-0.30797	0.695847	-2.7833892	-4.230877941				
	z4	3.743294	-12.3516	0.4186779	-1.31537	-46.6788	176.3898956	-0.11453	3.576149	42.93555	-171.7422	-5.44316636				
3ra Iteracion	z1	0.988173	-3.37104	0.02128394	-0.13174	-0.02521	0.106657514	0.000992	-0.0054	0.037038	-0.07407694	-3.475602915	RS3 =	0.754779	IRI =	0.684464
	z2	-0.92852	3.167532	0.9001616	-5.5716	-3.39137	14.34846829	0.062802	-0.34184	4.319885	-8.63977	2.962794514				
	z3	0.063863	-0.21786	0.006615445	-0.04095	0.24029	-1.016635968	0.009863	-0.05368	0.695847	-1.3916946	-2.720824				
	z4	3.743294	-12.7698	0.4186779	-2.59143	-46.6788	197.4924321	-0.11453	0.623379	42.93555	-85.8711	96.88344136				
4ta Iteracion	z1	0.988173	-3.4345	0.02128394	0.06306	-0.02521	0.068590096	0.000992	0.096139	0.037038	-0.07407694	-3.280783783	RS4 =	1.988471	IRI =	1.010466
	z2	-0.92852	3.227153	0.9001616	2.666394	-3.39137	9.227318167	0.062802	6.084442	4.319885	-8.63977	12.56613684				
	z3	0.063863	-0.22196	0.006615445	0.0196	0.24029	-0.653785711	0.009863	0.95553	0.695847	-1.3916946	-1.29231306				
	z4	3.743294	-13.0102	0.4186779	1.240457	-46.6788	127.0048809	-0.11453	-11.0956	42.93555	-85.8711	18.26844816				
5ta Iteracion	z1	0.988173	-3.24198	0.02128394	0.267457	-0.02521	0.032578321	0.000992	0.018128	0.037038	-0.07407694	-2.397894604	RS5 =	1.349456	IRI =	1.078264
	z2	-0.92852	3.04626	0.9001616	11.31155	-3.39137	4.38271045	0.062802	1.147289	4.319885	-8.63977	11.24804359				
	z3	0.063863	-0.20952	0.006615445	0.083131	0.24029	-0.310529388	0.009863	0.180176	0.695847	-1.3916946	-1.64843909				
	z4	3.743294	-12.2809	0.4186779	5.261164	-46.6788	60.32366163	-0.11453	-2.0922	42.93555	-85.8711	-34.65940867				

FIGURA 3.18: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 187m a 198m.*

N°	Dist	Cota	Y'
1	187.00	3817.846	
2	187.50	3817.847	2.00
3	188.00	3817.847	0.00
4	188.50	3817.844	-6.00
5	189.00	3817.841	-6.00
6	189.50	3817.840	-2.00
7	190.00	3817.839	-2.00
8	190.50	3817.839	0.00
9	191.00	3817.837	-4.00
10	191.50	3817.836	-2.00
11	192.00	3817.837	2.00
12	192.50	3817.840	6.00
13	193.00	3817.841	2.00
14	193.50	3817.844	6.00
15	194.00	3817.841	-6.00
16	194.50	3817.843	4.00
17	195.00	3817.848	10.00
18	195.50	3817.848	0.00
19	196.00	3817.847	-2.00
20	196.50	3817.847	0.00
21	197.00	3817.848	2.00
22	197.50	3817.848	0.00
23	198.00	3817.849	2.00

IRI | **3.7204**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.272727273
z2' = **z4'** = 0

$$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.269502	0.02128394	0	-0.02521	-0.006875266	0.000992	0	0.037038	0.07407694	0.336703319	RS1 =	1.137942	IRI =	1.137942
	z2	-0.92852	-0.25323	0.9001616	0	-3.39137	-0.924918818	0.062802	0	4.319885	8.639769998	7.461619543				
	z3	0.063863	0.017417	0.006615445	0	0.24029	0.065533527	0.009863	0	0.695847	1.3916946	1.47464538				
	z4	3.743294	1.020898	0.4186779	0	-46.6788	-12.73059	-0.11453	0	42.93555	85.87109998	74.16140834				
2da Iteracion	z1	0.988173	0.332721	0.02128394	0.158813	-0.02521	-0.037174793	0.000992	0.073592	0.037038	0	0.527950487	RS2 =	0.628687	IRI =	0.883314
	z2	-0.92852	-0.31263	0.9001616	6.716663	-3.39137	-5.001066627	0.062802	4.65746	4.319885	0	6.060422635				
	z3	0.063863	0.021503	0.006615445	0.049362	0.24029	0.354341948	0.009863	0.73143	0.695847	0	1.156637093				
	z4	3.743294	1.26038	0.4186779	3.124015	-46.6788	-68.83472099	-0.11453	-8.49334	42.93555	0	-72.94366898				
3ra Iteracion	z1	0.988173	0.521706	0.02128394	0.12899	-0.02521	-0.029158023	0.000992	-0.07238	0.037038	-0.22223082	0.326923881	RS3 =	4.869691	IRI =	2.212107
	z2	-0.92852	-0.49021	0.9001616	5.45536	-3.39137	-3.92258318	0.062802	-4.58098	4.319885	-25.91931	-29.45772814				
	z3	0.063863	0.033717	0.006615445	0.040092	0.24029	0.277927864	0.009863	-0.71942	0.695847	-4.1750838	-4.542766969				
	z4	3.743294	1.976274	0.4186779	2.537365	-46.6788	-53.99046622	-0.11453	8.353881	42.93555	-257.6133	-298.7362463				
4ta Iteracion	z1	0.988173	0.323057	0.02128394	-0.62638	-0.02521	0.114520021	0.000992	-0.29644	0.037038	-0.22223082	-0.70807097	RS4 =	7.67893	IRI =	3.578812
	z2	-0.92852	-0.30355	0.9001616	-26.5167	-3.39137	15.40619907	0.062802	-18.7611	4.319885	-25.91931	-56.09451584				
	z3	0.063863	0.020878	0.006615445	-0.19488	0.24029	-1.091579658	0.009863	-2.94634	0.695847	-4.1750838	-8.387001015				
	z4	3.743294	1.223772	0.4186779	-12.3333	-46.6788	212.0510471	-0.11453	34.2128	42.93555	-257.6133	-22.45898203				
5ta Iteracion	z1	0.988173	-0.6997	0.02128394	-1.19391	-0.02521	0.211430509	0.000992	-0.02229	0.037038	-0.07407694	-1.778541561	RS5 =	2.266278	IRI =	3.316305
	z2	-0.92852	0.657455	0.9001616	-50.4941	-3.39137	28.44341525	0.062802	-1.41046	4.319885	-8.63977	-31.44349024				
	z3	0.063863	-0.04522	0.006615445	-0.37109	0.24029	-2.015309119	0.009863	-0.22151	0.695847	-1.3916946	-4.044813377				
	z4	3.743294	-2.65052	0.4186779	-23.4855	-46.6788	391.4953946	-0.11453	2.572117	42.93555	-85.8711	282.0603598				

FIGURA 3.19: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 198m a 209m.*

N°	Dist	Cota	Y'
1	198.00	3817.849	
2	198.50	3817.849	0.00
3	199.00	3817.850	2.00
4	199.50	3817.852	4.00
5	200.00	3817.854	4.00
6	200.50	3817.851	-6.00
7	201.00	3817.852	2.00
8	201.50	3817.854	4.00
9	202.00	3817.852	-4.00
10	202.50	3817.850	-4.00
11	203.00	3817.847	-6.00
12	203.50	3817.845	-4.00
13	204.00	3817.840	-10.00
14	204.50	3817.838	-4.00
15	205.00	3817.836	-4.00
16	205.50	3817.837	2.00
17	206.00	3817.835	-4.00
18	206.50	3817.834	-2.00
19	207.00	3817.833	-2.00
20	207.50	3817.832	-2.00
21	208.00	3817.831	-2.00
22	208.50	3817.829	-4.00
23	209.00	3817.827	-4.00

IRI	3.2675

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.97635	0.02128394	0	-0.02521	0.05041862	0.000992	0	0.037038	0	-1.92592678	RS1 =	1.317621	IRI =	1.317621
	z2	-0.92852	1.857032	0.9001616	0	-3.39137	6.782738	0.062802	0	4.319885	0	8.63977				
	z3	0.063863	-0.12773	0.006615445	0	0.24029	-0.4805792	0.009863	0	0.695847	0	-0.60830572				
	z4	3.743294	-7.48659	0.4186779	0	-46.6788	93.35766	-0.11453	0	42.93555	0	85.871072				
2da Iteracion	z1	0.988173	-1.90315	0.02128394	0.183888	-0.02521	0.015334967	0.000992	0.085211	0.037038	0.07407694	-1.544636731	RS2 =	3.571241	IRI =	2.444431
	z2	-0.92852	1.788254	0.9001616	7.777189	-3.39137	2.062989161	0.062802	5.392847	4.319885	8.639770002	25.66104891				
	z3	0.063863	-0.123	0.006615445	0.057156	0.24029	-0.146169538	0.009863	0.846919	0.695847	1.3916946	2.026603927				
	z4	3.743294	-7.20931	0.4186779	3.617281	-46.6788	28.39439929	-0.11453	-9.83439	42.93555	85.87110002	100.8396768				
3ra Iteracion	z1	0.988173	-1.52637	0.02128394	0.546168	-0.02521	-0.051089287	0.000992	0.100065	0.037038	0.14815388	-0.783070155	RS3 =	5.119094	IRI =	3.335985
	z2	-0.92852	1.43422	0.9001616	23.09909	-3.39137	-6.872961734	0.062802	6.3329	4.319885	17.27954	41.27278913				
	z3	0.063863	-0.09865	0.006615445	0.169759	0.24029	0.486971847	0.009863	0.994549	0.695847	2.7833892	4.336024231				
	z4	3.743294	-5.78203	0.4186779	10.74371	-46.6788	-94.59950019	-0.11453	-11.5487	42.93555	171.7422	70.5557104				
4ta Iteracion	z1	0.988173	-0.77381	0.02128394	0.878448	-0.02521	-0.109308179	0.000992	0.070014	0.037038	0.14815388	0.213498315	RS4 =	4.530689	IRI =	3.634661
	z2	-0.92852	0.727093	0.9001616	37.15218	-3.39137	-14.70505816	0.062802	4.431016	4.319885	17.27954	44.88477135				
	z3	0.063863	-0.05001	0.006615445	0.273038	0.24029	1.041901528	0.009863	0.695868	0.695847	2.7833892	4.744187575				
	z4	3.743294	-2.93126	0.4186779	17.28	-46.6788	-202.400538	-0.11453	-8.0804	42.93555	171.7422	-24.38999488				
5ta Iteracion	z1	0.988173	0.210973	0.02128394	0.955325	-0.02521	-0.119597695	0.000992	-0.0242	0.037038	-0.22223082	0.800266877	RS5 =	3.765355	IRI =	3.6608
	z2	-0.92852	-0.19824	0.9001616	40.40355	-3.39137	-16.08929067	0.062802	-1.53173	4.319885	-25.91931	-3.335022089				
	z3	0.063863	0.013635	0.006615445	0.296933	0.24029	1.139978935	0.009863	-0.24055	0.695847	-4.1750838	-2.965088145				
	z4	3.743294	0.799187	0.4186779	18.79226	-46.6788	-221.4531253	-0.11453	2.793267	42.93555	-257.6133	-456.6817099				

FIGURA 3.20: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 209m a 220m.*

N°	Dist	Cota	Y'
1	209.00	3817.827	
2	209.50	3817.825	-4.00
3	210.00	3817.826	2.00
4	210.50	3817.825	-2.00
5	211.00	3817.823	-4.00
6	211.50	3817.822	-2.00
7	212.00	3817.821	-2.00
8	212.50	3817.820	-2.00
9	213.00	3817.820	0.00
10	213.50	3817.821	2.00
11	214.00	3817.821	0.00
12	214.50	3817.822	2.00
13	215.00	3817.823	2.00
14	215.50	3817.823	0.00
15	216.00	3817.829	12.00
16	216.50	3817.833	8.00
17	217.00	3817.832	-2.00
18	217.50	3817.832	0.00
19	218.00	3817.830	-4.00
20	218.50	3817.829	-2.00
21	219.00	3817.828	-2.00
22	219.50	3817.830	4.00
23	220.00	3817.832	4.00

IRI 3.2132

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 0.454545455
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.449169	0.02128394	0	-0.02521	-0.011458777	0.000992	0	0.037038	-0.14815388	0.289556752	RS1 =	2.934695	IRI =	2.934695
	z2	-0.92852	-0.42205	0.9001616	0	-3.39137	-1.541531364	0.062802	0	4.319885	-17.27954	-19.24312409				
	z3	0.063863	0.029029	0.006615445	0	0.24029	0.109222545	0.009863	0	0.695847	-2.7833892	-2.6451379				
	z4	3.743294	1.701497	0.4186779	0	-46.6788	-21.21765	-0.11453	0	42.93555	-171.7422	-191.2583527				
2da Iteracion	z1	0.988173	0.286132	0.02128394	-0.40957	-0.02521	0.066682101	0.000992	-0.18979	0.037038	0.07407694	-0.172467199	RS2 =	1.066567	IRI =	2.000631
	z2	-0.92852	-0.26886	0.9001616	-17.3219	-3.39137	8.970638675	0.062802	-12.0113	4.319885	8.639770002	-11.99171472				
	z3	0.063863	0.018492	0.006615445	-0.1273	0.24029	-0.635599128	0.009863	-1.88632	0.695847	1.3916946	-1.239034249				
	z4	3.743294	1.083896	0.4186779	-8.05667	-46.6788	123.4719424	-0.11453	21.90388	42.93555	85.87110002	224.2741496				
3ra Iteracion	z1	0.988173	-0.17043	0.02128394	-0.25523	-0.02521	0.031235198	0.000992	0.222551	0.037038	-0.07407694	-0.245949117	RS3 =	0.678127	IRI =	1.559796
	z2	-0.92852	0.160139	0.9001616	-10.7945	-3.39137	4.202022341	0.062802	14.08479	4.319885	-8.63977	-0.987299085				
	z3	0.063863	-0.01101	0.006615445	-0.07933	0.24029	-0.297727044	0.009863	2.211944	0.695847	-1.3916946	0.432177679				
	z4	3.743294	-0.6456	0.4186779	-5.02067	-46.6788	57.83666906	-0.11453	-25.685	42.93555	-85.8711	-59.38571174				
4ta Iteracion	z1	0.988173	-0.24304	0.02128394	-0.02101	-0.02521	-0.010894901	0.000992	-0.05893	0.037038	-0.14815388	-0.48203202	RS4 =	2.80545	IRI =	1.87121
	z2	-0.92852	0.228368	0.9001616	-0.88873	-3.39137	-1.465673982	0.062802	-3.72952	4.319885	-17.27954	-23.13509689				
	z3	0.063863	-0.01571	0.006615445	-0.00653	0.24029	0.103847802	0.009863	-0.5857	0.695847	-2.7833892	-3.287482205				
	z4	3.743294	-0.92066	0.4186779	-0.41336	-46.6788	-20.1735484	-0.11453	6.801155	42.93555	-171.7422	-186.448614				
5ta Iteracion	z1	0.988173	-0.47633	0.02128394	-0.49241	-0.02521	0.082875158	0.000992	-0.18502	0.037038	-0.07407694	-1.144954715	RS5 =	3.059404	IRI =	2.108848
	z2	-0.92852	0.447574	0.9001616	-20.8253	-3.39137	11.14906524	0.062802	-11.7093	4.319885	-8.63977	-29.57774047				
	z3	0.063863	-0.03078	0.006615445	-0.15305	0.24029	-0.789947784	0.009863	-1.83888	0.695847	-1.3916946	-4.204358497				
	z4	3.743294	-1.80439	0.4186779	-9.68615	-46.6788	153.455823	-0.11453	21.35305	42.93555	-85.8711	77.44722781				

FIGURA 3.21: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 220m a 231m.*

N°	Dist	Cota	Y'
1	220.00	3817.832	
2	220.50	3817.829	-6.00
3	221.00	3817.829	0.00
4	221.50	3817.829	0.00
5	222.00	3817.827	-4.00
6	222.50	3817.827	0.00
7	223.00	3817.827	0.00
8	223.50	3817.830	6.00
9	224.00	3817.828	-4.00
10	224.50	3817.827	-2.00
11	225.00	3817.826	-2.00
12	225.50	3817.825	-2.00
13	226.00	3817.824	-2.00
14	226.50	3817.824	0.00
15	227.00	3817.823	-2.00
16	227.50	3817.822	-2.00
17	228.00	3817.820	-4.00
18	228.50	3817.818	-4.00
19	229.00	3817.814	-8.00
20	229.50	3817.815	2.00
21	230.00	3817.813	-4.00
22	230.50	3817.812	-2.00
23	231.00	3817.815	6.00

IRI	2.2255

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -1.54545455
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.52718	0.02128394	0	-0.02521	0.038959843	0.000992	0	0.037038	-0.22223082	-1.710446968	RS1 =	2.934691	IRI =	2.934691
	z2	-0.92852	1.434979	0.9001616	0	-3.39137	5.241206636	0.062802	0	4.319885	-25.91931	-19.24312409				
	z3	0.063863	-0.0987	0.006615445	0	0.24029	-0.371356655	0.009863	0	0.695847	-4.1750838	-4.64513822				
	z4	3.743294	-5.78509	0.4186779	0	-46.6788	72.14001	-0.11453	0	42.93555	-257.6133	-191.2583807				
2da Iteracion	z1	0.988173	-1.69022	0.02128394	-0.40957	-0.02521	0.117100729	0.000992	-0.18979	0.037038	0	-2.172474615	RS2 =	1.066561	IRI =	2.000626
	z2	-0.92852	1.588177	0.9001616	-17.3219	-3.39137	15.75337776	0.062802	-12.0113	4.319885	0	-11.99171195				
	z3	0.063863	-0.10923	0.006615445	-0.1273	0.24029	-1.116178405	0.009863	-1.88632	0.695847	0	-3.23903516				
	z4	3.743294	-6.40271	0.4186779	-8.05667	-46.6788	216.8296173	-0.11453	21.90389	42.93555	0	224.2741258				
3ra Iteracion	z1	0.988173	-2.14678	0.02128394	-0.25523	-0.02521	0.081653841	0.000992	0.222551	0.037038	0	-2.097806226	RS3 =	3.313372	IRI =	2.438208
	z2	-0.92852	2.017177	0.9001616	-10.7945	-3.39137	10.98476343	0.062802	14.08479	4.319885	0	16.2922519				
	z3	0.063863	-0.13874	0.006615445	-0.07933	0.24029	-0.778306463	0.009863	2.211944	0.695847	0	1.21556565				
	z4	3.743294	-8.13221	0.4186779	-5.02066	-46.6788	151.1943716	-0.11453	-25.685	42.93555	0	112.3564789				
4ta Iteracion	z1	0.988173	-2.07299	0.02128394	0.346763	-0.02521	-0.030643571	0.000992	0.111493	0.037038	-0.14815388	-1.793535794	RS4 =	0.384178	IRI =	1.9247
	z2	-0.92852	1.947847	0.9001616	14.66566	-3.39137	-4.122431664	0.062802	7.056175	4.319885	-17.27954	2.267709032				
	z3	0.063863	-0.13397	0.006615445	0.10778	0.24029	0.292087784	0.009863	1.108136	0.695847	-2.7833892	-1.409357666				
	z4	3.743294	-7.85271	0.4186779	6.821206	-46.6788	-56.74118235	-0.11453	-12.8676	42.93555	-171.7422	-242.382519				
5ta Iteracion	z1	0.988173	-1.77232	0.02128394	0.048266	-0.02521	0.035528934	0.000992	-0.24052	0.037038	0	-1.929048564	RS5 =	0.899686	IRI =	1.719698
	z2	-0.92852	1.665327	0.9001616	2.041305	-3.39137	4.7796519	0.062802	-15.222	4.319885	0	-6.735743799				
	z3	0.063863	-0.11454	0.006615445	0.015002	0.24029	-0.33865399	0.009863	-2.39054	0.695847	0	-2.828734351				
	z4	3.743294	-6.71373	0.4186779	0.94944	-46.6788	65.78716692	-0.11453	27.75888	42.93555	0	87.78175702				

FIGURA 3.22: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 231m a 242m.*

N°	Dist	Cota	Y'
1	231.00	3817.815	
2	231.50	3817.818	6.00
3	232.00	3817.818	0.00
4	232.50	3817.814	-8.00
5	233.00	3817.813	-2.00
6	233.50	3817.813	0.00
7	234.00	3817.812	-2.00
8	234.50	3817.810	-4.00
9	235.00	3817.808	-4.00
10	235.50	3817.804	-8.00
11	236.00	3817.807	6.00
12	236.50	3817.805	-4.00
13	237.00	3817.803	-4.00
14	237.50	3817.803	0.00
15	238.00	3817.802	-2.00
16	238.50	3817.800	-4.00
17	239.00	3817.801	2.00
18	239.50	3817.802	2.00
19	240.00	3817.804	4.00
20	240.50	3817.803	-2.00
21	241.00	3817.804	2.00
22	241.50	3817.805	2.00
23	242.00	3817.804	-2.00

IRI	3.3198

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -1
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.98817	0.02128394	0	-0.02521	0.02520931	0.000992	0	0.037038	0.22223082	-0.74073257	RS1 =	4.611664	IRI =	4.611664
	z2	-0.92852	0.928516	0.9001616	0	-3.39137	3.391369	0.062802	0	4.319885	25.91931	30.239195				
	z3	0.063863	-0.06386	0.006615445	0	0.24029	-0.2402896	0.009863	0	0.695847	4.1750838	3.87093094				
	z4	3.743294	-3.74329	0.4186779	0	-46.6788	46.67883	-0.11453	0	42.93555	257.6133	300.548836				
2da Iteracion	z1	0.988173	-0.73197	0.02128394	0.643609	-0.02521	-0.097583498	0.000992	0.29824	0.037038	0	0.112293579	RS2 =	3.934808	IRI =	4.273236
	z2	-0.92852	0.687782	0.9001616	27.22016	-3.39137	-13.12775519	0.062802	18.87497	4.319885	0	33.65515782				
	z3	0.063863	-0.04731	0.006615445	0.200046	0.24029	0.930144447	0.009863	2.964217	0.695847	0	4.047101575				
	z4	3.743294	-2.77278	0.4186779	12.66048	-46.6788	-180.6905273	-0.11453	-34.4204	42.93555	0	-205.2232099				
3ra Iteracion	z1	0.988173	0.110965	0.02128394	0.716314	-0.02521	-0.102024638	0.000992	-0.20365	0.037038	-0.29630776	0.225301034	RS3 =	6.613839	IRI =	5.053437
	z2	-0.92852	-0.10427	0.9001616	30.29508	-3.39137	-13.72521482	0.062802	-12.8884	4.319885	-34.55908	-30.9818408				
	z3	0.063863	0.007171	0.006615445	0.222644	0.24029	0.972476419	0.009863	-2.02405	0.695847	-5.5667784	-6.388537549				
	z4	3.743294	0.420348	0.4186779	14.09067	-46.6788	-188.9139664	-0.11453	23.50321	42.93555	-343.4844	-494.3841391				
4ta Iteracion	z1	0.988173	0.222636	0.02128394	-0.65942	-0.02521	0.161050624	0.000992	-0.49059	0.037038	-0.07407694	-0.840391165	RS4 =	7.152925	IRI =	5.578309
	z2	-0.92852	-0.2092	0.9001616	-27.8887	-3.39137	21.6658882	0.062802	-31.0481	4.319885	-8.63977	-46.11989035				
	z3	0.063863	0.014388	0.006615445	-0.20496	0.24029	-1.535099132	0.009863	-4.87595	0.695847	-1.3916946	-7.993316498				
	z4	3.743294	0.843368	0.4186779	-12.9714	-46.6788	298.2094582	-0.11453	56.61939	42.93555	-85.8711	256.8297072				
5ta Iteracion	z1	0.988173	-0.83045	0.02128394	-0.98161	-0.02521	0.201505994	0.000992	0.254856	0.037038	0	-1.355702236	RS5 =	1.609247	IRI =	4.784496
	z2	-0.92852	0.780317	0.9001616	-41.5154	-3.39137	27.10828578	0.062802	16.12933	4.319885	0	2.502582646				
	z3	0.063863	-0.05367	0.006615445	-0.3051	0.24029	-1.920710824	0.009863	2.533029	0.695847	0	0.253544675				
	z4	3.743294	-3.14583	0.4186779	-19.3094	-46.6788	373.118662	-0.11453	-29.4134	42.93555	0	321.250004				

FIGURA 3.23: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 242m a 253m.*

N°	Dist	Cota	Y'
1	242.00	3817.804	
2	242.50	3817.806	4.00
3	243.00	3817.805	-2.00
4	243.50	3817.804	-2.00
5	244.00	3817.805	2.00
6	244.50	3817.805	0.00
7	245.00	3817.806	2.00
8	245.50	3817.805	-2.00
9	246.00	3817.804	-2.00
10	246.50	3817.807	6.00
11	247.00	3817.804	-6.00
12	247.50	3817.805	2.00
13	248.00	3817.810	10.00
14	248.50	3817.811	2.00
15	249.00	3817.813	4.00
16	249.50	3817.815	4.00
17	250.00	3817.816	2.00
18	250.50	3817.817	2.00
19	251.00	3817.818	2.00
20	251.50	3817.820	4.00
21	252.00	3817.818	-4.00
22	252.50	3817.820	4.00
23	253.00	3817.821	2.00

IRI | **2.1045**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 1.545454545
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	1.527176	0.02128394	0	-0.02521	-0.038959843	0.000992	0	0.037038	0.14815388	1.636370028	RS1 =	1.617074	IRI =	1.617074
	z2	-0.92852	-1.43498	0.9001616	0	-3.39137	-5.241206636	0.062802	0	4.319885	17.27954	10.60335409				
	z3	0.063863	0.098698	0.006615445	0	0.24029	0.371356655	0.009863	0	0.695847	2.7833892	3.25344362				
	z4	3.743294	5.785091	0.4186779	0	-46.6788	-72.14001	-0.11453	0	42.93555	171.7422	105.3872807				
2da Iteracion	z1	0.988173	1.617016	0.02128394	0.225681	-0.02521	-0.082017069	0.000992	0.104578	0.037038	-0.07407694	1.79118087	RS2 =	1.187056	IRI =	1.402065
	z2	-0.92852	-1.5194	0.9001616	9.544732	-3.39137	-11.03362784	0.062802	6.618497	4.319885	-8.63977	-5.029564181				
	z3	0.063863	0.104504	0.006615445	0.070146	0.24029	0.781768666	0.009863	1.039401	0.695847	-1.3916946	0.604124922				
	z4	3.743294	6.125414	0.4186779	4.43939	-46.6788	-151.8669416	-0.11453	-12.0695	42.93555	-85.8711	-239.2427264				
3ra Iteracion	z1	0.988173	1.769996	0.02128394	-0.10705	-0.02521	-0.015229572	0.000992	-0.2374	0.037038	-0.07407694	1.336236077	RS3 =	4.861222	IRI =	2.555117
	z2	-0.92852	-1.66314	0.9001616	-4.52742	-3.39137	-2.048810533	0.062802	-15.0248	4.319885	-8.63977	-31.90398392				
	z3	0.063863	0.114391	0.006615445	-0.03327	0.24029	0.145164936	0.009863	-2.35957	0.695847	-1.3916946	-3.524986272				
	z4	3.743294	6.704917	0.4186779	-2.10577	-46.6788	-28.19984453	-0.11453	27.3993	42.93555	-85.8711	-82.07249811				
4ta Iteracion	z1	0.988173	1.320432	0.02128394	-0.67904	-0.02521	0.088862472	0.000992	-0.08144	0.037038	0.07407694	0.72288705	RS4 =	1.113387	IRI =	2.194685
	z2	-0.92852	-1.24072	0.9001616	-28.7187	-3.39137	11.95452917	0.062802	-5.15429	4.319885	8.639769998	-14.51944857				
	z3	0.063863	0.085336	0.006615445	-0.21106	0.24029	-0.847017541	0.009863	-0.80945	0.695847	1.3916946	-0.390500386				
	z4	3.743294	5.001924	0.4186779	-13.3575	-46.6788	164.542235	-0.11453	9.399361	42.93555	85.87109998	251.4571275				
5ta Iteracion	z1	0.988173	0.714337	0.02128394	-0.30903	-0.02521	0.009844245	0.000992	0.249525	0.037038	0	0.664675478	RS5 =	1.671646	IRI =	2.090077
	z2	-0.92852	-0.67121	0.9001616	-13.0699	-3.39137	1.324330905	0.062802	15.79193	4.319885	0	3.3751962				
	z3	0.063863	0.046166	0.006615445	-0.09605	0.24029	-0.093833182	0.009863	2.480041	0.695847	0	2.336321311				
	z4	3.743294	2.705979	0.4186779	-6.07897	-46.6788	18.22810115	-0.11453	-28.7982	42.93555	0	-13.943045				

FIGURA 3.24: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 253m a 264m.*

N°	Dist	Cota	Y'
1	253.00	3817.821	
2	253.50	3817.820	-2.00
3	254.00	3817.819	-2.00
4	254.50	3817.816	-6.00
5	255.00	3817.814	-4.00
6	255.50	3817.813	-2.00
7	256.00	3817.811	-4.00
8	256.50	3817.809	-4.00
9	257.00	3817.807	-4.00
10	257.50	3817.808	2.00
11	258.00	3817.807	-2.00
12	258.50	3817.806	-2.00
13	259.00	3817.805	-2.00
14	259.50	3817.803	-4.00
15	260.00	3817.803	0.00
16	260.50	3817.803	0.00
17	261.00	3817.804	2.00
18	261.50	3817.803	-2.00
19	262.00	3817.801	-4.00
20	262.50	3817.801	0.00
21	263.00	3817.799	-4.00
22	263.50	3817.800	2.00
23	264.00	3817.799	-2.00

IRI **1.6929**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.97635	0.02128394	0	-0.02521	0.05041862	0.000992	0	0.037038	-0.07407694	-2.00000372	RS1 =	3.4E-06	IRI =	3.4E-06
	z2	-0.92852	1.857032	0.9001616	0	-3.39137	6.782738	0.062802	0	4.319885	-8.63977	-1.78587E-09				
	z3	0.063863	-0.12773	0.006615445	0	0.24029	-0.4805792	0.003863	0	0.695847	-1.3916946	-2.00000032				
	z4	3.743294	-7.48659	0.4186779	0	-46.6788	93.35766	-0.11453	0	42.93555	-85.8711	-2.80177E-05				
2da Iteracion	z1	0.988173	-1.97635	0.02128394	-3.8E-11	-0.02521	0.050418628	0.000992	-2.8E-08	0.037038	-0.07407694	-2.000007416	RS2 =	6.51E-06	IRI =	4.95E-06
	z2	-0.92852	1.857035	0.9001616	-1.6E-09	-3.39137	6.782739086	0.062802	-1.8E-06	4.319885	-8.63977	2.78128E-06				
	z3	0.063863	-0.12773	0.006615445	-1.2E-11	0.24029	-0.480579277	0.003863	-2.8E-07	0.695847	-1.3916946	-2.000000911				
	z4	3.743294	-7.4866	0.4186779	-7.5E-10	-46.6788	93.35767495	-0.11453	3.21E-06	42.93555	-85.8711	-2.37452E-05				
3ra Iteracion	z1	0.988173	-1.97635	0.02128394	5.92E-08	-0.02521	0.050418643	0.000992	-2.4E-08	0.037038	-0.22223082	-2.148164863	RS3 =	2.635226	IRI =	0.878412
	z2	-0.92852	1.857039	0.9001616	2.5E-06	-3.39137	6.782741088	0.062802	-1.5E-06	4.319885	-25.91931	-17.27952902				
	z3	0.063863	-0.12773	0.006615445	1.84E-08	0.24029	-0.480579419	0.003863	-2.3E-07	0.695847	-4.1750838	-4.783390428				
	z4	3.743294	-7.48662	0.4186779	1.16E-06	-46.6788	93.3577025	-0.11453	2.72E-06	42.93555	-257.6133	-171.7422094				
4ta Iteracion	z1	0.988173	-2.12276	0.02128394	-0.36778	-0.02521	0.120585972	0.000992	-0.17042	0.037038	-0.14815388	-2.688524874	RS4 =	3.189602	IRI =	1.456209
	z2	-0.92852	1.994605	0.9001616	-15.5544	-3.39137	16.22224201	0.062802	-10.7857	4.319885	-17.27954	-25.40275858				
	z3	0.063863	-0.13719	0.006615445	-0.11431	0.24029	-1.149398973	0.003863	-1.69384	0.695847	-2.7833892	-5.878127212				
	z4	3.743294	-8.04121	0.4186779	-7.23456	-46.6788	223.2830686	-0.11453	19.66879	42.93555	-171.7422	55.93383275				
5ta Iteracion	z1	0.988173	-2.65673	0.02128394	-0.54067	-0.02521	0.148183531	0.000992	0.055504	0.037038	-0.07407694	-3.067786957	RS5 =	0.475549	IRI =	1.260077
	z2	-0.92852	2.496338	0.9001616	-22.8666	-3.39137	19.9348984	0.062802	3.512742	4.319885	-8.63977	-5.562379164				
	z3	0.063863	-0.1717	0.006615445	-0.16805	0.24029	-1.412452836	0.003863	0.551658	0.695847	-1.3916946	-2.592237866				
	z4	3.743294	-10.0639	0.4186779	-10.6356	-46.6788	274.3841008	-0.11453	-6.40583	42.93555	-85.8711	161.4076535				

FIGURA 3.25: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 264m a 275m.*

N°	Dist	Cota	Y'
1	264.00	3817.799	
2	264.50	3817.799	0.00
3	265.00	3817.798	-2.00
4	265.50	3817.799	2.00
5	266.00	3817.800	2.00
6	266.50	3817.801	2.00
7	267.00	3817.802	2.00
8	267.50	3817.803	2.00
9	268.00	3817.804	2.00
10	268.50	3817.805	2.00
11	269.00	3817.806	2.00
12	269.50	3817.806	0.00
13	270.00	3817.806	0.00
14	270.50	3817.803	-6.00
15	271.00	3817.804	2.00
16	271.50	3817.803	-2.00
17	272.00	3817.802	-2.00
18	272.50	3817.804	4.00
19	273.00	3817.803	-2.00
20	273.50	3817.801	-4.00
21	274.00	3817.799	-4.00
22	274.50	3817.800	2.00
23	275.00	3817.798	-4.00

IRI | **1.7928**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.09090909
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.08983	0.02128394	0	-0.02521	0.002291755	0.000992	0	0.037038	0	-0.087542126	RS1 =	0.059892	IRI =	0.059892
	z2	-0.92852	0.084411	0.9001616	0	-3.39137	0.308306273	0.062802	0	4.319885	0	0.392716818				
	z3	0.063863	-0.00581	0.006615445	0	0.24029	-0.021844509	0.009863	0	0.695847	0	-0.02765026				
	z4	3.743294	-0.3403	0.4186779	0	-46.6788	4.243530001	-0.11453	0	42.93555	0	3.903230546				
2da Iteracion	z1	0.988173	-0.08651	0.02128394	0.008359	-0.02521	0.000697044	0.000992	0.003873	0.037038	-0.07407694	-0.147654834	RS2 =	1.21518	IRI =	0.637536
	z2	-0.92852	0.081284	0.9001616	0.353509	-3.39137	0.093772235	0.062802	0.245129	4.319885	-8.63977	-7.866075506				
	z3	0.063863	-0.00559	0.006615445	0.002598	0.24029	-0.00664407	0.009863	0.038496	0.695847	-1.3916946	-1.362835085				
	z4	3.743294	-0.3277	0.4186779	0.164422	-46.6788	1.290681786	-0.11453	-0.44702	42.93555	-85.8711	-85.19071016				
3ra Iteracion	z1	0.988173	-0.14591	0.02128394	-0.16742	-0.02521	0.034356132	0.000992	-0.08454	0.037038	0.07407694	-0.28943263	RS3 =	0.451976	IRI =	0.575683
	z2	-0.92852	0.1371	0.9001616	-7.08074	-3.39137	4.621876661	0.062802	-5.35012	4.319885	8.639770002	0.967888559				
	z3	0.063863	-0.00943	0.006615445	-0.05204	0.24029	-0.327475098	0.009863	-0.84021	0.695847	1.3916946	0.16254348				
	z4	3.743294	-0.55272	0.4186779	-3.29335	-46.6788	63.61554727	-0.11453	9.756475	42.93555	85.87110002	155.3970545				
4ta Iteracion	z1	0.988173	-0.28601	0.02128394	0.0206	-0.02521	-0.004097609	0.000992	0.154203	0.037038	0.07407694	-0.04122655	RS4 =	2.992529	IRI =	1.179894
	z2	-0.92852	0.268743	0.9001616	0.871256	-3.39137	-0.551244921	0.062802	9.759195	4.319885	8.639769998	18.98771855				
	z3	0.063863	-0.01848	0.006615445	0.006403	0.24029	0.039057508	0.009863	1.532631	0.695847	1.3916946	2.951302431				
	z4	3.743294	-1.08343	0.4186779	0.405234	-46.6788	-7.587339493	-0.11453	-17.7969	42.93555	85.87109998	59.8086994				
5ta Iteracion	z1	0.988173	-0.04074	0.02128394	0.404133	-0.02521	-0.074400298	0.000992	0.059349	0.037038	0.07407694	0.422420313	RS5 =	2.391295	IRI =	1.422174
	z2	-0.92852	0.03828	0.9001616	17.09202	-3.39137	-10.00895557	0.062802	3.756086	4.319885	8.639770002	19.51719525				
	z3	0.063863	-0.00263	0.006615445	0.125612	0.24029	0.709167281	0.009863	0.589874	0.695847	1.3916946	2.81371529				
	z4	3.743294	-0.15432	0.4186779	7.949738	-46.6788	-137.7633444	-0.11453	-6.8496	42.93555	85.87110002	-50.94642668				

FIGURA 3.26: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 275m a 286m.*

N°	Dist	Cota	Y'
1	275.00	3817.798	
2	275.50	3817.799	2.00
3	276.00	3817.795	-8.00
4	276.50	3817.798	6.00
5	277.00	3817.800	4.00
6	277.50	3817.800	0.00
7	278.00	3817.802	4.00
8	278.50	3817.804	4.00
9	279.00	3817.807	6.00
10	279.50	3817.810	6.00
11	280.00	3817.812	4.00
12	280.50	3817.811	-2.00
13	281.00	3817.809	-4.00
14	281.50	3817.810	2.00
15	282.00	3817.811	2.00
16	282.50	3817.812	2.00
17	283.00	3817.811	-2.00
18	283.50	3817.813	4.00
19	284.00	3817.812	-2.00
20	284.50	3817.814	4.00
21	285.00	3817.813	-2.00
22	285.50	3817.815	4.00
23	286.00	3817.816	2.00

IRI **2.6032**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 1.636363636
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	1.61701	0.02128394	0	-0.02521	-0.041251598	0.000992	0	0.037038	0.07407694	1.649835215	RS1 =	0.239564	IRI =	0.239564
	z2	-0.92852	-1.51939	0.9001616	0	-3.39137	-5.549512909	0.062802	0	4.319885	8.639770002	1.570867274				
	z3	0.063863	0.104504	0.006615445	0	0.24029	0.393201164	0.009863	0	0.695847	1.3916946	1.88939928				
	z4	3.743294	6.12539	0.4186779	0	-46.6788	-76.38354	-0.11453	0	42.93555	85.87110002	15.6129502				
2da Iteracion	z1	0.988173	1.630322	0.02128394	0.033434	-0.02521	-0.047630452	0.000992	0.015493	0.037038	-0.29630776	1.335311139	RS2 =	6.178345	IRI =	3.208955
	z2	-0.92852	-1.5319	0.9001616	1.414034	-3.39137	-6.407650148	0.062802	0.980519	4.319885	-34.55908	-40.1040748				
	z3	0.063863	0.105364	0.006615445	0.010392	0.24029	0.454002997	0.009863	0.153986	0.695847	-5.5667784	-4.84303403				
	z4	3.743294	6.175818	0.4186779	0.657687	-46.6788	-88.19494781	-0.11453	-1.78807	42.93555	-343.4844	-426.6339168				
3ra Iteracion	z1	0.988173	1.319518	0.02128394	-0.85357	-0.02521	0.122089546	0.000992	-0.42336	0.037038	0.22223082	0.386909783	RS3 =	1.763339	IRI =	2.727083
	z2	-0.92852	-1.23986	0.9001616	-36.1001	-3.39137	16.42451547	0.062802	-26.7933	4.319885	25.91931	-21.78950288				
	z3	0.063863	0.085277	0.006615445	-0.26531	0.24029	-1.16373071	0.009863	-4.20775	0.695847	4.1750838	-1.376429687				
	z4	3.743294	4.998462	0.4186779	-16.7907	-46.6788	226.0671622	-0.11453	48.86029	42.93555	257.6133	520.7485265				
4ta Iteracion	z1	0.988173	0.382334	0.02128394	-0.46377	-0.02521	0.034698843	0.000992	0.516747	0.037038	0.14815388	0.618167291	RS4 =	6.851018	IRI =	3.758067
	z2	-0.92852	-0.35925	0.9001616	-19.6141	-3.39137	4.667980973	0.062802	32.70388	4.319885	17.27954	34.67807239				
	z3	0.063863	0.024709	0.006615445	-0.14415	0.24029	-0.330741739	0.009863	5.135976	0.695847	2.7833892	7.4691856				
	z4	3.743294	1.448317	0.4186779	-9.12278	-46.6788	64.25012739	-0.11453	-59.6388	42.93555	171.7422	168.6790841				
5ta Iteracion	z1	0.988173	0.610856	0.02128394	0.738086	-0.02521	-0.188293015	0.000992	0.167383	0.037038	0	1.328032076	RS5 =	2.399252	IRI =	3.486304
	z2	-0.92852	-0.57398	0.9001616	31.21587	-3.39137	-25.3307645	0.062802	10.59333	4.319885	0	15.90445458				
	z3	0.063863	0.039478	0.006615445	0.229411	0.24029	1.79476762	0.009863	1.663628	0.695847	0	3.727284508				
	z4	3.743294	2.313982	0.4186779	14.51894	-46.6788	-348.6528449	-0.11453	-19.318	42.93555	0	-351.1379094				

FIGURA 3.27: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 286m a 297m.*

N°	Dist	Cota	Y'
1	286.00	3817.816	
2	286.50	3817.812	-8.00
3	287.00	3817.812	0.00
4	287.50	3817.807	-10.00
5	288.00	3817.804	-6.00
6	288.50	3817.805	2.00
7	289.00	3817.807	4.00
8	289.50	3817.806	-2.00
9	290.00	3817.801	-10.00
10	290.50	3817.803	4.00
11	291.00	3817.800	-6.00
12	291.50	3817.801	2.00
13	292.00	3817.800	-2.00
14	292.50	3817.799	-2.00
15	293.00	3817.800	2.00
16	293.50	3817.797	-6.00
17	294.00	3817.798	2.00
18	294.50	3817.795	-6.00
19	295.00	3817.800	10.00
20	295.50	3817.797	-6.00
21	296.00	3817.798	2.00
22	296.50	3817.799	2.00
23	297.00	3817.797	-4.00

IRI 3.0323

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.72727273
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.70684	0.02128394	0	-0.02521	0.043543354	0.000992	0	0.037038	-0.29630776	-1.959608161	RS1 =	4.132525	IRI =	4.132525
	z2	-0.92852	1.6038	0.9001616	0	-3.39137	5.857819182	0.062802	0	4.319885	-34.55908	-27.09746045				
	z3	0.063863	-0.11031	0.006615445	0	0.24029	-0.415045673	0.009863	0	0.695847	-5.5667784	-6.09213334				
	z4	3.743294	-6.46569	0.4186779	0	-46.6788	80.62707	-0.11453	0	42.93555	-343.4844	-269.3230196				
2da Iteracion	z1	0.988173	-1.93643	0.02128394	-0.57674	-0.02521	0.153578478	0.000992	-0.26725	0.037038	0	-2.626847208	RS2 =	1.797685	IRI =	2.965105
	z2	-0.92852	1.819528	0.9001616	-24.3921	-3.39137	20.66067215	0.062802	-16.9139	4.319885	0	-18.82582908				
	z3	0.063863	-0.12515	0.006615445	-0.17926	0.24029	-1.463876283	0.009863	-2.65625	0.695847	0	-4.424531767				
	z4	3.743294	-7.33539	0.4186779	-11.3451	-46.6788	284.3736565	-0.11453	30.84425	42.93555	0	296.537405				
3ra Iteracion	z1	0.988173	-2.59578	0.02128394	-0.40069	-0.02521	0.111539393	0.000992	0.294259	0.037038	-0.3703847	-2.961052862	RS3 =	2.428236	IRI =	2.786149
	z2	-0.92852	2.43907	0.9001616	-16.9463	-3.39137	15.00521988	0.062802	18.62304	4.319885	-43.19885	-24.07780464				
	z3	0.063863	-0.16776	0.006615445	-0.12454	0.24029	-1.063168969	0.009863	2.924654	0.695847	-6.958473	-5.389288699				
	z4	3.743294	-9.83306	0.4186779	-7.88196	-46.6788	206.5319662	-0.11453	-33.961	42.93555	-429.3555	-274.4995297				
4ta Iteracion	z1	0.988173	-2.92603	0.02128394	-0.51247	-0.02521	0.135860249	0.000992	-0.27239	0.037038	-0.22223082	-3.797263134	RS4 =	4.7285	IRI =	3.271736
	z2	-0.92852	2.749385	0.9001616	-21.6739	-3.39137	18.27706662	0.062802	-17.239	4.319885	-25.91931	-43.80580244				
	z3	0.063863	-0.1891	0.006615445	-0.15929	0.24029	-1.294990026	0.009863	-2.7073	0.695847	-4.1750838	-8.525762728				
	z4	3.743294	-11.0841	0.4186779	-10.0808	-46.6788	251.565691	-0.11453	31.43709	42.93555	-257.6133	4.224541012				
5ta Iteracion	z1	0.988173	-3.75235	0.02128394	-0.93236	-0.02521	0.214928596	0.000992	0.004192	0.037038	0.07407694	-4.391514217	RS5 =	3.243922	IRI =	3.266173
	z2	-0.92852	3.52582	0.9001616	-39.4323	-3.39137	28.91400742	0.062802	0.265308	4.319885	8.639769998	1.912604006				
	z3	0.063863	-0.24251	0.006615445	-0.28979	0.24029	-2.048652116	0.009863	0.041665	0.695847	1.3916946	-1.147592699				
	z4	3.743294	-14.2143	0.4186779	-18.3405	-46.6788	397.972629	-0.11453	-0.48382	42.93555	85.87109998	450.8051193				

FIGURA 3.28: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 297m a 308m.*

N°	Dist	Cota	Y'
1	297.00	3817.797	
2	297.50	3817.795	-4.00
3	298.00	3817.794	-2.00
4	298.50	3817.794	0.00
5	299.00	3817.792	-4.00
6	299.50	3817.791	-2.00
7	300.00	3817.794	6.00
8	300.50	3817.794	0.00
9	301.00	3817.793	-2.00
10	301.50	3817.791	-4.00
11	302.00	3817.790	-2.00
12	302.50	3817.790	0.00
13	303.00	3817.788	-4.00
14	303.50	3817.788	0.00
15	304.00	3817.791	6.00
16	304.50	3817.793	4.00
17	305.00	3817.792	-2.00
18	305.50	3817.793	2.00
19	306.00	3817.795	4.00
20	306.50	3817.791	-8.00
21	307.00	3817.786	-10.00
22	307.50	3817.783	-6.00
23	308.00	3817.778	-10.00

IRI **3.5933**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.72727273
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.70684	0.02128394	0	-0.02521	0.043543354	0.000992	0	0.037038	-0.14815388	-1.811454281	RS1 =	1.49729	IRI =	1.49729
	z2	-0.92852	1.6038	0.9001616	0	-3.39137	5.857819182	0.062802	0	4.319885	-17.27954	-9.817920454				
	z3	0.063863	-0.11031	0.006615445	0	0.24029	-0.415045673	0.009863	0	0.695847	-2.7833892	-3.30874414				
	z4	3.743294	-6.46569	0.4186779	0	-46.6788	80.62707	-0.11453	0	42.93555	-171.7422	-97.58081963				
2da Iteracion	z1	0.988173	-1.79003	0.02128394	-0.20896	-0.02521	0.083411157	0.000992	-0.09683	0.037038	-0.07407694	-2.086490538	RS2 =	1.243305	IRI =	1.370297
	z2	-0.92852	1.681964	0.9001616	-8.83771	-3.39137	11.22117231	0.062802	-6.12824	4.319885	-8.63977	-10.70258683				
	z3	0.063863	-0.11569	0.006615445	-0.06495	0.24029	-0.795056806	0.009863	-0.96241	0.695847	-1.3916946	-3.329795093				
	z4	3.743294	-6.78081	0.4186779	-4.11055	-46.6788	154.4483052	-0.11453	11.17545	42.93555	-85.8711	68.86130607				
3ra Iteracion	z1	0.988173	-2.06181	0.02128394	-0.22779	-0.02521	0.083941837	0.000992	0.068332	0.037038	0	-2.137332158	RS3 =	1.812322	IRI =	1.517639
	z2	-0.92852	1.93734	0.9001616	-9.63406	-3.39137	11.29256385	0.062802	4.324605	4.319885	0	7.920451037				
	z3	0.063863	-0.13325	0.006615445	-0.0708	0.24029	-0.800115131	0.009863	0.679157	0.695847	0	-0.325010567				
	z4	3.743294	-7.81035	0.4186779	-4.48094	-46.6788	155.4309391	-0.11453	-7.88635	42.93555	0	135.253307				
4ta Iteracion	z1	0.988173	-2.11205	0.02128394	0.168578	-0.02521	0.008193292	0.000992	0.134214	0.037038	-0.14815388	-1.949221384	RS4 =	0.337596	IRI =	1.222628
	z2	-0.92852	1.984547	0.9001616	7.129686	-3.39137	1.102230762	0.062802	8.494134	4.319885	-17.27954	1.431057299				
	z3	0.063863	-0.1365	0.006615445	0.052397	0.24029	-0.078096659	0.009863	1.33396	0.695847	-2.7833892	-1.611625464				
	z4	3.743294	-8.00066	0.4186779	3.316118	-46.6788	15.17111301	-0.11453	-15.4899	42.93555	-171.7422	-176.7455303				
5ta Iteracion	z1	0.988173	-1.92617	0.02128394	0.030459	-0.02521	0.040627966	0.000992	-0.17539	0.037038	-0.07407694	-2.1045453	RS5 =	1.532607	IRI =	1.284624
	z2	-0.92852	1.809883	0.9001616	1.288183	-3.39137	5.465616639	0.062802	-11.0999	4.319885	-8.63977	-11.17600176				
	z3	0.063863	-0.12448	0.006615445	0.009467	0.24029	-0.387256838	0.009863	-1.74318	0.695847	-1.3916946	-3.637152597				
	z4	3.743294	-7.29651	0.4186779	0.539152	-46.6788	75.22879106	-0.11453	20.2418	42.93555	-85.8711	2.902133935				

FIGURA 3.29: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 308m a 319m.*

N°	Dist	Cota	Y'
1	308.00	3817.778	
2	308.50	3817.775	-6.00
3	309.00	3817.772	-6.00
4	309.50	3817.770	-4.00
5	310.00	3817.767	-6.00
6	310.50	3817.765	-4.00
7	311.00	3817.766	2.00
8	311.50	3817.766	0.00
9	312.00	3817.771	10.00
10	312.50	3817.769	-4.00
11	313.00	3817.773	8.00
12	313.50	3817.776	6.00
13	314.00	3817.778	4.00
14	314.50	3817.780	4.00
15	315.00	3817.783	6.00
16	315.50	3817.785	4.00
17	316.00	3817.784	-2.00
18	316.50	3817.788	8.00
19	317.00	3817.790	4.00
20	317.50	3817.791	2.00
21	318.00	3817.792	2.00
22	318.50	3817.791	-2.00
23	319.00	3817.793	4.00

IRI 4.1962

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 1.363636364
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_i|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	1.347508	0.02128394	0	-0.02521	-0.034376332	0.000992	0	0.037038	-0.22223082	1.090901075	RS1 =	4.851231	IRI =	4.851231
	z2	-0.92852	-1.26616	0.9001616	0	-3.39137	-4.624594091	0.062802	0	4.319885	-25.91931	-31.81006227				
	z3	0.063863	0.087086	0.006615445	0	0.24029	0.327667636	0.009863	0	0.695847	-4.1750838	-3.7603299				
	z4	3.743294	5.104492	0.4186779	0	-46.6788	-63.65295	-0.11453	0	42.93555	-257.6133	-316.1617582				
2da Iteracion	z1	0.988173	1.077999	0.02128394	-0.67704	-0.02521	0.094795322	0.000992	-0.31373	0.037038	-0.22223082	-0.040212823	RS2 =	8.297411	IRI =	6.574321
	z2	-0.92852	-1.01292	0.9001616	-28.6342	-3.39137	12.75266625	0.062802	-19.8555	4.319885	-25.91931	-62.6692458				
	z3	0.063863	0.069668	0.006615445	-0.21044	0.24029	-0.903568168	0.009863	-3.1182	0.695847	-4.1750838	-8.337623435				
	z4	3.743294	4.083563	0.4186779	-13.3182	-46.6788	175.5278002	-0.11453	36.20846	42.93555	-257.6133	-55.11164947				
3ra Iteracion	z1	0.988173	-0.03974	0.02128394	-1.33385	-0.02521	0.210185734	0.000992	-0.05469	0.037038	-0.14815388	-1.366242027	RS3 =	4.381293	IRI =	5.843312
	z2	-0.92852	0.037338	0.9001616	-56.4124	-3.39137	28.27595765	0.062802	-3.4611	4.319885	-17.27954	-48.8397963				
	z3	0.063863	-0.00257	0.006615445	-0.41458	0.24029	-2.0034442	0.009863	-0.54355	0.695847	-2.7833892	-5.747535034				
	z4	3.743294	-0.15053	0.4186779	-26.2382	-46.6788	389.1905069	-0.11453	6.311667	42.93555	-171.7422	197.3712174				
4ta Iteracion	z1	0.988173	-1.35008	0.02128394	-1.0395	-0.02521	0.144891392	0.000992	0.195855	0.037038	-0.22223082	-2.271071078	RS4 =	1.748826	IRI =	4.81969
	z2	-0.92852	1.268578	0.9001616	-43.9637	-3.39137	19.49201214	0.062802	12.39524	4.319885	-25.91931	-36.72718739				
	z3	0.063863	-0.08725	0.006615445	-0.3231	0.24029	-1.381072894	0.009863	1.946609	0.695847	-4.1750838	-4.019897192				
	z4	3.743294	-5.11425	0.4186779	-20.4481	-46.6788	268.2882108	-0.11453	-22.604	42.93555	-257.6133	-37.4914366				
5ta Iteracion	z1	0.988173	-2.24421	0.02128394	-0.7817	-0.02521	0.101338834	0.000992	-0.0372	0.037038	-0.14815388	-3.109928109	RS5 =	1.397171	IRI =	4.135186
	z2	-0.92852	2.108726	0.9001616	-33.0604	-3.39137	13.63295472	0.062802	-2.35452	4.319885	-17.27954	-36.95278804				
	z3	0.063863	-0.14504	0.006615445	-0.24297	0.24029	-0.965939488	0.009863	-0.36977	0.695847	-2.7833892	-4.507099421				
	z4	3.743294	-8.50129	0.4186779	-15.3769	-46.6788	187.6440976	-0.11453	4.293711	42.93555	-171.7422	-3.682540278				

FIGURA 3.30: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 319m a 330m.*

N°	Dist	Cota	Y'
1	319.00	3817.793	
2	319.50	3817.795	4.00
3	320.00	3817.794	-2.00
4	320.50	3817.793	-2.00
5	321.00	3817.791	-4.00
6	321.50	3817.789	-4.00
7	322.00	3817.788	-2.00
8	322.50	3817.786	-4.00
9	323.00	3817.783	-6.00
10	323.50	3817.783	0.00
11	324.00	3817.782	-2.00
12	324.50	3817.783	2.00
13	325.00	3817.782	-2.00
14	325.50	3817.783	2.00
15	326.00	3817.782	-2.00
16	326.50	3817.780	-4.00
17	327.00	3817.781	2.00
18	327.50	3817.782	2.00
19	328.00	3817.783	2.00
20	328.50	3817.784	2.00
21	329.00	3817.786	4.00
22	329.50	3817.787	2.00
23	330.00	3817.790	6.00

IRI **2.5775**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.27272727
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.2695	0.02128394	0	-0.02521	0.006875266	0.000992	0	0.037038	0.14815388	-0.114472499	**RS1** =	2.814911	**IRI** =	2.814911
	z2	-0.92852	0.253232	0.9001616	0	-3.39137	0.924918818	0.062802	0	4.319885	17.27954	18.45769045				
	z3	0.063863	-0.01742	0.006615445	0	0.24029	-0.065533527	0.009863	0	0.695847	2.7833892	2.70043842				
	z4	3.743294	-1.0209	0.4186779	0	-46.6788	12.73059	-0.11453	0	42.93555	171.7422	183.4518916				
2da Iteracion	z1	0.988173	-0.11312	0.02128394	0.392852	-0.02521	-0.068076189	0.000992	0.182042	0.037038	-0.07407694	0.319622987	**RS2** =	0.861692	**IRI** =	1.838302
	z2	-0.92852	0.10629	0.9001616	16.6149	-3.39137	-9.158183144	0.062802	11.52109	4.319885	-8.63977	10.44432574				
	z3	0.063863	-0.00731	0.006615445	0.122106	0.24029	0.648887268	0.009863	1.809327	0.695847	-1.3916946	1.18131522				
	z4	3.743294	-0.4285	0.4186779	7.727827	-46.6788	-126.0533059	-0.11453	-21.0098	42.93555	-85.8711	-225.6349293				
3ra Iteracion	z1	0.988173	0.315843	0.02128394	0.222296	-0.02521	-0.029780142	0.000992	-0.2239	0.037038	-0.07407694	0.210380768	**RS3** =	3.454077	**IRI** =	2.376893
	z2	-0.92852	-0.29678	0.9001616	9.401581	-3.39137	-4.006275815	0.062802	-14.1703	4.319885	-8.63977	-17.71149028				
	z3	0.063863	0.020412	0.006615445	0.069094	0.24029	0.283857762	0.009863	-2.22537	0.695847	-1.3916946	-3.243695915				
	z4	3.743294	1.196443	0.4186779	4.372808	-46.6788	-55.14241232	-0.11453	25.84086	42.93555	-85.8711	-109.6033983				
4ta Iteracion	z1	0.988173	0.207893	0.02128394	-0.37697	-0.02521	0.081771336	0.000992	-0.10876	0.037038	-0.14815388	-0.34422157	**RS4** =	4.403311	**IRI** =	2.883498
	z2	-0.92852	-0.19534	0.9001616	-15.9432	-3.39137	11.00056977	0.062802	-6.88328	4.319885	-17.27954	-29.30079202				
	z3	0.063863	0.013436	0.006615445	-0.11717	0.24029	-0.779426394	0.009863	-1.08098	0.695847	-2.7833892	-4.747532626				
	z4	3.743294	0.787517	0.4186779	-7.41541	-46.6788	151.4119302	-0.11453	12.55234	42.93555	-171.7422	-14.40582216				
5ta Iteracion	z1	0.988173	-0.34015	0.02128394	-0.62364	-0.02521	0.119682022	0.000992	-0.0143	0.037038	-0.14815388	-1.006553651	**RS5** =	3.275519	**IRI** =	2.961902
	z2	-0.92852	0.319615	0.9001616	-26.3754	-3.39137	16.10063498	0.062802	-0.90471	4.319885	-17.27954	-28.1394473				
	z3	0.063863	-0.02198	0.006615445	-0.19384	0.24029	-1.140782716	0.009863	-0.14208	0.695847	-2.7833892	-4.28207282				
	z4	3.743294	-1.28852	0.4186779	-12.2676	-46.6788	221.6092684	-0.11453	1.649828	42.93555	-171.7422	37.96078001				

FIGURA 3.31: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 330m a 341m.*

N°	Dist	Cota	Y'
1	330.00	3817.790	
2	330.50	3817.788	-4.00
3	331.00	3817.788	0.00
4	331.50	3817.787	-2.00
5	332.00	3817.789	4.00
6	332.50	3817.790	2.00
7	333.00	3817.790	0.00
8	333.50	3817.791	2.00
9	334.00	3817.792	2.00
10	334.50	3817.792	0.00
11	335.00	3817.792	0.00
12	335.50	3817.793	2.00
13	336.00	3817.793	0.00
14	336.50	3817.792	-2.00
15	337.00	3817.794	4.00
16	337.50	3817.795	2.00
17	338.00	3817.796	2.00
18	338.50	3817.795	-2.00
19	339.00	3817.794	-2.00
20	339.50	3817.795	2.00
21	340.00	3817.793	-4.00
22	340.50	3817.791	-4.00
23	341.00	3817.795	8.00

IRI	1.9644

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.454545455
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.449169	0.02128394	0	-0.02521	-0.011458777	0.000992	0	0.037038	-0.14815388	0.289556752	**RS1** =	2.934695	**IRI** =	2.934695
	z2	-0.92852	-0.42205	0.9001616	0	-3.39137	-1.541531364	0.062802	0	4.319885	-17.27954	-19.24312409				
	z3	0.063863	0.029029	0.006615445	0	0.24029	0.109222545	0.009863	0	0.695847	-2.7833892	-2.6451379				
	z4	3.743294	1.701497	0.4186779	0	-46.6788	-21.21765	-0.11453	0	42.93555	-171.7422	-191.2583527				
2da Iteracion	z1	0.988173	0.286132	0.02128394	-0.40957	-0.02521	0.066682101	0.000992	-0.18979	0.037038	0	-0.246544139	**RS2** =	2.384185	**IRI** =	2.65944
	z2	-0.92852	-0.26886	0.9001616	-17.3219	-3.39137	8.970638675	0.062802	-12.0113	4.319885	0	-20.63148472				
	z3	0.063863	0.018492	0.006615445	-0.1273	0.24029	-0.635599128	0.009863	-1.88632	0.695847	0	-2.630728849				
	z4	3.743294	1.083896	0.4186779	-8.05667	-46.6788	123.4719424	-0.11453	21.90388	42.93555	0	138.4030496				
3ra Iteracion	z1	0.988173	-0.24363	0.02128394	-0.43912	-0.02521	0.066318859	0.000992	0.13734	0.037038	-0.07407694	-0.553165922	**RS3** =	0.257872	**IRI** =	1.858917
	z2	-0.92852	0.22892	0.9001616	-18.5717	-3.39137	8.921772266	0.062802	8.691943	4.319885	-8.63977	-9.36880521				
	z3	0.063863	-0.01575	0.006615445	-0.13649	0.24029	-0.632136783	0.009863	1.365025	0.695847	-1.3916946	-0.811037959				
	z4	3.743294	-0.92289	0.4186779	-8.63795	-46.6788	122.7993447	-0.11453	-15.8506	42.93555	-85.8711	11.51678771				
4ta Iteracion	z1	0.988173	-0.54662	0.02128394	-0.19941	-0.02521	0.020445707	0.000992	0.011428	0.037038	0.14815388	-0.566000665	**RS4** =	3.170786	**IRI** =	2.186884
	z2	-0.92852	0.513623	0.9001616	-8.43344	-3.39137	2.750528992	0.062802	0.723274	4.319885	17.27954	12.83352721				
	z3	0.063863	-0.03533	0.006615445	-0.06198	0.24029	-0.194883987	0.009863	0.113586	0.695847	2.7833892	2.60478581				
	z4	3.743294	-2.07066	0.4186779	-3.92251	-46.6788	37.85830301	-0.11453	-1.31896	42.93555	171.7422	202.2883674				
5ta Iteracion	z1	0.988173	-0.55931	0.02128394	0.273148	-0.02521	-0.065664853	0.000992	0.200734	0.037038	0.07407694	-0.07701221	**RS5** =	4.138468	**IRI** =	2.577201
	z2	-0.92852	0.525541	0.9001616	11.55225	-3.39137	-8.833789849	0.062802	12.70405	4.319885	8.639770002	24.58781651				
	z3	0.063863	-0.03615	0.006615445	0.084899	0.24029	0.62590294	0.009863	1.995105	0.695847	1.3916946	4.061455822				
	z4	3.743294	-2.11871	0.4186779	5.373114	-46.6788	-121.588354	-0.11453	-23.1671	42.93555	85.87110002	-55.62394218				

FIGURA 3.32: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 341m a 352m.*

N°	Dist	Cota	Y'
1	341.00	3817.795	
2	341.50	3817.793	-4.00
3	342.00	3817.792	-2.00
4	342.50	3817.791	-2.00
5	343.00	3817.796	10.00
6	343.50	3817.794	-4.00
7	344.00	3817.791	-6.00
8	344.50	3817.790	-2.00
9	345.00	3817.789	-2.00
10	345.50	3817.788	-2.00
11	346.00	3817.789	2.00
12	346.50	3817.789	0.00
13	347.00	3817.787	-4.00
14	347.50	3817.788	2.00
15	348.00	3817.790	4.00
16	348.50	3817.793	6.00
17	349.00	3817.792	-2.00
18	349.50	3817.793	2.00
19	350.00	3817.793	0.00
20	350.50	3817.798	10.00
21	351.00	3817.798	0.00
22	351.50	3817.797	-2.00
23	352.00	3817.792	-10.00

IRI **3.9713**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.27272727
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.2695	0.02128394	0	-0.02521	0.006875266	0.000992	0	0.037038	-0.14815388	-0.410780259	RS1 =	2.45556	IRI =	2.45556
	z2	-0.92852	0.253232	0.9001616	0	-3.39137	0.924918818	0.062802	0	4.319885	-17.27954	-16.10138955				
	z3	0.063863	-0.01742	0.006615445	0	0.24029	-0.065533527	0.009863	0	0.695847	-2.7833892	-2.86633998				
	z4	3.743294	-1.0209	0.4186779	0	-46.6788	12.73059	-0.11453	0	42.93555	-171.7422	-160.0325084				
2da Iteracion	z1	0.988173	-0.40592	0.02128394	-0.3427	-0.02521	0.072258453	0.000992	-0.1588	0.037038	-0.07407694	-0.909244232	RS2 =	2.882303	IRI =	2.668931
	z2	-0.92852	0.381416	0.9001616	-14.4939	-3.39137	9.720816551	0.062802	-10.0503	4.319885	-8.63977	-23.08169876				
	z3	0.063863	-0.02623	0.006615445	-0.10652	0.24029	-0.688751687	0.009863	-1.57835	0.695847	-1.3916946	-3.79154733				
	z4	3.743294	-1.53767	0.4186779	-6.7413	-46.6788	133.7973966	-0.11453	18.32774	42.93555	-85.8711	57.97506845				
3ra Iteracion	z1	0.988173	-0.89849	0.02128394	-0.49127	-0.02521	0.095582292	0.000992	0.05753	0.037038	-0.07407694	-1.31072485	RS3 =	0.631013	IRI =	1.989625
	z2	-0.92852	0.844248	0.9001616	-20.7773	-3.39137	12.85853608	0.062802	3.640931	4.319885	-8.63977	-12.07331388				
	z3	0.063863	-0.05807	0.006615445	-0.1527	0.24029	-0.911069391	0.009863	0.57179	0.695847	-1.3916946	-1.941737453				
	z4	3.743294	-3.40357	0.4186779	-9.6638	-46.6788	176.9849932	-0.11453	-6.6396	42.93555	-85.8711	71.40692708				
4ta Iteracion	z1	0.988173	-1.29522	0.02128394	-0.25697	-0.02521	0.048949861	0.000992	0.070858	0.037038	0.3703847	-1.061997369	RS4 =	8.094577	IRI =	3.515863
	z2	-0.92852	1.217029	0.9001616	-10.8679	-3.39137	6.585148204	0.062802	4.484474	4.319885	43.19885	44.61756793				
	z3	0.063863	-0.08371	0.006615445	-0.07987	0.24029	-0.466579316	0.009863	0.704264	0.695847	6.958473	7.03257985				
	z4	3.743294	-4.90643	0.4186779	-5.05483	-46.6788	90.63803247	-0.11453	-8.17789	42.93555	429.3555	501.8543888				
5ta Iteracion	z1	0.988173	-1.04944	0.02128394	0.949638	-0.02521	-0.177286486	0.000992	0.497998	0.037038	-0.14815388	0.072758856	RS5 =	4.010679	IRI =	3.614826
	z2	-0.92852	0.986082	0.9001616	40.16302	-3.39137	-23.85007329	0.062802	31.51729	4.319885	-17.27954	31.53678331				
	z3	0.063863	-0.06782	0.006615445	0.295165	0.24029	1.689855799	0.009863	4.949629	0.695847	-2.7833892	4.083438296				
	z4	3.743294	-3.97537	0.4186779	18.68039	-46.6788	-328.2725993	-0.11453	-57.4749	42.93555	-171.7422	-542.7847021				

FIGURA 3.33: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 352m a 363m.*

N°	Dist	Cota	Y'
1	352.00	3817.792	
2	352.50	3817.790	-4.00
3	353.00	3817.791	2.00
4	353.50	3817.792	2.00
5	354.00	3817.792	0.00
6	354.50	3817.791	-2.00
7	355.00	3817.792	2.00
8	355.50	3817.792	0.00
9	356.00	3817.792	0.00
10	356.50	3817.793	2.00
11	357.00	3817.795	4.00
12	357.50	3817.794	-2.00
13	358.00	3817.787	-14.00
14	358.50	3817.787	0.00
15	359.00	3817.789	4.00
16	359.50	3817.785	-8.00
17	360.00	3817.786	2.00
18	360.50	3817.787	2.00
19	361.00	3817.789	4.00
20	361.50	3817.785	-8.00
21	362.00	3817.786	2.00
22	362.50	3817.783	-6.00
23	363.00	3817.782	-2.00

IRI 2.8825

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.90909091
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.89834	0.02128394	0	-0.02521	0.022917555	0.000992	0	0.037038	-0.14815388	-1.023575144	RS1 =	2.036317	IRI =	2.036317
	z2	-0.92852	0.844105	0.9001616	0	-3.39137	3.083062727	0.062802	0	4.319885	-17.27954	-13.35237182				
	z3	0.063863	-0.05806	0.006615445	0	0.24029	-0.218445091	0.009863	0	0.695847	-2.7833892	-3.0598918				
	z4	3.743294	-3.40299	0.4186779	0	-46.6788	42.4353	-0.11453	0	42.93555	-171.7422	-132.7098945				
2da Iteracion	z1	0.988173	-1.01147	0.02128394	-0.28419	-0.02521	0.077137761	0.000992	-0.13169	0.037038	0.07407694	-1.276135611	RS2 =	0.469994	IRI =	1.253155
	z2	-0.92852	0.950406	0.9001616	-12.0193	-3.39137	10.37722219	0.062802	-8.3344	4.319885	8.639769998	-0.386297292				
	z3	0.063863	-0.06537	0.006615445	-0.08833	0.24029	-0.735260177	0.009863	-1.30888	0.695847	1.3916946	-0.806141527				
	z4	3.743294	-3.83154	0.4186779	-5.59034	-46.6788	142.8321691	-0.11453	15.19861	42.93555	85.87109998	234.4799374				
3ra Iteracion	z1	0.988173	-1.26104	0.02128394	-0.00822	-0.02521	0.020322272	0.000992	0.232678	0.037038	0.07407694	-0.942186719	RS3 =	4.368721	IRI =	2.291677
	z2	-0.92852	1.184912	0.9001616	-0.34773	-3.39137	2.733923383	0.062802	14.72574	4.319885	8.639770002	26.93661115				
	z3	0.063863	-0.0815	0.006615445	-0.00256	0.24029	-0.193707425	0.009863	2.312601	0.695847	1.3916946	3.426534647				
	z4	3.743294	-4.77695	0.4186779	-0.16173	-46.6788	37.62974328	-0.11453	-26.8538	42.93555	85.87110002	91.70831323				
4ta Iteracion	z1	0.988173	-0.93104	0.02128394	0.573317	-0.02521	-0.086380574	0.000992	0.091004	0.037038	0	-0.35310288	RS4 =	2.19898	IRI =	2.268503
	z2	-0.92852	0.874835	0.9001616	24.2473	-3.39137	-11.62064338	0.062802	5.759435	4.319885	0	19.26093028				
	z3	0.063863	-0.06017	0.006615445	0.178198	0.24029	0.82336064	0.009863	0.90449	0.695847	0	1.845876941				
	z4	3.743294	-3.52688	0.4186779	11.27776	-46.6788	-159.9466283	-0.11453	-10.5029	42.93555	0	-162.6986501				
5ta Iteracion	z1	0.988173	-0.34893	0.02128394	0.409948	-0.02521	-0.046533284	0.000992	-0.16145	0.037038	-0.07407694	-0.221036921	RS5 =	2.226888	IRI =	2.26018
	z2	-0.92852	0.327862	0.9001616	17.33795	-3.39137	-6.260049834	0.062802	-10.2177	4.319885	-8.63977	-7.451755282				
	z3	0.063863	-0.02255	0.006615445	0.12742	0.24029	0.443545032	0.009863	-1.60464	0.695847	-1.3916946	-2.447924967				
	z4	3.743294	-1.32177	0.4186779	8.064126	-46.6788	-86.16337591	-0.11453	18.63308	42.93555	-85.8711	-146.6590388				

FIGURA 3.34: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 363m a 374m.*

N°	Dist	Cota	Y'
1	363.00	3817.782	
2	363.50	3817.781	-2.00
3	364.00	3817.781	0.00
4	364.50	3817.783	4.00
5	365.00	3817.785	4.00
6	365.50	3817.784	-2.00
7	366.00	3817.785	2.00
8	366.50	3817.786	2.00
9	367.00	3817.785	-2.00
10	367.50	3817.783	-4.00
11	368.00	3817.780	-6.00
12	368.50	3817.777	-6.00
13	369.00	3817.775	-4.00
14	369.50	3817.773	-4.00
15	370.00	3817.773	0.00
16	370.50	3817.771	-4.00
17	371.00	3817.769	-4.00
18	371.50	3817.767	-4.00
19	372.00	3817.766	-2.00
20	372.50	3817.765	-2.00
21	373.00	3817.765	0.00
22	373.50	3817.766	2.00
23	374.00	3817.766	0.00

IRI 2.8205

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.45454545
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.43734	0.02128394	0	-0.02521	0.036668087	0.000992	0	0.037038	-0.07407694	-1.474750962	RS1 =	0.359348	IRI =	0.359348
	z2	-0.92852	1.350569	0.9001616	0	-3.39137	4.932900364	0.062802	0	4.319885	-8.63977	-2.356300907				
	z3	0.063863	-0.09289	0.006615445	0	0.24029	-0.349512145	0.009863	0	0.695847	-1.3916946	-1.83409876				
	z4	3.743294	-5.44479	0.4186779	0	-46.6788	67.89648	-0.11453	0	42.93555	-85.8711	-23.41941125				
2da Iteracion	z1	0.988173	-1.45731	0.02128394	-0.05015	-0.02521	0.046236364	0.000992	-0.02324	0.037038	0	-1.484463111	RS2 =	0.703	IRI =	0.531174
	z2	-0.92852	1.36933	0.9001616	-2.12105	-3.39137	6.220105676	0.062802	-1.47078	4.319885	0	3.997605809				
	z3	0.063863	-0.09418	0.006615445	-0.01559	0.24029	-0.440714857	0.009863	-0.23098	0.695847	0	-0.781463399				
	z4	3.743294	-5.52043	0.4186779	-0.98653	-46.6788	85.61358421	-0.11453	2.68211	42.93555	0	81.78873708				
3ra Iteracion	z1	0.988173	-1.46691	0.02128394	0.085085	-0.02521	0.019700153	0.000992	0.08116	0.037038	0.14815388	-1.132806772	RS3 =	4.466718	IRI =	1.843022
	z2	-0.92852	1.378348	0.9001616	3.598491	-3.39137	2.650230747	0.062802	5.136469	4.319885	17.27954	30.04307901				
	z3	0.063863	-0.0948	0.006615445	0.026446	0.24029	-0.187777528	0.009863	0.806656	0.695847	2.7833892	3.333911101				
	z4	3.743294	-5.55678	0.4186779	1.673709	-46.6788	36.47779717	-0.11453	-9.36686	42.93555	171.7422	194.9700612				
4ta Iteracion	z1	0.988173	-1.11941	0.02128394	0.639435	-0.02521	-0.084045598	0.000992	0.193472	0.037038	0.14815388	-0.222393345	RS4 =	5.856218	IRI =	2.846321
	z2	-0.92852	1.051829	0.9001616	27.04363	-3.39137	-11.30652276	0.062802	12.24445	4.319885	17.27954	46.31291737				
	z3	0.063863	-0.07234	0.006615445	0.198748	0.24029	0.801104165	0.009863	1.922927	0.695847	2.7833892	5.633824292				
	z4	3.743294	-4.24043	0.4186779	12.57837	-46.6788	-155.6230695	-0.11453	-22.329	42.93555	171.7422	2.128109138				
5ta Iteracion	z1	0.988173	-0.21976	0.02128394	0.985721	-0.02521	-0.142024823	0.000992	0.002112	0.037038	-0.07407694	0.55196833	RS5 =	0.276747	IRI =	2.332406
	z2	-0.92852	0.206496	0.9001616	41.68911	-3.39137	-19.10637705	0.062802	0.133649	4.319885	-8.63977	14.28310787				
	z3	0.063863	-0.0142	0.006615445	0.306381	0.24029	1.353749386	0.009863	0.020989	0.695847	-1.3916946	0.275221442				
	z4	3.743294	-0.83248	0.4186779	19.3902	-46.6788	-262.9803264	-0.11453	-0.24372	42.93555	-85.8711	-330.5374367				

FIGURA 3.35: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 374m a 385m.*

N°	Dist	Cota	Y'
1	374.00	3817.766	
2	374.50	3817.768	4.00
3	375.00	3817.771	6.00
4	375.50	3817.771	0.00
5	376.00	3817.770	-2.00
6	376.50	3817.771	2.00
7	377.00	3817.766	-10.00
8	377.50	3817.767	2.00
9	378.00	3817.768	2.00
10	378.50	3817.765	-6.00
11	379.00	3817.764	-2.00
12	379.50	3817.762	-4.00
13	380.00	3817.761	-2.00
14	380.50	3817.761	0.00
15	381.00	3817.764	6.00
16	381.50	3817.762	-4.00
17	382.00	3817.763	2.00
18	382.50	3817.760	-6.00
19	383.00	3817.758	-4.00
20	383.50	3817.759	2.00
21	384.00	3817.758	-2.00
22	384.50	3817.759	2.00
23	385.00	3817.757	-4.00

IRI	3.2184

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.81818182
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.8085	0.02128394	0	-0.02521	0.020625799	0.000992	0	0.037038	0.14815388	-0.639725257	RS1 =	3.174262	IRI =	3.174262
	z2	-0.92852	0.759695	0.9001616	0	-3.39137	2.774756455	0.062802	0	4.319885	17.27954	20.81399137				
	z3	0.063863	-0.05225	0.006615445	0	0.24029	-0.196600582	0.009863	0	0.695847	2.783389201	2.534536861				
	z4	3.743294	-3.0627	0.4186779	0	-46.6788	38.19177	-0.11453	0	42.93555	171.7422	206.8712749				
2da Iteracion	z1	0.988173	-0.63216	0.02128394	0.443004	-0.02521	-0.063893925	0.000992	0.205282	0.037038	0.22223082	0.174463383	RS2 =	6.746787	IRI =	4.960525
	z2	-0.92852	0.593995	0.9001616	18.73596	-3.39137	-8.595549738	0.062802	12.99186	4.319885	25.91931	49.64557271				
	z3	0.063863	-0.04085	0.006615445	0.137694	0.24029	0.609022848	0.009863	2.040305	0.695847	4.1750838	6.921250709				
	z4	3.743294	-2.39468	0.4186779	8.714358	-46.6788	-118.3092152	-0.11453	-23.692	42.93555	257.6133	121.9318098				
3ra Iteracion	z1	0.988173	0.1724	0.02128394	1.056653	-0.02521	-0.174479355	0.000992	0.120995	0.037038	0	1.175568335	RS3 =	2.02968	IRI =	3.983576
	z2	-0.92852	-0.16199	0.9001616	44.68904	-3.39137	-23.47251509	0.062802	7.657521	4.319885	0	28.7120523				
	z3	0.063863	0.011142	0.006615445	0.328428	0.24029	1.663104564	0.009863	1.202574	0.695847	0	3.205248342				
	z4	3.743294	0.653068	0.4186779	20.7855	-46.6788	-323.0758852	-0.11453	-13.9643	42.93555	0	-315.6015661				
4ta Iteracion	z1	0.988173	1.161665	0.02128394	0.611106	-0.02521	-0.080802099	0.000992	-0.31318	0.037038	-0.07407694	1.304714453	RS4 =	4.77388	IRI =	4.181152
	z2	-0.92852	-1.09153	0.9001616	25.84549	-3.39137	-10.87017986	0.062802	-19.8203	4.319885	-8.63977	-14.57630233				
	z3	0.063863	0.075076	0.006615445	0.189943	0.24029	0.770187842	0.009863	-3.11268	0.695847	-1.3916946	-3.469165382				
	z4	3.743294	4.400498	0.4186779	12.0211	-46.6788	-149.6172425	-0.11453	36.1443	42.93555	-85.8711	-182.3224419				
5ta Iteracion	z1	0.988173	1.289283	0.02128394	-0.31024	-0.02521	0.087455266	0.000992	-0.18152	0.037038	0.07407694	0.959057308	RS5 =	2.218178	IRI =	3.788557
	z2	-0.92852	-1.21145	0.9001616	-13.121	-3.39137	11.76521993	0.062802	-11.4878	4.319885	8.639769998	-5.415320773				
	z3	0.063863	0.083323	0.006615445	-0.09643	0.24029	-0.833604362	0.009863	-1.80411	0.695847	1.3916946	-1.259120679				
	z4	3.743294	4.88393	0.4186779	-6.10278	-46.6788	161.9365811	-0.11453	20.94921	42.93555	85.87109998	267.5380462				

FIGURA 3.36: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 385m a 396m.*

N°	Dist	Cota	Y'
1	385.00	3817.757	
2	385.50	3817.757	0.00
3	386.00	3817.756	-2.00
4	386.50	3817.755	-2.00
5	387.00	3817.755	0.00
6	387.50	3817.757	4.00
7	388.00	3817.755	-4.00
8	388.50	3817.756	2.00
9	389.00	3817.754	-4.00
10	389.50	3817.754	0.00
11	390.00	3817.753	-2.00
12	390.50	3817.752	-2.00
13	391.00	3817.755	6.00
14	391.50	3817.756	2.00
15	392.00	3817.757	2.00
16	392.50	3817.758	2.00
17	393.00	3817.753	-10.00
18	393.50	3817.754	2.00
19	394.00	3817.752	-4.00
20	394.50	3817.755	6.00
21	395.00	3817.754	-2.00
22	395.50	3817.755	2.00
23	396.00	3817.755	0.00

IRI	2.0297

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.18181818
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.17967	0.02128394	0	-0.02521	0.004583511	0.000992	0	0.037038	0	-0.175084253	RS1 =	0.119784	IRI =	0.119784
	z2	-0.92852	0.168821	0.9001616	0	-3.39137	0.616612545	0.062802	0	4.319885	0	0.785433636				
	z3	0.063863	-0.01161	0.006615445	0	0.24029	-0.043689018	0.009863	0	0.695847	0	-0.05530052				
	z4	3.743294	-0.6806	0.4186779	0	-46.6788	8.48706	-0.11453	0	42.93555	0	7.806461091				
2da Iteracion	z1	0.988173	-0.17301	0.02128394	0.016717	-0.02521	0.001394088	0.000992	0.007746	0.037038	-0.07407694	-0.221232728	RS2 =	1.112743	IRI =	0.616263
	z2	-0.92852	0.162569	0.9001616	0.707017	-3.39137	0.187544469	0.062802	0.490259	4.319885	-8.63977	-7.092381007				
	z3	0.063863	-0.01118	0.006615445	0.005196	0.24029	-0.01328814	0.009863	0.076993	0.695847	-1.3916946	-1.333397557				
	z4	3.743294	-0.65539	0.4186779	0.328844	-46.6788	2.581363572	-0.11453	-0.89404	42.93555	-85.8711	-84.51032027				
3ra Iteracion	z1	0.988173	-0.21862	0.02128394	-0.15095	-0.02521	0.033628604	0.000992	-0.08386	0.037038	-0.07407694	-0.493879276	RS3 =	2.112902	IRI =	1.115143
	z2	-0.92852	0.205418	0.9001616	-6.38429	-3.39137	4.524003395	0.062802	-5.30739	4.319885	-8.63977	-15.60202676				
	z3	0.063863	-0.01413	0.006615445	-0.04692	0.24029	-0.320540456	0.009863	-0.8335	0.695847	-1.3916946	-2.606781202				
	z4	3.743294	-0.82814	0.4186779	-2.96942	-46.6788	62.26841885	-0.11453	9.678553	42.93555	-85.8711	-17.72169061				
4ta Iteracion	z1	0.988173	-0.48804	0.02128394	-0.33207	-0.02521	0.065715155	0.000992	-0.01759	0.037038	0	-0.771980989	RS4 =	0.16394	IRI =	0.877342
	z2	-0.92852	0.458575	0.9001616	-14.0443	-3.39137	8.840556957	0.062802	-1.11295	4.319885	0	-5.85816537				
	z3	0.063863	-0.03154	0.006615445	-0.10321	0.24029	-0.626382412	0.009863	-0.17478	0.695847	0	-0.935920866				
	z4	3.743294	-1.84874	0.4186779	-6.53222	-46.6788	121.6814966	-0.11453	2.029578	42.93555	0	115.3301158				
5ta Iteracion	z1	0.988173	-0.76285	0.02128394	-0.12468	-0.02521	0.023593919	0.000992	0.114444	0.037038	0.14815388	-0.601343603	RS5 =	4.209249	IRI =	1.543724
	z2	-0.92852	0.716797	0.9001616	-5.2733	-3.39137	3.174053013	0.062802	7.242924	4.319885	17.27954	23.14001807				
	z3	0.063863	-0.0493	0.006615445	-0.03875	0.24029	-0.224892051	0.009863	1.137464	0.695847	2.7833892	3.607905583				
	z4	3.743294	-2.88975	0.4186779	-2.45268	-46.6788	43.68769101	-0.11453	-13.2082	42.93555	171.7422	196.8792618				

FIGURA 3.37: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 396m a 407m.*

N°	Dist	Cota	Y'
1	396.00	3817.755	
2	396.50	3817.756	2.00
3	397.00	3817.753	-6.00
4	397.50	3817.752	-2.00
5	398.00	3817.753	2.00
6	398.50	3817.754	2.00
7	399.00	3817.754	0.00
8	399.50	3817.753	-2.00
9	400.00	3817.753	0.00
10	400.50	3817.753	0.00
11	401.00	3817.753	0.00
12	401.50	3817.752	-2.00
13	402.00	3817.752	0.00
14	402.50	3817.752	0.00
15	403.00	3817.753	2.00
16	403.50	3817.753	0.00
17	404.00	3817.752	-2.00
18	404.50	3817.751	-2.00
19	405.00	3817.750	-2.00
20	405.50	3817.749	-2.00
21	406.00	3817.749	0.00
22	406.50	3817.748	-2.00
23	407.00	3817.750	4.00

IRI	1.7939

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.45454545
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

Z_j' = Z_j from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.44917	0.02128394	0	-0.02521	0.011458777	0.000392	0	0.037038	0.07407694	-0.363633692	RS1 =	1.617077	IRI =	1.617077
	z2	-0.92852	0.422053	0.9001616	0	-3.39137	1.541531364	0.062802	0	4.319885	8.639770002	10.60335409				
	z3	0.063863	-0.02903	0.006615445	0	0.24029	-0.109222545	0.009863	0	0.695847	1.3916946	1.2534433				
	z4	3.743294	-1.7015	0.4186779	0	-46.6788	21.21765	-0.11453	0	42.93555	85.87110002	105.3872527				
2da Iteracion	z1	0.988173	-0.35933	0.02128394	0.225681	-0.02521	-0.031598441	0.000392	0.104578	0.037038	-0.22223082	-0.282903486	RS2 =	2.504667	IRI =	2.060872
	z2	-0.92852	0.33764	0.9001616	9.544732	-3.39137	-4.250888752	0.062802	6.618495	4.319885	-25.91931	-13.6693314				
	z3	0.063863	-0.02322	0.006615445	0.070146	0.24029	0.301189389	0.009863	1.039401	0.695847	-4.1750838	-2.787570588				
	z4	3.743294	-1.36119	0.4186779	4.43939	-46.6788	-58.50926673	-0.11453	-12.0695	42.93555	-257.6133	-325.1138502				
3ra Iteracion	z1	0.988173	-0.27956	0.02128394	-0.29094	-0.02521	0.070272731	0.000392	-0.32262	0.037038	-0.07407694	-0.896914777	RS3 =	4.479594	IRI =	2.867113
	z2	-0.92852	0.26268	0.9001616	-12.3046	-3.39137	9.453680478	0.062802	-20.4177	4.319885	-8.63977	-31.64570906				
	z3	0.063863	-0.01807	0.006615445	-0.09043	0.24029	-0.669824222	0.009863	-3.20649	0.695847	-1.3916946	-5.376508538				
	z4	3.743294	-1.05899	0.4186779	-5.72305	-46.6788	130.1205336	-0.11453	37.2337	42.93555	-85.8711	74.70109194				
4ta Iteracion	z1	0.988173	-0.88631	0.02128394	-0.67355	-0.02521	0.13553807	0.000392	0.074127	0.037038	0.07407694	-1.276109934	RS4 =	1.846008	IRI =	2.611836
	z2	-0.92852	0.8328	0.9001616	-28.4863	-3.39137	18.23372438	0.062802	4.691353	4.319885	8.639769998	3.911395328				
	z3	0.063863	-0.05728	0.006615445	-0.20935	0.24029	-1.291919086	0.009863	0.736753	0.695847	1.3916946	0.56989813				
	z4	3.743294	-3.35742	0.4186779	-13.2494	-46.6788	250.969128	-0.11453	-8.55515	42.93555	85.87109998	311.6783033				
5ta Iteracion	z1	0.988173	-1.26102	0.02128394	0.08325	-0.02521	-0.014366739	0.000392	0.309284	0.037038	0.07407694	-0.808773371	RS5 =	5.355771	IRI =	3.160623
	z2	-0.92852	1.184888	0.9001616	3.520888	-3.39137	-1.93273485	0.062802	19.57392	4.319885	8.639770002	30.98672947				
	z3	0.063863	-0.0815	0.006615445	0.025876	0.24029	0.136940594	0.009863	3.073983	0.695847	1.3916946	4.546997642				
	z4	3.743294	-4.77685	0.4186779	1.637615	-46.6788	-26.60217791	-0.11453	-35.695	42.93555	85.87110002	20.43469338				

FIGURA 3.38: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 407m a 418m.*

N°	Dist	Cota	Y'
1	407.00	3817.750	
2	407.50	3817.751	2.00
3	408.00	3817.754	6.00
4	408.50	3817.756	4.00
5	409.00	3817.757	2.00
6	409.50	3817.759	4.00
7	410.00	3817.758	-2.00
8	410.50	3817.756	-4.00
9	411.00	3817.756	0.00
10	411.50	3817.756	0.00
11	412.00	3817.757	2.00
12	412.50	3817.757	0.00
13	413.00	3817.758	2.00
14	413.50	3817.759	2.00
15	414.00	3817.759	0.00
16	414.50	3817.759	0.00
17	415.00	3817.760	2.00
18	415.50	3817.760	0.00
19	416.00	3817.757	-6.00
20	416.50	3817.755	-4.00
21	417.00	3817.757	4.00
22	417.50	3817.759	4.00
23	418.00	3817.759	0.00

IRI | **2.5330**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.818181818
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.808505	0.02128394	0	-0.02521	-0.020625799	0.000992	0	0.037038	0.07407694	0.861956077	RS1 =	0.778591	IRI =	0.778591
	z2	-0.92852	-0.75969	0.9001616	0	-3.39137	-2.774756455	0.062802	0	4.319885	8.639770002	5.105318638				
	z3	0.063863	0.052252	0.006615445	0	0.24029	0.196600582	0.009863	0	0.695847	1.3916946	1.64054694				
	z4	3.743294	3.062695	0.4186779	0	-46.6788	-38.19177	-0.11453	0	42.93555	85.87110002	50.74202511				
2da Iteracion	z1	0.988173	0.851761	0.02128394	0.108661	-0.02521	-0.041357056	0.000992	0.050352	0.037038	0.22223082	1.191648672	RS2 =	3.966915	IRI =	2.372753
	z2	-0.92852	-0.80034	0.9001616	4.595612	-3.39137	-5.563700036	0.062802	3.186684	4.319885	25.91931	27.33756566				
	z3	0.063863	0.055047	0.006615445	0.033774	0.24029	0.394206368	0.009863	0.500452	0.695847	4.1750838	5.158563804				
	z4	3.743294	3.226555	0.4186779	2.137484	-46.6788	-76.57881173	-0.11453	-5.81124	42.93555	257.6133	180.5872918				
3ra Iteracion	z1	0.988173	1.177555	0.02128394	0.581851	-0.02521	-0.130043834	0.000992	0.1792	0.037038	0.14815388	1.956715588	RS3 =	4.10425	IRI =	2.949919
	z2	-0.92852	-1.10646	0.9001616	24.60823	-3.39137	-17.49459337	0.062802	11.34118	4.319885	17.27954	34.62789213				
	z3	0.063863	0.076103	0.006615445	0.18085	0.24029	1.239549233	0.009863	1.781075	0.695847	2.7833892	6.060965835				
	z4	3.743294	4.460691	0.4186779	11.44563	-46.6788	-240.7957228	-0.11453	-20.6818	42.93555	171.7422	-73.82897459				
4ta Iteracion	z1	0.988173	1.933573	0.02128394	0.737018	-0.02521	-0.152792767	0.000992	-0.07326	0.037038	0.07407694	2.518613368	RS4 =	0.044642	IRI =	2.2236
	z2	-0.92852	-1.81684	0.9001616	31.1707	-3.39137	-20.55497164	0.062802	-4.63658	4.319885	8.639770002	12.80207251				
	z3	0.063863	0.124962	0.006615445	0.229079	0.24029	1.456387056	0.009863	-0.72815	0.695847	1.3916946	2.473971258				
	z4	3.743294	7.324562	0.4186779	14.49793	-46.6788	-282.9187939	-0.11453	8.455271	42.93555	85.87110002	-166.7699283				
5ta Iteracion	z1	0.988173	2.488825	0.02128394	0.272479	-0.02521	-0.062367108	0.000992	-0.16549	0.037038	0.14815388	2.681601736	RS5 =	0.703003	IRI =	1.91948
	z2	-0.92852	-2.33857	0.9001616	11.52393	-3.39137	-8.39014943	0.062802	-10.4734	4.319885	17.27954	7.601321832				
	z3	0.063863	0.160847	0.006615445	0.084691	0.24029	0.594469564	0.009863	-1.6448	0.695847	2.7833892	1.978598595				
	z4	3.743294	9.42791	0.4186779	5.359945	-46.6788	-115.4820838	-0.11453	19.09934	42.93555	171.7422	90.14731409				

FIGURA 3.39: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 418m a 429m.*

N°	Dist	Cota	Y'
1	418.00	3817.759	
2	418.50	3817.760	2.00
3	419.00	3817.756	-8.00
4	419.50	3817.751	-10.00
5	420.00	3817.747	-8.00
6	420.50	3817.744	-6.00
7	421.00	3817.740	-8.00
8	421.50	3817.737	-6.00
9	422.00	3817.735	-4.00
10	422.50	3817.732	-6.00
11	423.00	3817.731	-2.00
12	423.50	3817.729	-4.00
13	424.00	3817.727	-4.00
14	424.50	3817.725	-4.00
15	425.00	3817.726	2.00
16	425.50	3817.726	0.00
17	426.00	3817.727	2.00
18	426.50	3817.727	0.00
19	427.00	3817.728	2.00
20	427.50	3817.729	2.00
21	428.00	3817.729	0.00
22	428.50	3817.730	2.00
23	429.00	3817.729	-2.00

IRI | **3.0771**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.72727273
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.69502	0.02128394	0	-0.02521	0.068752664	0.000992	0	0.037038	0.07407694	-2.552186851	RS1 =	3.114374	IRI =	3.114374
	z2	-0.92852	2.532316	0.9001616	0	-3.39137	9.249188182	0.062802	0	4.319885	8.639770002	20.42127455				
	z3	0.063863	-0.17417	0.006615445	0	0.24029	-0.655335273	0.009863	0	0.695847	1.3916946	0.5621868				
	z4	3.743294	-10.209	0.4186779	0	-46.6788	127.3059	-0.11453	0	42.93555	85.87110002	202.9680164				
2da Iteracion	z1	0.988173	-2.522	0.02128394	0.434645	-0.02521	-0.014172341	0.000992	0.201409	0.037038	-0.29630776	-2.196427779	RS2 =	1.26135	IRI =	2.187862
	z2	-0.92852	2.369746	0.9001616	18.38245	-3.39137	-1.906582887	0.062802	12.74673	4.319885	-34.55908	-2.966739008				
	z3	0.063863	-0.16299	0.006615445	0.135096	0.24029	0.135087641	0.009863	2.001809	0.695847	-5.5667784	-3.457777317				
	z4	3.743294	-9.55359	0.4186779	8.549936	-46.6788	-26.24222208	-0.11453	-23.2449	42.93555	-343.4844	-393.9752039				
3ra Iteracion	z1	0.988173	-2.17045	0.02128394	-0.06314	-0.02521	0.08716818	0.000992	-0.39095	0.037038	-0.3703847	-2.907758479	RS3 =	8.927131	IRI =	4.434285
	z2	-0.92852	2.039418	0.9001616	-2.67054	-3.39137	11.7265988	0.062802	-24.7423	4.319885	-43.19885	-56.84567813				
	z3	0.063863	-0.14027	0.006615445	-0.01963	0.24029	-0.830867928	0.009863	-3.88565	0.695847	-6.958473	-11.83488963				
	z4	3.743294	-8.22187	0.4186779	-1.24211	-46.6788	161.4049996	-0.11453	45.12005	42.93555	-429.3555	-232.2944338				
4ta Iteracion	z1	0.988173	-2.87337	0.02128394	-1.2099	-0.02521	0.298349401	0.000992	-0.23051	0.037038	-0.29630776	-4.311735508	RS4 =	6.951648	IRI =	5.063626
	z2	-0.92852	2.6999	0.9001616	-51.1703	-3.39137	40.13647781	0.062802	-14.5885	4.319885	-34.55908	-57.48147688				
	z3	0.063863	-0.1857	0.006615445	-0.37606	0.24029	-2.843800895	0.009863	-2.29105	0.695847	-5.5667784	-11.26338335				
	z4	3.743294	-10.8846	0.4186779	-23.8	-46.6788	552.438801	-0.11453	26.60354	42.93555	-343.4844	200.8733203				
5ta Iteracion	z1	0.988173	-4.26074	0.02128394	-1.22343	-0.02521	0.283942123	0.000992	0.19933	0.037038	-0.22223082	-5.22313041	RS5 =	0.332905	IRI =	4.117481
	z2	-0.92852	4.003515	0.9001616	-51.7426	-3.39137	38.19828914	0.062802	12.61518	4.319885	-25.91931	-22.84494368				
	z3	0.063863	-0.27536	0.006615445	-0.38027	0.24029	-2.706473881	0.009863	1.981149	0.695847	-4.1750838	-5.556035437				
	z4	3.743294	-16.1401	0.4186779	-24.0662	-46.6788	525.7615568	-0.11453	-23.005	42.93555	-257.6133	204.9369021				

FIGURA 3.40: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 429m a 440m.*

N°	Dist	Cota	Y'
1	429.00	3817.729	
2	429.50	3817.728	-2.00
3	430.00	3817.728	0.00
4	430.50	3817.727	-2.00
5	431.00	3817.729	4.00
6	431.50	3817.730	2.00
7	432.00	3817.730	0.00
8	432.50	3817.730	0.00
9	433.00	3817.731	2.00
10	433.50	3817.731	0.00
11	434.00	3817.729	-4.00
12	434.50	3817.727	-4.00
13	435.00	3817.726	-2.00
14	435.50	3817.725	-2.00
15	436.00	3817.724	-2.00
16	436.50	3817.723	-2.00
17	437.00	3817.727	8.00
18	437.50	3817.729	4.00
19	438.00	3817.728	-2.00
20	438.50	3817.726	-4.00
21	439.00	3817.724	-4.00
22	439.50	3817.723	-2.00
23	440.00	3817.724	2.00

IRI | **2.6516**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.45454545
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.44917	0.02128394	0	-0.02521	0.011458777	0.000992	0	0.037038	-0.07407694	-0.511787572	**RS1** =	1.018158	**IRI** =	1.018158
	z2	-0.92852	0.422053	0.9001616	0	-3.39137	1.541531364	0.062802	0	4.319885	-8.63977	-6.676185907				
	z3	0.063863	-0.02903	0.006615445	0	0.24029	-0.109222545	0.009863	0	0.695847	-1.3916946	-1.5299459				
	z4	3.743294	-1.7015	0.4186779	0	-46.6788	21.21765	-0.11453	0	42.93555	-85.8711	-66.35494725				
2da Iteracion	z1	0.988173	-0.50573	0.02128394	-0.1421	-0.02521	0.03856888	0.000992	-0.06585	0.037038	0	-0.675106275	**RS2** =	0.423812	**IRI** =	0.720985
	z2	-0.92852	0.475203	0.9001616	-6.00965	-3.39137	5.188611096	0.062802	-4.1672	4.319885	0	-4.513033644				
	z3	0.063863	-0.03268	0.006615445	-0.04417	0.24029	-0.367630088	0.009863	-0.65444	0.695847	0	-1.098918063				
	z4	3.743294	-1.91577	0.4186779	-2.79517	-46.6788	71.41608456	-0.11453	7.599307	42.93555	0	74.30444869				
3ra Iteracion	z1	0.988173	-0.66712	0.02128394	-0.09606	-0.02521	0.027702966	0.000992	0.073734	0.037038	-0.07407694	-0.735817172	**RS3** =	0.260065	**IRI** =	0.567345
	z2	-0.92852	0.626847	0.9001616	-4.06246	-3.39137	3.726836652	0.062802	4.666443	4.319885	-8.63977	-3.682102491				
	z3	0.063863	-0.04311	0.006615445	-0.02986	0.24029	-0.264058582	0.009863	0.732841	0.695847	-1.3916946	-0.995882396				
	z4	3.743294	-2.52712	0.4186779	-1.88951	-46.6788	51.29620944	-0.11453	-8.50972	42.93555	-85.8711	-47.50124371				
4ta Iteracion	z1	0.988173	-0.72711	0.02128394	-0.07837	-0.02521	0.025105508	0.000992	-0.04714	0.037038	0.14815388	-0.67936097	**RS4** =	2.68361	**IRI** =	1.096411
	z2	-0.92852	0.683218	0.9001616	-3.31449	-3.39137	3.377404684	0.062802	-2.98316	4.319885	17.27954	15.042518				
	z3	0.063863	-0.04699	0.006615445	-0.02436	0.24029	-0.239300182	0.009863	-0.46849	0.695847	2.7833892	2.004249021				
	z4	3.743294	-2.75438	0.4186779	-1.54161	-46.6788	46.48662504	-0.11453	5.440085	42.93555	171.7422	219.3729148				
5ta Iteracion	z1	0.988173	-0.67133	0.02128394	0.320164	-0.02521	-0.050525735	0.000992	0.217687	0.037038	0.07407694	-0.109923345	**RS5** =	4.20295	**IRI** =	1.717719
	z2	-0.92852	0.630798	0.9001616	13.5407	-3.39137	-6.797147999	0.062802	13.77699	4.319885	8.639770002	29.791102				
	z3	0.063863	-0.04339	0.006615445	0.099513	0.24029	0.481600196	0.009863	2.163605	0.695847	1.3916946	4.093026399				
	z4	3.743294	-2.54305	0.4186779	6.29797	-46.6788	-93.55599934	-0.11453	-25.1237	42.93555	85.87110002	-29.05368232				

FIGURA 3.41: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 440m a 451m.*

N°	Dist	Cota	Y'
1	440.00	3817.724	
2	440.50	3817.725	2.00
3	441.00	3817.726	2.00
4	441.50	3817.727	2.00
5	442.00	3817.727	0.00
6	442.50	3817.728	2.00
7	443.00	3817.728	0.00
8	443.50	3817.728	0.00
9	444.00	3817.728	0.00
10	444.50	3817.728	0.00
11	445.00	3817.727	-2.00
12	445.50	3817.727	0.00
13	446.00	3817.726	-2.00
14	446.50	3817.724	-4.00
15	447.00	3817.723	-2.00
16	447.50	3817.721	-4.00
17	448.00	3817.717	-8.00
18	448.50	3817.713	-8.00
19	449.00	3817.712	-2.00
20	449.50	3817.711	-2.00
21	450.00	3817.707	-8.00
22	450.50	3817.704	-6.00
23	451.00	3817.701	-6.00

IRI	2.5419

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.09090909
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.06618	0.02128394	0	-0.02521	0.052710375	0.000992	0	0.037038	0.07407694	-1.939391966	RS1 =	2.695131	IRI =	2.695131
	z2	-0.92852	1.941443	0.9001616	0	-3.39137	7.091044273	0.062802	0	4.319885	8.639769998	17.67225682				
	z3	0.063863	-0.13353	0.006615445	0	0.24029	-0.502423709	0.009863	0	0.695847	1.3916946	0.75573862				
	z4	3.743294	-7.82689	0.4186779	0	-46.6788	97.60119	-0.11453	0	42.93555	85.87109998	175.6454025				
2da Iteracion	z1	0.988173	-1.91645	0.02128394	0.376135	-0.02521	-0.019051649	0.000992	0.174296	0.037038	0.07407694	-1.31099782	RS2 =	4.609677	IRI =	3.652404
	z2	-0.92852	1.800756	0.9001616	15.90789	-3.39137	-2.562988527	0.062802	11.03082	4.319885	8.639770002	34.81624952				
	z3	0.063863	-0.12386	0.006615445	0.11691	0.24029	0.181596131	0.009863	1.732334	0.695847	1.3916946	3.298679079				
	z4	3.743294	-7.25971	0.4186779	7.398983	-46.6788	-35.27699455	-0.11453	-20.1158	42.93555	85.87110002	30.61756724				
3ra Iteracion	z1	0.988173	-1.29549	0.02128394	0.741027	-0.02521	-0.083157423	0.000992	0.030382	0.037038	0.07407694	-0.533163456	RS3 =	3.166068	IRI =	3.490292
	z2	-0.92852	1.217282	0.9001616	31.34025	-3.39137	-11.18703797	0.062802	1.922834	4.319885	8.639769998	31.93309971				
	z3	0.063863	-0.08372	0.006615445	0.230325	0.24029	0.792638276	0.009863	0.301971	0.695847	1.3916946	2.632904533				
	z4	3.743294	-4.90745	0.4186779	14.57679	-46.6788	-153.97848	-0.11453	-3.50648	42.93555	85.87109998	-61.94451597				
4ta Iteracion	z1	0.988173	-0.52686	0.02128394	0.679662	-0.02521	-0.066373707	0.000992	-0.06147	0.037038	0	0.024962334	RS4 =	0.17396	IRI =	2.661209
	z2	-0.92852	0.495051	0.9001616	28.74495	-3.39137	-8.929150814	0.062802	-3.89022	4.319885	0	16.42063106				
	z3	0.063863	-0.03405	0.006615445	0.211252	0.24029	0.632659577	0.009863	-0.61094	0.695847	0	0.198922747				
	z4	3.743294	-1.99579	0.4186779	13.36968	-46.6788	-122.9009031	-0.11453	7.094202	42.93555	0	-104.4328057				
5ta Iteracion	z1	0.988173	0.024667	0.02128394	0.349496	-0.02521	-0.005014705	0.000992	-0.10363	0.037038	0.07407694	0.339594662	RS5 =	0.180136	IRI =	2.164994
	z2	-0.92852	-0.02318	0.9001616	14.78122	-3.39137	-0.674620437	0.062802	-6.55855	4.319885	8.639770002	16.16463857				
	z3	0.063863	0.001594	0.006615445	0.10863	0.24029	0.047799067	0.009863	-1.02999	0.695847	1.3916946	0.519730281				
	z4	3.743294	0.093441	0.4186779	6.874955	-46.6788	-9.285481082	-0.11453	11.96018	42.93555	85.87110002	95.51419314				

FIGURA 3.42: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 451m a 462m.*

N°	Dist	Cota	Y'
1	451.00	3817.701	
2	451.50	3817.699	-4.00
3	452.00	3817.700	2.00
4	452.50	3817.700	0.00
5	453.00	3817.697	-6.00
6	453.50	3817.695	-4.00
7	454.00	3817.693	-4.00
8	454.50	3817.690	-6.00
9	455.00	3817.691	2.00
10	455.50	3817.691	0.00
11	456.00	3817.692	2.00
12	456.50	3817.693	2.00
13	457.00	3817.691	-4.00
14	457.50	3817.690	-2.00
15	458.00	3817.689	-2.00
16	458.50	3817.688	-2.00
17	459.00	3817.689	2.00
18	459.50	3817.690	2.00
19	460.00	3817.690	0.00
20	460.50	3817.690	0.00
21	461.00	3817.686	-8.00
22	461.50	3817.685	-2.00
23	462.00	3817.684	-2.00

IRI 2.6203

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.54545455
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.52718	0.02128394	0	-0.02521	0.038959843	0.000992	0	0.037038	-0.14815388	-1.636370028	RS1 =	1.617074	IRI =	1.617074
	z2	-0.92852	1.434979	0.9001616	0	-3.39137	5.241206636	0.062802	0	4.319885	-17.27954	-10.60335409				
	z3	0.063863	-0.0987	0.006615445	0	0.24029	-0.371356655	0.009863	0	0.695847	-2.7833892	-3.25344362				
	z4	3.743294	-5.78509	0.4186779	0	-46.6788	72.14001	-0.11453	0	42.93555	-171.7422	-105.3872807				
2da Iteracion	z1	0.988173	-1.61702	0.02128394	-0.22568	-0.02521	0.082017069	0.000992	-0.10458	0.037038	0.07407694	-1.79118087	RS2 =	1.187056	IRI =	1.402065
	z2	-0.92852	1.519396	0.9001616	-3.54473	-3.39137	11.03362784	0.062802	-6.6185	4.319885	8.639769398	5.029564177				
	z3	0.063863	-0.1045	0.006615445	-0.07015	0.24029	-0.781768666	0.009863	-1.0394	0.695847	1.3916946	-0.604124923				
	z4	3.743294	-6.12541	0.4186779	-4.43939	-46.6788	151.8669416	-0.11453	12.06949	42.93555	85.87109398	239.2427264				
3ra Iteracion	z1	0.988173	-1.77	0.02128394	0.107049	-0.02521	0.015229572	0.000992	0.237405	0.037038	0	-1.410313017	RS3 =	3.543605	IRI =	2.115911
	z2	-0.92852	1.66314	0.9001616	4.527421	-3.39137	2.048810535	0.062802	15.02484	4.319885	0	23.26421392				
	z3	0.063863	-0.11439	0.006615445	0.033273	0.24029	-0.145164936	0.009863	2.359574	0.695847	0	2.133231672				
	z4	3.743294	-6.70492	0.4186779	2.105767	-46.6788	28.19984456	-0.11453	-27.3933	42.93555	0	-3.798601835				
4ta Iteracion	z1	0.988173	-1.39363	0.02128394	0.435154	-0.02521	-0.053778811	0.000992	-0.00377	0.037038	-0.22223082	-1.178257735	RS4 =	2.457847	IRI =	2.201395
	z2	-0.92852	1.309498	0.9001616	20.94155	-3.39137	-7.234779244	0.062802	-0.23856	4.319885	-25.91931	-11.14159756				
	z3	0.063863	-0.09007	0.006615445	0.153903	0.24029	0.512607803	0.009863	-0.03746	0.695847	-4.1750838	-3.636104451				
	z4	3.743294	-5.27922	0.4186779	9.740212	-46.6788	-99.5795593	-0.11453	0.435035	42.93555	-257.6133	-352.296828				
5ta Iteracion	z1	0.988173	-1.16432	0.02128394	-0.23714	-0.02521	0.091663684	0.000992	-0.34959	0.037038	-0.14815388	-1.807539372	RS5 =	5.473113	IRI =	2.855739
	z2	-0.92852	1.094031	0.9001616	-10.0292	-3.39137	12.33137191	0.062802	-22.1248	4.319885	-17.27954	-36.00820434				
	z3	0.063863	-0.07525	0.006615445	-0.07371	0.24029	-0.873718084	0.009863	-3.47459	0.695847	-2.7833892	-7.28065217				
	z4	3.743294	-4.41057	0.4186779	-4.66474	-46.6788	169.7291015	-0.11453	40.34683	42.93555	-171.7422	29.2584252				

FIGURA 3.43: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 462m a 473m.*

N°	Dist	Cota	Y'
1	462.00	3817.684	
2	462.50	3817.682	-4.00
3	463.00	3817.681	-2.00
4	463.50	3817.679	-4.00
5	464.00	3817.680	2.00
6	464.50	3817.681	2.00
7	465.00	3817.680	-2.00
8	465.50	3817.680	0.00
9	466.00	3817.680	0.00
10	466.50	3817.679	-2.00
11	467.00	3817.679	0.00
12	467.50	3817.678	-2.00
13	468.00	3817.677	-2.00
14	468.50	3817.676	-2.00
15	469.00	3817.675	-2.00
16	469.50	3817.674	-2.00
17	470.00	3817.672	-4.00
18	470.50	3817.670	-4.00
19	471.00	3817.666	-8.00
20	471.50	3817.663	-6.00
21	472.00	3817.662	-2.00
22	472.50	3817.660	-4.00
23	473.00	3817.655	-10.00

IRI	1.9838

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.63636364
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.60518	0.02128394	0	-0.02521	0.066460908	0.000992	0	0.037038	-0.14815388	-2.686875545	RS1 =	0.898371	IRI =	0.898371
	z2	-0.92852	2.447906	0.9001616	0	-3.39137	8.940881909	0.062802	0	4.319885	-17.27954	-5.890752276				
	z3	0.063863	-0.16837	0.006615445	0	0.24029	-0.633490764	0.009863	0	0.695847	-2.7833892	-3.585246741				
	z4	3.743294	-9.86868	0.4186779	0	-46.6788	123.06237	-0.11453	0	42.93555	-171.7422	-58.54851422				
2da Iteracion	z1	0.988173	-2.6551	0.02128394	-0.12538	-0.02521	0.090381597	0.000992	-0.0581	0.037038	-0.07407694	-2.82226948	RS2 =	0.21893	IRI =	0.558651
	z2	-0.92852	2.494807	0.9001616	-5.30263	-3.39137	12.15889465	0.062802	-3.67694	4.319885	-8.63977	-2.965641874				
	z3	0.063863	-0.17159	0.006615445	-0.03897	0.24029	-0.861497505	0.009863	-0.57745	0.695847	-1.3916946	-3.041199344				
	z4	3.743294	-10.0578	0.4186779	-2.46633	-46.6788	167.3551231	-0.11453	6.705274	42.93555	-85.8711	75.66520468				
3ra Iteracion	z1	0.988173	-2.78889	0.02128394	-0.06312	-0.02521	0.076666552	0.000992	0.075084	0.037038	-0.14815388	-2.848413692	RS3 =	0.119341	IRI =	0.412214
	z2	-0.92852	2.620522	0.9001616	-2.66956	-3.39137	10.31383121	0.062802	4.751901	4.319885	-17.27954	-2.262842138				
	z3	0.063863	-0.18024	0.006615445	-0.01962	0.24029	-0.730768718	0.009863	0.746262	0.695847	-2.7833892	-2.967754587				
	z4	3.743294	-10.5646	0.4186779	-1.24165	-46.6788	141.9596552	-0.11453	-8.66557	42.93555	-171.7422	-50.25434306				
4ta Iteracion	z1	0.988173	-2.81472	0.02128394	-0.04816	-0.02521	0.074815045	0.000992	-0.04987	0.037038	0.07407694	-2.763863074	RS4 =	2.749916	IRI =	0.99664
	z2	-0.92852	2.644798	0.9001616	-2.03692	-3.39137	10.06475091	0.062802	-3.15606	4.319885	8.639769998	16.15633833				
	z3	0.063863	-0.18191	0.006615445	-0.01497	0.24029	-0.713120563	0.009863	-0.49564	0.695847	1.3916946	-0.013947159				
	z4	3.743294	-10.6624	0.4186779	-0.9474	-46.6788	138.5313119	-0.11453	5.755384	42.93555	85.87109998	218.5479436				
5ta Iteracion	z1	0.988173	-2.73117	0.02128394	0.343871	-0.02521	0.000351598	0.000992	0.216869	0.037038	0.07407694	-2.096006232	RS5 =	5.57019	IRI =	1.91135
	z2	-0.92852	2.566291	0.9001616	14.54332	-3.39137	0.047299963	0.062802	13.72518	4.319885	8.639770002	39.52185224				
	z3	0.063863	-0.17651	0.006615445	0.106881	0.24029	-0.003351357	0.009863	2.155468	0.695847	1.3916946	3.474183737				
	z4	3.743294	-10.346	0.4186779	6.764302	-46.6788	0.651037072	-0.11453	-25.0292	42.93555	85.87110002	57.91126173				

FIGURA 3.44: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 473m a 484m.*

N°	Dist	Cota	Y'
1	473.00	3817.655	
2	473.50	3817.653	-4.00
3	474.00	3817.651	-4.00
4	474.50	3817.650	-2.00
5	475.00	3817.648	-4.00
6	475.50	3817.646	-4.00
7	476.00	3817.645	-2.00
8	476.50	3817.645	0.00
9	477.00	3817.644	-2.00
10	477.50	3817.644	0.00
11	478.00	3817.643	-2.00
12	478.50	3817.643	0.00
13	479.00	3817.644	2.00
14	479.50	3817.646	4.00
15	480.00	3817.644	-4.00
16	480.50	3817.643	-2.00
17	481.00	3817.644	2.00
18	481.50	3817.646	4.00
19	482.00	3817.645	-2.00
20	482.50	3817.645	0.00
21	483.00	3817.646	2.00
22	483.50	3817.646	0.00
23	484.00	3817.645	-2.00

IRI 2.1268

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.90909091
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.89834	0.02128394	0	-0.02521	0.022917555	0.000932	0	0.037038	-0.14815388	-1.023575144	RS1 =	2.036317	IRI =	2.036317
	z2	-0.92852	0.844105	0.9001616	0	-3.39137	3.083062727	0.062802	0	4.319885	-17.27954	-13.35237182				
	z3	0.063863	-0.05806	0.006615445	0	0.24029	-0.218445091	0.009863	0	0.695847	-2.7833892	-3.059831801				
	z4	3.743294	-3.40299	0.4186779	0	-46.6788	42.4353	-0.11453	0	42.93555	-171.7422	-132.7098946				
2da Iteracion	z1	0.988173	-1.01147	0.02128394	-0.28419	-0.02521	0.077137761	0.000932	-0.13169	0.037038	-0.14815388	-1.498366431	RS2 =	3.482859	IRI =	2.759588
	z2	-0.92852	0.950406	0.9001616	-12.0193	-3.39137	10.3772222	0.062802	-8.3344	4.319885	-17.27954	-26.30560729				
	z3	0.063863	-0.06537	0.006615445	-0.08833	0.24029	-0.735260177	0.009863	-1.30888	0.695847	-2.7833892	-4.981225327				
	z4	3.743294	-3.83154	0.4186779	-5.59034	-46.6788	142.8321692	-0.11453	15.19861	42.93555	-171.7422	-23.13330256				
3ra Iteracion	z1	0.988173	-1.48064	0.02128394	-0.55989	-0.02521	0.125573253	0.000932	-0.02296	0.037038	-0.07407694	-2.011931014	RS3 =	1.07451	IRI =	2.197895
	z2	-0.92852	1.391257	0.9001616	-23.6793	-3.39137	16.89317316	0.062802	-1.45281	4.319885	-8.63977	-15.48744722				
	z3	0.063863	-0.09569	0.006615445	-0.17402	0.24029	-1.196936641	0.009863	-0.22816	0.695847	-1.3916946	-3.086501465				
	z4	3.743294	-5.60883	0.4186779	-11.0136	-46.6788	232.5177702	-0.11453	2.649344	42.93555	-85.8711	132.6736115				
4ta Iteracion	z1	0.988173	-1.98819	0.02128394	-0.32963	-0.02521	0.077808572	0.000932	0.131654	0.037038	-0.14815388	-2.256519584	RS4 =	0.190955	IRI =	1.69616
	z2	-0.92852	1.868166	0.9001616	-13.9412	-3.39137	10.46746539	0.062802	8.332124	4.319885	-17.27954	-10.55298967				
	z3	0.063863	-0.12849	0.006615445	-0.10246	0.24029	-0.741654202	0.009863	1.308517	0.695847	-2.7833892	-2.447474688				
	z4	3.743294	-7.53147	0.4186779	-6.48425	-46.6788	144.0742772	-0.11453	-15.1945	42.93555	-171.7422	-56.87810723				
5ta Iteracion	z1	0.988173	-2.22983	0.02128394	-0.22461	-0.02521	0.061699148	0.000932	-0.05644	0.037038	-0.14815388	-2.597336065	RS5 =	1.549048	IRI =	1.666738
	z2	-0.92852	2.095215	0.9001616	-9.4394	-3.39137	8.300289784	0.062802	-3.57204	4.319885	-17.27954	-19.95547186				
	z3	0.063863	-0.14411	0.006615445	-0.06981	0.24029	-0.588102714	0.009863	-0.56097	0.695847	-2.7833892	-4.146383904				
	z4	3.743294	-8.44682	0.4186779	-4.4183	-46.6788	114.2452549	-0.11453	6.513971	42.93555	-171.7422	-63.84809397				

FIGURA 3.45: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 484m a 495m.*

N°	Dist	Cota	Y'
1	484.00	3817.645	
2	484.50	3817.644	-2.00
3	485.00	3817.643	-2.00
4	485.50	3817.642	-2.00
5	486.00	3817.644	4.00
6	486.50	3817.645	2.00
7	487.00	3817.643	-4.00
8	487.50	3817.641	-4.00
9	488.00	3817.642	2.00
10	488.50	3817.642	0.00
11	489.00	3817.642	0.00
12	489.50	3817.641	-2.00
13	490.00	3817.642	2.00
14	490.50	3817.642	0.00
15	491.00	3817.640	-4.00
16	491.50	3817.638	-4.00
17	492.00	3817.638	0.00
18	492.50	3817.637	-2.00
19	493.00	3817.637	0.00
20	493.50	3817.637	0.00
21	494.00	3817.636	-2.00
22	494.50	3817.635	-2.00
23	495.00	3817.634	-2.00

IRI	1.9455

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.98817	0.02128394	0	-0.02521	0.02520931	0.000992	0	0.037038	-0.07407694	-1.03704033	RS1 =	0.658807	IRI =	0.658807
	z2	-0.92852	0.928516	0.9001616	0	-3.39137	3.391369	0.062802	0	4.319885	-8.63977	-4.319885002				
	z3	0.063863	-0.06386	0.006615445	0	0.24029	-0.2402896	0.009863	0	0.695847	-1.3916946	-1.69584746				
	z4	3.743294	-3.74329	0.4186779	0	-46.6788	46.67883	-0.11453	0	42.93555	-85.8711	-42.93556402				
2da Iteracion	z1	0.988173	-1.02477	0.02128394	-0.09194	-0.02521	0.042751144	0.000992	-0.04261	0.037038	-0.07407694	-1.19065058	RS2 =	1.126805	IRI =	0.892806
	z2	-0.92852	0.962909	0.9001616	-3.88859	-3.39137	5.751244506	0.062802	-2.69643	4.319885	-8.63977	-8.510636671				
	z3	0.063863	-0.06623	0.006615445	-0.02858	0.24029	-0.407494508	0.009863	-0.42346	0.695847	-1.3916946	-2.317455574				
	z4	3.743294	-3.88195	0.4186779	-1.80864	-46.6788	79.1601753	-0.11453	4.9172	42.93555	-85.8711	-7.484312137				
3ra Iteracion	z1	0.988173	-1.17657	0.02128394	-0.18114	-0.02521	0.058421456	0.000992	-0.00743	0.037038	-0.07407694	-1.380790569	RS3 =	0.77392	IRI =	0.853177
	z2	-0.92852	1.105538	0.9001616	-7.66095	-3.39137	7.859346992	0.062802	-0.47003	4.319885	-8.63977	-7.805860519				
	z3	0.063863	-0.07604	0.006615445	-0.0563	0.24029	-0.556860473	0.009863	-0.07382	0.695847	-1.3916946	-2.154710925				
	z4	3.743294	-4.45696	0.4186779	-3.56322	-46.6788	108.1761148	-0.11453	0.857142	42.93555	-85.8711	15.14198568				
4ta Iteracion	z1	0.988173	-1.36446	0.02128394	-0.16614	-0.02521	0.054318776	0.000992	0.015026	0.037038	0.14815388	-1.313100714	RS4 =	3.588255	IRI =	1.536947
	z2	-0.92852	1.282086	0.9001616	-7.02654	-3.39137	7.307419836	0.062802	0.950942	4.319885	17.27954	19.79345207				
	z3	0.063863	-0.08818	0.006615445	-0.05164	0.24029	-0.517754626	0.009863	0.149341	0.695847	2.7833892	2.275154105				
	z4	3.743294	-5.16871	0.4186779	-3.26814	-46.6788	100.579385	-0.11453	-1.73414	42.93555	171.7422	262.1506012				
5ta Iteracion	z1	0.988173	-1.29757	0.02128394	0.421283	-0.02521	-0.057355065	0.000992	0.260136	0.037038	0.07407694	-0.59342939	RS5 =	5.170411	IRI =	2.26364
	z2	-0.92852	1.219235	0.9001616	17.81731	-3.39137	-7.715887102	0.062802	16.4635	4.319885	8.639770002	36.42391895				
	z3	0.063863	-0.08386	0.006615445	0.130942	0.24029	0.54669587	0.009863	2.585507	0.695847	1.3916946	4.570981563				
	z4	3.743294	-4.91532	0.4186779	8.287081	-46.6788	-106.2015317	-0.11453	-30.0228	42.93555	85.87110002	-46.98149657				

FIGURA 3.46: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 495m a 506m.*

N°	Dist	Cota	Y'
1	495.00	3817.634	
2	495.50	3817.633	-2.00
3	496.00	3817.632	-2.00
4	496.50	3817.630	-4.00
5	497.00	3817.630	0.00
6	497.50	3817.629	-2.00
7	498.00	3817.627	-4.00
8	498.50	3817.626	-2.00
9	499.00	3817.626	0.00
10	499.50	3817.626	0.00
11	500.00	3817.626	0.00
12	500.50	3817.628	4.00
13	501.00	3817.629	2.00
14	501.50	3817.631	4.00
15	502.00	3817.633	4.00
16	502.50	3817.635	4.00
17	503.00	3817.637	4.00
18	503.50	3817.638	2.00
19	504.00	3817.640	4.00
20	504.50	3817.642	4.00
21	505.00	3817.641	-2.00
22	505.50	3817.640	-2.00
23	506.00	3817.639	-2.00

IRI **2.6636**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 0.454545455
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.449169	0.02128394	0	-0.02521	-0.011458777	0.000992	0	0.037038	-0.07407694	0.363633692	RS1 =	1.617077	IRI =	1.617077
	z2	-0.92852	-0.42205	0.9001616	0	-3.39137	-1.541531364	0.062802	0	4.319885	-8.63977	-10.60335409				
	z3	0.063863	0.029029	0.006615445	0	0.24029	0.109222545	0.009863	0	0.695847	-1.3916946	-1.2534433				
	z4	3.743294	1.701497	0.4186779	0	-46.6788	-21.21765	-0.11453	0	42.93555	-85.8711	-105.3872527				
2da Iteracion	z1	0.988173	0.359333	0.02128394	-0.22568	-0.02521	0.031598441	0.000992	-0.10458	0.037038	-0.07407694	-0.013404274	RS2 =	2.765804	IRI =	2.19144
	z2	-0.92852	-0.33764	0.9001616	-9.54473	-3.39137	4.250888752	0.062802	-6.6185	4.319885	-8.63977	-20.8897486				
	z3	0.063863	0.023223	0.006615445	-0.07015	0.24029	-0.301189389	0.009863	-1.0394	0.695847	-1.3916946	-2.779207812				
	z4	3.743294	1.361188	0.4186779	-4.43939	-46.6788	58.50926673	-0.11453	12.06949	42.93555	-85.8711	-18.3705498				
3ra Iteracion	z1	0.988173	-0.01325	0.02128394	-0.44462	-0.02521	0.070061911	0.000992	-0.01823	0.037038	-0.14815388	-0.554183262	RS3 =	3.217255	IRI =	2.533378
	z2	-0.92852	0.012446	0.9001616	-18.8041	-3.39137	9.425319217	0.062802	-1.1537	4.319885	-17.27954	-27.79962543				
	z3	0.063863	-0.00086	0.006615445	-0.13819	0.24029	-0.667814733	0.009863	-0.18118	0.695847	-2.7833892	-3.771437811				
	z4	3.743294	-0.05018	0.4186779	-8.74608	-46.6788	129.730169	-0.11453	2.103889	42.93555	-171.7422	-48.70439419				
4ta Iteracion	z1	0.988173	-0.54763	0.02128394	-0.59169	-0.02521	0.095075345	0.000992	-0.04833	0.037038	0	-1.092569153	RS4 =	0.513323	IRI =	2.028364
	z2	-0.92852	0.514568	0.9001616	-25.0242	-3.39137	12.79033728	0.062802	-3.05872	4.319885	0	-14.77796729				
	z3	0.063863	-0.03539	0.006615445	-0.18391	0.24029	-0.906237283	0.009863	-0.48036	0.695847	0	-1.60589198				
	z4	3.743294	-2.07447	0.4186779	-11.6391	-46.6788	176.0463044	-0.11453	5.577876	42.93555	0	167.9106204				
5ta Iteracion	z1	0.988173	-1.07965	0.02128394	-0.31453	-0.02521	0.040483429	0.000992	0.16662	0.037038	-0.07407694	-1.261153417	RS5 =	0.972091	IRI =	1.81711
	z2	-0.92852	1.014468	0.9001616	-13.3026	-3.39137	5.446172279	0.062802	10.54507	4.319885	-8.63977	-4.936621092				
	z3	0.063863	-0.06978	0.006615445	-0.09776	0.24029	-0.385879142	0.009863	1.656049	0.695847	-1.3916946	-0.289062883				
	z4	3.743294	-4.08981	0.4186779	-6.18721	-46.6788	74.96115875	-0.11453	-19.23	42.93555	-85.8711	-40.41693775				

FIGURA 3.47: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 506m a 517m.*

N°	Dist	Cota	Y'
1	506.00	3817.639	
2	506.50	3817.641	4.00
3	507.00	3817.643	4.00
4	507.50	3817.639	-8.00
5	508.00	3817.637	-4.00
6	508.50	3817.636	-2.00
7	509.00	3817.637	2.00
8	509.50	3817.637	0.00
9	510.00	3817.637	0.00
10	510.50	3817.638	2.00
11	511.00	3817.638	0.00
12	511.50	3817.637	-2.00
13	512.00	3817.636	-2.00
14	512.50	3817.635	-2.00
15	513.00	3817.634	-2.00
16	513.50	3817.633	-2.00
17	514.00	3817.631	-4.00
18	514.50	3817.629	-4.00
19	515.00	3817.627	-4.00
20	515.50	3817.624	-6.00
21	516.00	3817.623	-2.00
22	516.50	3817.621	-4.00
23	517.00	3817.619	-4.00

IRI	2.5585

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.81818182
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.79668	0.02128394	0	-0.02521	0.045835109	0.000992	0	0.037038	0.14815388	-1.602688647	RS1 =	3.833073	IRI =	3.833073
	z2	-0.92852	1.688211	0.9001616	0	-3.39137	6.166125455	0.062802	0	4.319885	17.27954	25.13387636				
	z3	0.063863	-0.11612	0.006615445	0	0.24029	-0.436890182	0.009863	0	0.695847	2.7833892	2.230384				
	z4	3.743294	-6.80599	0.4186779	0	-46.6788	84.8706	-0.11453	0	42.93555	171.7422	249.8068109				
2da Iteracion	z1	0.988173	-1.58373	0.02128394	0.534948	-0.02521	-0.056226442	0.000992	0.247887	0.037038	0.14815388	-0.708970393	RS2 =	6.555981	IRI =	5.194527
	z2	-0.92852	1.488122	0.9001616	22.62455	-3.39137	-7.564055155	0.062802	15.68828	4.319885	17.27954	49.51644216				
	z3	0.063863	-0.10235	0.006615445	0.166272	0.24029	0.535938079	0.009863	2.463765	0.695847	2.7833892	5.847010772				
	z4	3.743294	-5.99933	0.4186779	10.523	-46.6788	-104.1117156	-0.11453	-28.6091	42.93555	171.7422	43.54499821				
3ra Iteracion	z1	0.988173	-0.70059	0.02128394	1.053905	-0.02521	-0.147399107	0.000992	0.04321	0.037038	-0.29630776	-0.04717665	RS3 =	3.402859	IRI =	4.597304
	z2	-0.92852	0.65829	0.9001616	44.5728	-3.39137	-19.82937107	0.062802	2.734699	4.319885	-34.55908	-6.422662312				
	z3	0.063863	-0.04528	0.006615445	0.327573	0.24029	1.40497588	0.009863	0.42947	0.695847	-5.5667784	-3.450035998				
	z4	3.743294	-2.65388	0.4186779	20.73144	-46.6788	-272.9316218	-0.11453	-4.987	42.93555	-343.4844	-603.3254617				
4ta Iteracion	z1	0.988173	-0.04662	0.02128394	-0.1367	-0.02521	0.086973027	0.000992	-0.53869	0.037038	-0.14815388	-0.843188901	RS4 =	8.765116	IRI =	5.639257
	z2	-0.92852	0.043804	0.9001616	-5.78143	-3.39137	11.70034513	0.062802	-37.8898	4.319885	-17.27954	-49.20667112				
	z3	0.063863	-0.00301	0.006615445	-0.04249	0.24029	-0.82900777	0.009863	-5.35041	0.695847	-2.7833892	-9.608304558				
	z4	3.743294	-0.1766	0.4186779	-2.68903	-46.6788	161.0436439	-0.11453	69.09591	42.93555	-171.7422	55.53172985				
5ta Iteracion	z1	0.988173	-0.83322	0.02128394	-1.04731	-0.02521	0.242218728	0.000992	0.055105	0.037038	-0.07407694	-1.657281248	RS5 =	1.87487	IRI =	4.88638
	z2	-0.92852	0.782914	0.9001616	-44.294	-3.39137	32.58530622	0.062802	3.487485	4.319885	-8.63977	-16.07801983				
	z3	0.063863	-0.05385	0.006615445	-0.32552	0.24029	-2.308775659	0.009863	0.547692	0.695847	-1.3916946	-3.532151396				
	z4	3.743294	-3.1563	0.4186779	-20.6017	-46.6788	448.5044151	-0.11453	-6.35978	42.93555	-85.8711	332.5154885				

FIGURA 3.48: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 517m a 528m.*

N°	Dist	Cota	Y'
1	517.00	3817.619	
2	517.50	3817.618	-2.00
3	518.00	3817.616	-4.00
4	518.50	3817.614	-4.00
5	519.00	3817.612	-4.00
6	519.50	3817.611	-2.00
7	520.00	3817.609	-4.00
8	520.50	3817.608	-2.00
9	521.00	3817.608	0.00
10	521.50	3817.610	4.00
11	522.00	3817.609	-2.00
12	522.50	3817.609	0.00
13	523.00	3817.610	2.00
14	523.50	3817.609	-2.00
15	524.00	3817.609	0.00
16	524.50	3817.609	0.00
17	525.00	3817.610	2.00
18	525.50	3817.611	2.00
19	526.00	3817.614	6.00
20	526.50	3817.619	10.00
21	527.00	3817.619	0.00
22	527.50	3817.618	-2.00
23	528.00	3817.617	-2.00

IRI 2.8040

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.18181818
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.17967	0.02128394	0	-0.02521	0.004583511	0.000992	0	0.037038	-0.07407694	-0.249161193	RS1 =	1.197834	IRI =	1.197834
	z2	-0.92852	0.168821	0.9001616	0	-3.39137	0.616612545	0.062802	0	4.319885	-8.63977	-7.854336361				
	z3	0.063863	-0.01161	0.006615445	0	0.24029	-0.043689018	0.009863	0	0.695847	-1.3916946	-1.44699512				
	z4	3.743294	-0.6806	0.4186779	0	-46.6788	8.48706	-0.11453	0	42.93555	-85.8711	-78.06463889				
2da Iteracion	z1	0.988173	-0.24621	0.02128394	-0.16717	-0.02521	0.036477749	0.000992	-0.07746	0.037038	-0.14815388	-0.602526473	RS2 =	3.366359	IRI =	2.282097
	z2	-0.92852	0.23135	0.9001616	-7.07017	-3.39137	4.907294392	0.062802	-4.90259	4.319885	-17.27954	-24.11365713				
	z3	0.063863	-0.01591	0.006615445	-0.05196	0.24029	-0.347697879	0.009863	-0.76993	0.695847	-2.7833892	-3.968885808				
	z4	3.743294	-0.93268	0.4186779	-3.28844	-46.6788	67.5440392	-0.11453	8.940361	42.93555	-171.7422	-99.47892091				
3ra Iteracion	z1	0.988173	-0.5954	0.02128394	-0.51323	-0.02521	0.100052873	0.000992	-0.09871	0.037038	-0.14815388	-1.255449425	RS3 =	3.660752	IRI =	2.741649
	z2	-0.92852	0.559455	0.9001616	-21.7062	-3.39137	13.45995629	0.062802	-6.24744	4.319885	-17.27954	-31.21375879				
	z3	0.063863	-0.03848	0.006615445	-0.15952	0.24029	-0.953681983	0.009863	-0.98113	0.695847	-2.7833892	-4.916201824				
	z4	3.743294	-2.25543	0.4186779	-10.0959	-46.6788	185.2629459	-0.11453	11.39283	42.93555	-171.7422	12.56229023				
4ta Iteracion	z1	0.988173	-1.2406	0.02128394	-0.66435	-0.02521	0.123934056	0.000992	0.012466	0.037038	-0.14815388	-1.916706674	RS4 =	2.210767	IRI =	2.608928
	z2	-0.92852	1.165705	0.9001616	-28.0974	-3.39137	16.67265446	0.062802	0.788933	4.319885	-17.27954	-26.7496749				
	z3	0.063863	-0.08018	0.006615445	-0.20649	0.24029	-1.18131217	0.009863	0.123898	0.695847	-2.7833892	-4.127473519				
	z4	3.743294	-4.69952	0.4186779	-13.0685	-46.6788	229.4825492	-0.11453	-1.4387	42.93555	-171.7422	38.53362438				
5ta Iteracion	z1	0.988173	-1.89404	0.02128394	-0.56934	-0.02521	0.104050759	0.000992	0.038238	0.037038	-0.07407694	-2.395164314	RS5 =	0.092357	IRI =	2.105614
	z2	-0.92852	1.779693	0.9001616	-24.079	-3.39137	13.99778574	0.062802	2.419976	4.319885	-8.63977	-14.52134564				
	z3	0.063863	-0.12241	0.006615445	-0.17696	0.24029	-0.931788961	0.009863	0.380045	0.695847	-1.3916946	-2.302806894				
	z4	3.743294	-7.1748	0.4186779	-11.1995	-46.6788	192.6656347	-0.11453	-4.41307	42.93555	-85.8711	84.00717324				

FIGURA 3.49: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 528m a 539m.*

N°	Dist	Cota	Y'
1	528.00	3817.617	
2	528.50	3817.615	-4.00
3	529.00	3817.614	-2.00
4	529.50	3817.613	-2.00
5	530.00	3817.612	-2.00
6	530.50	3817.611	-2.00
7	531.00	3817.609	-4.00
8	531.50	3817.608	-2.00
9	532.00	3817.609	2.00
10	532.50	3817.609	0.00
11	533.00	3817.611	4.00
12	533.50	3817.612	2.00
13	534.00	3817.611	-2.00
14	534.50	3817.611	0.00
15	535.00	3817.612	2.00
16	535.50	3817.613	2.00
17	536.00	3817.613	0.00
18	536.50	3817.614	2.00
19	537.00	3817.615	2.00
20	537.50	3817.616	2.00
21	538.00	3817.616	0.00
22	538.50	3817.617	2.00
23	539.00	3817.618	2.00

IRI	1.7805

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.090909091
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.089834	0.02128394	0	-0.02521	-0.002291755	0.000992	0	0.037038	-0.14815388	-0.060611754	RS1 =	2.695127	IRI =	2.695127
	z2	-0.92852	-0.08441	0.9001616	0	-3.39137	-0.308306273	0.062802	0	4.319885	-17.27954	-17.67225682				
	z3	0.063863	0.005806	0.006615445	0	0.24029	0.021844509	0.009863	0	0.695847	-2.7833892	-2.75573894				
	z4	3.743294	0.340299	0.4186779	0	-46.6788	-4.243530001	-0.11453	0	42.93555	-171.7422	-175.6454305				
2da Iteracion	z1	0.988173	-0.05989	0.02128394	-0.37614	-0.02521	0.069470277	0.000992	-0.1743	0.037038	-0.07407694	-0.614932656	RS2 =	3.292053	IRI =	2.99359
	z2	-0.92852	0.056279	0.9001616	-15.9079	-3.39137	9.345727613	0.062802	-11.0308	4.319885	-8.63977	-26.17647674				
	z3	0.063863	-0.00387	0.006615445	-0.11691	0.24029	-0.662175408	0.009863	-1.73233	0.695847	-1.3916946	-3.90698539				
	z4	3.743294	-0.22689	0.4186779	-7.39898	-46.6788	128.6346695	-0.11453	20.11581	42.93555	-85.8711	55.25350899				
3ra Iteracion	z1	0.988173	-0.60766	0.02128394	-0.55714	-0.02521	0.098492406	0.000992	0.054829	0.037038	-0.07407694	-1.085553783	RS3 =	0.912442	IRI =	2.299874
	z2	-0.92852	0.570975	0.9001616	-23.5631	-3.39137	13.25002913	0.062802	3.470013	4.319885	-8.63977	-14.9118126				
	z3	0.063863	-0.03927	0.006615445	-0.17317	0.24029	-0.938807957	0.009863	0.544948	0.695847	-1.3916946	-1.997995524				
	z4	3.743294	-2.30187	0.4186779	-10.9595	-46.6788	182.3735068	-0.11453	-6.32791	42.93555	-85.8711	76.91310718				
4ta Iteracion	z1	0.988173	-1.07271	0.02128394	-0.31738	-0.02521	0.050368089	0.000992	0.076322	0.037038	-0.07407694	-1.337483449	RS4 =	0.056285	IRI =	1.738977
	z2	-0.92852	1.007954	0.9001616	-13.423	-3.39137	6.775940084	0.062802	4.830272	4.319885	-8.63977	-9.448645373				
	z3	0.063863	-0.06333	0.006615445	-0.09865	0.24029	-0.480097545	0.009863	0.758569	0.695847	-1.3916946	-1.281198062				
	z4	3.743294	-4.06355	0.4186779	-6.24325	-46.6788	93.26409342	-0.11453	-8.80848	42.93555	-85.8711	-11.72228125				
5ta Iteracion	z1	0.988173	-1.32166	0.02128394	-0.2011	-0.02521	0.032298119	0.000992	-0.01163	0.037038	-0.07407694	-1.576180066	RS5 =	0.386909	IRI =	1.468563
	z2	-0.92852	1.241875	0.9001616	-8.50531	-3.39137	4.345015389	0.062802	-0.73618	4.319885	-8.63977	-12.2943664				
	z3	0.063863	-0.08542	0.006615445	-0.06251	0.24029	-0.30785857	0.009863	-0.11561	0.695847	-1.3916946	-1.963089325				
	z4	3.743294	-5.00659	0.4186779	-3.95594	-46.6788	59.80482652	-0.11453	1.342495	42.93555	-85.8711	-33.6863108				

FIGURA 3.50: Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 539m a 550m.

N°	Dist	Cota	Y'
1	539.00	3817.618	
2	539.50	3817.619	2.00
3	540.00	3817.618	-2.00
4	540.50	3817.618	0.00
5	541.00	3817.619	2.00
6	541.50	3817.619	0.00
7	542.00	3817.619	0.00
8	542.50	3817.619	0.00
9	543.00	3817.620	2.00
10	543.50	3817.621	2.00
11	544.00	3817.621	0.00
12	544.50	3817.621	0.00
13	545.00	3817.621	0.00
14	545.50	3817.620	-2.00
15	546.00	3817.622	4.00
16	546.50	3817.624	4.00
17	547.00	3817.626	4.00
18	547.50	3817.628	4.00
19	548.00	3817.628	0.00
20	548.50	3817.629	2.00
21	549.00	3817.631	4.00
22	549.50	3817.632	2.00
23	550.00	3817.634	4.00

IRI **1.6906**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 1.454545455
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	1.437342	0.02128394	0	-0.02521	-0.036668087	0.000992	0	0.037038	0.07407694	1.474750962	RS1 =	0.359348	IRI =	0.359348
	z2	-0.92852	-1.35057	0.9001616	0	-3.39137	-4.932900364	0.062802	0	4.319885	8.639769998	2.356300907				
	z3	0.063863	0.092892	0.006615445	0	0.24029	0.349512145	0.009863	0	0.695847	1.3916946	1.83409876				
	z4	3.743294	5.444791	0.4186779	0	-46.6788	-67.89648	-0.11453	0	42.93555	85.87109998	23.41941125				
2da Iteracion	z1	0.988173	1.457309	0.02128394	0.050151	-0.02521	-0.046236364	0.000992	0.023239	0.037038	-0.07407694	1.410386171	RS2 =	2.020617	IRI =	1.189983
	z2	-0.92852	-1.36933	0.9001616	2.121052	-3.39137	-6.220105676	0.062802	1.470778	4.319885	-8.63977	-12.63737581				
	z3	0.063863	0.094182	0.006615445	0.015588	0.24029	0.440714857	0.009863	0.230978	0.695847	-1.3916946	-0.6102312				
	z4	3.743294	5.520426	0.4186779	0.986531	-46.6788	-85.6135842	-0.11453	-2.68211	42.93555	-85.8711	-167.6598371				
3ra Iteracion	z1	0.988173	1.393705	0.02128394	-0.26897	-0.02521	0.015383507	0.000992	-0.16637	0.037038	0	0.973743847	RS3 =	2.767481	IRI =	1.715816
	z2	-0.92852	-1.30957	0.9001616	-11.3757	-3.39137	2.069519175	0.062802	-10.5293	4.319885	0	-21.14504514				
	z3	0.063863	0.090072	0.006615445	-0.0836	0.24029	-0.146632211	0.009863	-1.65358	0.695847	0	-1.793737539				
	z4	3.743294	5.27949	0.4186779	-5.29099	-46.6788	28.48487845	-0.11453	19.20126	42.93555	0	47.67463819				
4ta Iteracion	z1	0.988173	0.962227	0.02128394	-0.45005	-0.02521	0.045218886	0.000992	0.047308	0.037038	0.07407694	0.67878137	RS4 =	0.674399	IRI =	1.455461
	z2	-0.92852	-0.90414	0.9001616	-19.034	-3.39137	6.083225883	0.062802	2.994047	4.319885	8.639769998	-2.221051628				
	z3	0.063863	0.062186	0.006615445	-0.13988	0.24029	-0.431016476	0.009863	0.4702	0.695847	1.3916946	1.353180398				
	z4	3.743294	3.645009	0.4186779	-8.85296	-46.6788	83.72956963	-0.11453	-5.45994	42.93555	85.87109998	158.9327733				
5ta Iteracion	z1	0.988173	0.670753	0.02128394	-0.04727	-0.02521	-0.034112744	0.000992	0.157712	0.037038	0	0.747079359	RS5 =	1.174235	IRI =	1.399216
	z2	-0.92852	-0.63026	0.9001616	-1.99331	-3.39137	-4.589134053	0.062802	9.981244	4.319885	0	2.762544779				
	z3	0.063863	0.043349	0.006615445	-0.01469	0.24029	0.325155177	0.009863	1.567503	0.695847	0	1.921314207				
	z4	3.743294	2.540878	0.4186779	-0.92991	-46.6788	-63.16487775	-0.11453	-18.2018	42.93555	0	-79.75569651				

FIGURA 3.51: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 550m a 561m.*

N°	Dist	Cota	Y'
1	550.00	3817.634	
2	550.50	3817.637	6.00
3	551.00	3817.636	-2.00
4	551.50	3817.636	0.00
5	552.00	3817.636	0.00
6	552.50	3817.637	2.00
7	553.00	3817.637	0.00
8	553.50	3817.637	0.00
9	554.00	3817.637	0.00
10	554.50	3817.638	2.00
11	555.00	3817.638	0.00
12	555.50	3817.638	0.00
13	556.00	3817.640	4.00
14	556.50	3817.642	4.00
15	557.00	3817.642	0.00
16	557.50	3817.643	2.00
17	558.00	3817.645	4.00
18	558.50	3817.647	4.00
19	559.00	3817.648	2.00
20	559.50	3817.649	2.00
21	560.00	3817.650	2.00
22	560.50	3817.650	0.00
23	561.00	3817.650	0.00

IRI	1.7364

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 1.454545455
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	1.437342	0.02128394	0	-0.02521	-0.036668087	0.000932	0	0.037038	0.22223082	1.622904842	RS1 =	2.994583	IRI =	2.994583
	z2	-0.92852	-1.35057	0.9001616	0	-3.39137	-4.932900364	0.062802	0	4.319885	25.31931	19.63584091				
	z3	0.063863	0.092892	0.006615445	0	0.24029	0.349512145	0.009863	0	0.695847	4.1750838	4.61748796				
	z4	3.743294	5.444791	0.4186779	0	-46.6788	-67.89648	-0.11453	0	42.93555	257.6133	195.1616113				
2da Iteracion	z1	0.988173	1.60371	0.02128394	0.417928	-0.02521	-0.116403685	0.000932	0.193662	0.037038	-0.07407694	2.024819781	RS2 =	0.14862	IRI =	1.571601
	z2	-0.92852	-1.50689	0.9001616	17.67543	-3.39137	-15.65960553	0.062802	12.25648	4.319885	-8.63977	4.12563644				
	z3	0.063863	0.103644	0.006615445	0.1299	0.24029	1.109534335	0.009863	1.924817	0.695847	-1.3916946	1.876200075				
	z4	3.743294	6.07501	0.4186779	8.221093	-46.6788	-215.5389355	-0.11453	-22.3509	42.93555	-85.8711	-309.464836				
3ra Iteracion	z1	0.988173	2.000872	0.02128394	0.08781	-0.02521	-0.047297709	0.000932	-0.30709	0.037038	0	1.734296656	RS3 =	4.179013	IRI =	2.440739
	z2	-0.92852	-1.88008	0.9001616	3.713739	-3.39137	-6.362886771	0.062802	-19.4349	4.319885	0	-23.96413334				
	z3	0.063863	0.129312	0.006615445	0.027293	0.24029	0.450831365	0.009863	-3.05215	0.695847	0	-2.44471677				
	z4	3.743294	7.579496	0.4186779	1.727313	-46.6788	-87.57882432	-0.11453	35.44149	42.93555	0	-42.8305245				
4ta Iteracion	z1	0.988173	1.713785	0.02128394	-0.51005	-0.02521	0.061629623	0.000932	-0.0425	0.037038	0	1.22286162	RS4 =	2.280501	IRI =	2.400679
	z2	-0.92852	-1.61032	0.9001616	-21.5716	-3.39137	8.290936668	0.062802	-2.68983	4.319885	0	-17.5808066				
	z3	0.063863	0.110758	0.006615445	-0.15853	0.24029	-0.587440015	0.009863	-0.42242	0.695847	0	-1.05763934				
	z4	3.743294	6.491982	0.4186779	-10.0333	-46.6788	114.1165185	-0.11453	4.90517	42.93555	0	115.4804179				
5ta Iteracion	z1	0.988173	1.208398	0.02128394	-0.37419	-0.02521	0.026662358	0.000932	0.114593	0.037038	0.07407694	1.049542058	RS5 =	1.18875	IRI =	2.158293
	z2	-0.92852	-1.13545	0.9001616	-15.8256	-3.39137	3.586845271	0.062802	7.252363	4.319885	8.639770002	2.517964786				
	z3	0.063863	0.078096	0.006615445	-0.1163	0.24029	-0.254139734	0.009863	1.138946	0.695847	1.3916946	2.238292344				
	z4	3.743294	4.577531	0.4186779	-7.3607	-46.6788	49.36936695	-0.11453	-13.2254	42.93555	85.87110002	119.2318959				

FIGURA 3.52: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 561m a 572m.*

N°	Dist	Cota	Y'
1	561.00	3817.650	
2	561.50	3817.650	0.00
3	562.00	3817.652	4.00
4	562.50	3817.654	4.00
5	563.00	3817.656	4.00
6	563.50	3817.658	4.00
7	564.00	3817.656	-4.00
8	564.50	3817.652	-8.00
9	565.00	3817.651	-2.00
10	565.50	3817.651	0.00
11	566.00	3817.649	-4.00
12	566.50	3817.647	-4.00
13	567.00	3817.646	-2.00
14	567.50	3817.645	-2.00
15	568.00	3817.645	0.00
16	568.50	3817.644	-2.00
17	569.00	3817.645	2.00
18	569.50	3817.646	2.00
19	570.00	3817.646	0.00
20	570.50	3817.646	0.00
21	571.00	3817.646	0.00
22	571.50	3817.645	-2.00
23	572.00	3817.644	-2.00

IRI **2.8230**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.54545455
z2' = **z4'** = 0

$$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.539	0.02128394	0	-0.02521	0.013750533	0.000992	0	0.037038	0	-0.525252758	RS1 =	0.359351	IRI =	0.359351
	z2	-0.92852	0.506463	0.9001616	0	-3.39137	1.849837636	0.062802	0	4.319885	0	2.356300909				
	z3	0.063863	-0.03483	0.006615445	0	0.24029	-0.131067055	0.009863	0	0.695847	0	-0.16590156				
	z4	3.743294	-2.0418	0.4186779	0	-46.6788	25.46118	-0.11453	0	42.93555	0	23.41938327				
2da Iteracion	z1	0.988173	-0.51904	0.02128394	0.050151	-0.02521	0.004182264	0.000992	0.023239	0.037038	0.14815388	-0.293313485	RS2 =	3.24986	IRI =	1.804605
	z2	-0.92852	0.487706	0.9001616	2.121052	-3.39137	0.562633408	0.062802	1.470776	4.319885	17.27954	21.92170697				
	z3	0.063863	-0.03354	0.006615445	0.015588	0.24029	-0.039864419	0.009863	0.230978	0.695847	2.7833892	2.956546289				
	z4	3.743294	-1.96618	0.4186779	0.986531	-46.6788	7.744090716	-0.11453	-2.68211	42.93555	171.7422	175.8245391				
3ra Iteracion	z1	0.988173	-0.28984	0.02128394	0.46658	-0.02521	-0.074532492	0.000992	0.174474	0.037038	0.14815388	0.424830897	RS3 =	4.929377	IRI =	2.846196
	z2	-0.92852	0.272346	0.9001616	19.73308	-3.39137	-10.02673943	0.062802	11.04207	4.319885	17.27954	38.30030034				
	z3	0.063863	-0.01873	0.006615445	0.145022	0.24029	0.710427325	0.009863	1.734101	0.695847	2.7833892	5.354207582				
	z4	3.743294	-1.09796	0.4186779	9.178134	-46.6788	-138.0081216	-0.11453	-20.1363	42.93555	171.7422	21.67793109				
4ta Iteracion	z1	0.988173	0.419806	0.02128394	0.815181	-0.02521	-0.134975879	0.000992	0.021511	0.037038	0.14815388	1.269676959	RS4 =	3.29458	IRI =	2.958292
	z2	-0.92852	-0.39446	0.9001616	34.47646	-3.39137	-18.15809361	0.062802	1.36141	4.319885	17.27954	34.56485401				
	z3	0.063863	0.027131	0.006615445	0.253374	0.24029	1.286560398	0.009863	0.213802	0.695847	2.783389201	4.564256713				
	z4	3.743294	1.590267	0.4186779	16.03549	-46.6788	-249.9281455	-0.11453	-2.48267	42.93555	171.7422	-63.04285643				
5ta Iteracion	z1	0.988173	1.25466	0.02128394	0.735676	-0.02521	-0.115061762	0.000992	-0.06256	0.037038	0.14815388	1.960870039	RS5 =	1.607239	IRI =	2.688081
	z2	-0.92852	-1.17892	0.9001616	31.11395	-3.39137	-15.47907872	0.062802	-3.9592	4.319885	17.27954	27.77630353				
	z3	0.063863	0.081086	0.006615445	0.228662	0.24029	1.09674342	0.009863	-0.62177	0.695847	2.7833892	3.568108701				
	z4	3.743294	4.752774	0.4186779	14.47154	-46.6788	-213.0541632	-0.11453	7.219989	42.93555	171.7422	-14.86765909				

FIGURA 3.53: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 572m a 583m.*

N°	Dist	Cota	Y'
1	572.00	3817.644	
2	572.50	3817.643	-2.00
3	573.00	3817.643	0.00
4	573.50	3817.643	0.00
5	574.00	3817.643	0.00
6	574.50	3817.642	-2.00
7	575.00	3817.643	2.00
8	575.50	3817.643	0.00
9	576.00	3817.642	-2.00
10	576.50	3817.641	-2.00
11	577.00	3817.640	-2.00
12	577.50	3817.639	-2.00
13	578.00	3817.640	2.00
14	578.50	3817.640	0.00
15	579.00	3817.640	0.00
16	579.50	3817.639	-2.00
17	580.00	3817.639	0.00
18	580.50	3817.638	-2.00
19	581.00	3817.637	-2.00
20	581.50	3817.636	-2.00
21	582.00	3817.637	2.00
22	582.50	3817.639	4.00
23	583.00	3817.640	2.00

IRI	1.5646

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.36363636
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.35934	0.02128394	0	-0.02521	0.009167022	0.000992	0	0.037038	-0.07407694	-0.424245445	RS1 =	1.07805	IRI =	1.07805
	z2	-0.92852	0.337642	0.9001616	0	-3.39137	1.233225091	0.062802	0	4.319885	-8.63977	-7.068902729				
	z3	0.063863	-0.02322	0.006615445	0	0.24029	-0.087378036	0.009863	0	0.695847	-1.3916946	-1.50229564				
	z4	3.743294	-1.3612	0.4186779	0	-46.6788	16.97412	-0.11453	0	42.93555	-85.8711	-70.25817784				
2da Iteracion	z1	0.988173	-0.41923	0.02128394	-0.15045	-0.02521	0.037871837	0.000992	-0.06972	0.037038	0	-0.601528381	RS2 =	0.526249	IRI =	0.80215
	z2	-0.92852	0.393919	0.9001616	-6.36315	-3.39137	5.094838863	0.062802	-4.41233	4.319885	0	-5.286728143				
	z3	0.063863	-0.02709	0.006615445	-0.04676	0.24029	-0.360986018	0.009863	-0.69293	0.695847	0	-1.127777578				
	z4	3.743294	-1.58808	0.4186779	-2.95959	-46.6788	70.1254028	-0.11453	8.046325	42.93555	0	73.62405886				
3ra Iteracion	z1	0.988173	-0.59441	0.02128394	-0.11252	-0.02521	0.028430495	0.000992	0.073058	0.037038	0	-0.605447466	RS3 =	0.987195	IRI =	0.863832
	z2	-0.92852	0.558529	0.9001616	-4.75891	-3.39137	3.824709918	0.062802	4.623714	4.319885	0	4.24804283				
	z3	0.063863	-0.03842	0.006615445	-0.03497	0.24029	-0.270993223	0.009863	0.726131	0.695847	0	0.381747687				
	z4	3.743294	-2.2517	0.4186779	-2.21344	-46.6788	52.64333785	-0.11453	-8.4318	42.93555	0	39.74640133				
4ta Iteracion	z1	0.988173	-0.59829	0.02128394	0.090415	-0.02521	-0.009623596	0.000992	0.039441	0.037038	0	-0.478054155	RS4 =	0.951227	IRI =	0.88568
	z2	-0.92852	0.562168	0.9001616	3.823925	-3.39137	-1.294647272	0.062802	2.49614	4.319885	0	5.587585799				
	z3	0.063863	-0.03867	0.006615445	0.028103	0.24029	0.091729999	0.009863	0.392006	0.695847	0	0.473172881				
	z4	3.743294	-2.26637	0.4186779	1.778562	-46.6788	-17.81953539	-0.11453	-4.55196	42.93555	0	-22.85930219				
5ta Iteracion	z1	0.988173	-0.4724	0.02128394	0.118926	-0.02521	-0.011928362	0.000992	-0.02268	0.037038	-0.07407694	-0.462163189	RS5 =	1.034853	IRI =	0.915515
	z2	-0.92852	0.443881	0.9001616	5.02973	-3.39137	-1.604703841	0.062802	-1.4356	4.319885	-8.63977	-6.206465087				
	z3	0.063863	-0.03053	0.006615445	0.036964	0.24029	0.113698522	0.009863	-0.22545	0.695847	-1.3916946	-1.49701579				
	z4	3.743294	-1.7895	0.4186779	2.339399	-46.6788	-22.08715648	-0.11453	2.617964	42.93555	-85.8711	-104.7903912				

FIGURA 3.54: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 583m a 594m.*

N°	Dist	Cota	Y'
1	583.00	3817.640	
2	583.50	3817.641	2.00
3	584.00	3817.642	2.00
4	584.50	3817.643	2.00
5	585.00	3817.645	4.00
6	585.50	3817.646	2.00
7	586.00	3817.645	-2.00
8	586.50	3817.644	-2.00
9	587.00	3817.643	-2.00
10	587.50	3817.641	-4.00
11	588.00	3817.643	4.00
12	588.50	3817.646	6.00
13	589.00	3817.645	-2.00
14	589.50	3817.644	-2.00
15	590.00	3817.643	-2.00
16	590.50	3817.641	-4.00
17	591.00	3817.640	-2.00
18	591.50	3817.639	-2.00
19	592.00	3817.637	-4.00
20	592.50	3817.635	-4.00
21	593.00	3817.634	-2.00
22	593.50	3817.633	-2.00
23	594.00	3817.632	-2.00

IRI **2.5400**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.72727273
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.71867	0.02128394	0	-0.02521	0.018334044	0.000992	0	0.037038	0.07407694	-0.626260071	RS1 =	1.796753	IRI =	1.796753
	z2	-0.92852	0.675284	0.9001616	0	-3.39137	2.466450182	0.062802	0	4.319885	8.639769998	11.78150454				
	z3	0.063863	-0.04645	0.006615445	0	0.24029	-0.174756073	0.009863	0	0.695847	1.3916946	1.17049252				
	z4	3.743294	-2.7224	0.4186779	0	-46.6788	33.94824	-0.11453	0	42.93555	85.87109998	117.0969443				
2da Iteracion	z1	0.988173	-0.61885	0.02128394	0.250757	-0.02521	-0.029507309	0.000992	0.116197	0.037038	0.07407694	-0.207329408	RS2 =	3.073116	IRI =	2.434934
	z2	-0.92852	0.581492	0.9001616	10.60526	-3.39137	-3.969572046	0.062802	7.353884	4.319885	8.639770002	23.21083209				
	z3	0.063863	-0.04	0.006615445	0.07794	0.24029	0.281257179	0.009863	1.15489	0.695847	1.3916946	2.865786356				
	z4	3.743294	-2.34428	0.4186779	4.932656	-46.6788	-54.63722134	-0.11453	-13.4105	42.93555	85.87110002	20.41171943				
3ra Iteracion	z1	0.988173	-0.20488	0.02128394	0.494018	-0.02521	-0.072244497	0.000992	0.020255	0.037038	0.07407694	0.311228026	RS3 =	2.110709	IRI =	2.326859
	z2	-0.92852	0.192509	0.9001616	20.8935	-3.39137	-9.718939009	0.062802	1.28189	4.319885	8.639769998	21.28872948				
	z3	0.063863	-0.01324	0.006615445	0.15355	0.24029	0.688618657	0.009863	0.201314	0.695847	1.3916946	2.421936765				
	z4	3.743294	-0.77609	0.4186779	9.717862	-46.6788	-133.7715541	-0.11453	-2.33765	42.93555	85.87109998	-41.29634086				
4ta Iteracion	z1	0.988173	0.307547	0.02128394	0.453108	-0.02521	-0.061055355	0.000992	-0.04098	0.037038	0.14815388	0.806774564	RS4 =	2.311999	IRI =	2.323144
	z2	-0.92852	-0.28898	0.9001616	19.1633	-3.39137	-8.213681265	0.062802	-2.59348	4.319885	17.27954	25.34669615				
	z3	0.063863	0.019876	0.006615445	0.140834	0.24029	0.581966217	0.009863	-0.40729	0.695847	2.7833892	3.118773277				
	z4	3.743294	1.165018	0.4186779	8.913121	-46.6788	-113.0531745	-0.11453	4.729468	42.93555	171.7422	73.49663159				
5ta Iteracion	z1	0.988173	0.797233	0.02128394	0.539478	-0.02521	-0.078622122	0.000992	0.072932	0.037038	0.07407694	1.405096897	RS5 =	1.680083	IRI =	2.194532
	z2	-0.92852	-0.7491	0.9001616	22.81612	-3.39137	-10.57691101	0.062802	4.615711	4.319885	8.639770002	24.74558967				
	z3	0.063863	0.051523	0.006615445	0.16768	0.24029	0.749408783	0.009863	0.724874	0.695847	1.3916946	3.08518007				
	z4	3.743294	3.019994	0.4186779	10.6121	-46.6788	-145.5806876	-0.11453	-8.41721	42.93555	85.87110002	-54.49470075				

FIGURA 3.55: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 594m a 605m.*

N°	Dist	Cota	Y'
1	594.00	3817.632	
2	594.50	3817.631	-2.00
3	595.00	3817.630	-2.00
4	595.50	3817.629	-2.00
5	596.00	3817.629	0.00
6	596.50	3817.628	-2.00
7	597.00	3817.629	2.00
8	597.50	3817.630	2.00
9	598.00	3817.630	0.00
10	598.50	3817.629	-2.00
11	599.00	3817.630	2.00
12	599.50	3817.632	4.00
13	600.00	3817.631	-2.00
14	600.50	3817.633	4.00
15	601.00	3817.633	0.00
16	601.50	3817.634	2.00
17	602.00	3817.634	0.00
18	602.50	3817.635	2.00
19	603.00	3817.635	0.00
20	603.50	3817.636	2.00
21	604.00	3817.636	0.00
22	604.50	3817.636	0.00
23	605.00	3817.636	0.00

IRI	1.3376

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 0.363636364
z2' = z4' = 0

$$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.359336	0.02128394	0	-0.02521	-0.009167022	0.000992	0	0.037038	-0.07407694	0.276091566	RS1 =	1.557185	IRI =	1.557185
	z2	-0.92852	-0.33764	0.9001616	0	-3.39137	-1.233225091	0.062802	0	4.319885	-8.63977	-10.21063727				
	z3	0.063863	0.023223	0.006615445	0	0.24029	0.087378036	0.009863	0	0.695847	-1.3916946	-1.28109356				
	z4	3.743294	1.361198	0.4186779	0	-46.6788	-16.97412	-0.11453	0	42.93555	-85.8711	-101.4840222				
2da Iteracion	z1	0.988173	0.272826	0.02128394	-0.21732	-0.02521	0.032295485	0.000992	-0.1007	0.037038	-0.07407694	-0.086982168	RS2 =	2.663366	IRI =	2.110276
	z2	-0.92852	-0.25636	0.9001616	-9.19122	-3.39137	4.344660984	0.062802	-6.37337	4.319885	-8.63977	-20.11605411				
	z3	0.063863	0.017632	0.006615445	-0.06755	0.24029	-0.307833459	0.009863	-1.0009	0.695847	-1.3916946	-2.750348297				
	z4	3.743294	1.033492	0.4186779	-4.27497	-46.6788	59.79994848	-0.11453	11.62247	42.93555	-85.8711	-17.69016002				
3ra Iteracion	z1	0.988173	-0.08595	0.02128394	-0.42815	-0.02521	0.069334383	0.000992	-0.01755	0.037038	-0.07407694	-0.536399088	RS3 =	1.82928	IRI =	2.01661
	z2	-0.92852	0.080764	0.9001616	-18.1077	-3.39137	9.327445953	0.062802	-1.11097	4.319885	-8.63977	-18.45023075				
	z3	0.063863	-0.00555	0.006615445	-0.13308	0.24029	-0.660880092	0.009863	-0.17447	0.695847	-1.3916946	-2.365678694				
	z4	3.743294	-0.3256	0.4186779	-8.42215	-46.6788	128.3830406	-0.11453	2.025967	42.93555	-85.8711	35.79016084				
4ta Iteracion	z1	0.988173	-0.53005	0.02128394	-0.39269	-0.02521	0.059637128	0.000992	0.035515	0.037038	0	-0.827596244	RS4 =	0.455822	IRI =	1.626413
	z2	-0.92852	0.498055	0.9001616	-16.6082	-3.39137	8.022889385	0.062802	2.247682	4.319885	0	-5.839562843				
	z3	0.063863	-0.03426	0.006615445	-0.12206	0.24029	-0.568447987	0.009863	0.352987	0.695847	0	-0.371773765				
	z4	3.743294	-2.0079	0.4186779	-7.7247	-46.6788	110.4271136	-0.11453	-4.09887	42.93555	0	96.59563847				
5ta Iteracion	z1	0.988173	-0.81781	0.02128394	-0.12429	-0.02521	0.00937216	0.000992	0.095853	0.037038	-0.07407694	-0.910948254	RS5 =	0.291128	IRI =	1.359356
	z2	-0.92852	0.768436	0.9001616	-5.25655	-3.39137	1.260822021	0.062802	6.066367	4.319885	-8.63977	-5.800694448				
	z3	0.063863	-0.05285	0.006615445	-0.03863	0.24029	-0.089333369	0.009863	0.952692	0.695847	-1.3916946	-0.619820399				
	z4	3.743294	-3.09794	0.4186779	-2.4449	-46.6788	17.35396436	-0.11453	-11.0626	42.93555	-85.8711	-85.12259278				

FIGURA 3.56: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 605m a 616m.*

N°	Dist	Cota	Y'
1	605.00	3817.636	
2	605.50	3817.636	0.00
3	606.00	3817.636	0.00
4	606.50	3817.637	2.00
5	607.00	3817.637	0.00
6	607.50	3817.638	2.00
7	608.00	3817.640	4.00
8	608.50	3817.642	4.00
9	609.00	3817.641	-2.00
10	609.50	3817.640	-2.00
11	610.00	3817.638	-4.00
12	610.50	3817.637	-2.00
13	611.00	3817.637	0.00
14	611.50	3817.636	-2.00
15	612.00	3817.634	-4.00
16	612.50	3817.633	-2.00
17	613.00	3817.632	-2.00
18	613.50	3817.631	-2.00
19	614.00	3817.630	-2.00
20	614.50	3817.628	-4.00
21	615.00	3817.626	-4.00
22	615.50	3817.623	-6.00
23	616.00	3817.623	0.00

IRI 2.0869

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -1.18181818
z2' = z4' = 0

$$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.16784	0.02128394	0	-0.02521	0.029792821	0.000992	0	0.037038	0	-1.138047643	RS1 =	0.778594	IRI =	0.778594
	z2	-0.92852	1.097337	0.9001616	0	-3.39137	4.007981545	0.062802	0	4.319885	0	5.105318636				
	z3	0.063863	-0.07547	0.006615445	0	0.24029	-0.283978618	0.009863	0	0.695847	0	-0.35945338				
	z4	3.743294	-4.42389	0.4186779	0	-46.6788	55.16589	-0.11453	0	42.93555	0	50.74199709				
2da Iteracion	z1	0.988173	-1.12459	0.02128394	0.108661	-0.02521	0.009061572	0.000992	0.050352	0.037038	0	-0.956512624	RS2 =	1.331686	IRI =	1.05514
	z2	-0.92852	1.056695	0.9001616	4.595612	-3.39137	1.21903905	0.062802	3.186682	4.319885	0	10.05802844				
	z3	0.063863	-0.07268	0.006615445	0.033774	0.24029	-0.086372909	0.009863	0.500452	0.695847	0	0.375173693				
	z4	3.743294	-4.26005	0.4186779	2.137484	-46.6788	16.77886322	-0.11453	-5.81123	42.93555	0	8.8450681				
3ra Iteracion	z1	0.988173	-0.9452	0.02128394	0.214074	-0.02521	-0.00945787	0.000992	0.008777	0.037038	0.07407694	-0.657729011	RS3 =	2.232262	IRI =	1.447514
	z2	-0.92852	0.888137	0.9001616	9.053851	-3.39137	-1.272352432	0.062802	0.555485	4.319885	8.639769998	17.86489087				
	z3	0.063863	-0.06109	0.006615445	0.066538	0.24029	0.090150337	0.009863	0.087236	0.695847	1.3916946	1.574533332				
	z4	3.743294	-3.58051	0.4186779	4.211074	-46.6788	-17.51266904	-0.11453	-1.01298	42.93555	85.87109998	67.97601489				
4ta Iteracion	z1	0.988173	-0.64995	0.02128394	0.380235	-0.02521	-0.039692899	0.000992	0.067454	0.037038	0	-0.241953765	RS4 =	1.366903	IRI =	1.427361
	z2	-0.92852	0.610712	0.9001616	16.08129	-3.39137	-5.339823532	0.062802	4.269007	4.319885	0	15.62118438				
	z3	0.063863	-0.042	0.006615445	0.118184	0.24029	0.378343985	0.009863	0.670426	0.695847	0	1.124949151				
	z4	3.743294	-2.46207	0.4186779	7.479635	-46.6788	-73.49737374	-0.11453	-7.78496	42.93555	0	-76.26477171				
5ta Iteracion	z1	0.988173	-0.23909	0.02128394	0.33248	-0.02521	-0.028359192	0.000992	-0.07568	0.037038	0.07407694	0.063427203	RS5 =	0.934295	IRI =	1.328748
	z2	-0.92852	0.224658	0.9001616	14.06159	-3.39137	-3.815117678	0.062802	-4.78956	4.319885	8.639770002	14.32134556				
	z3	0.063863	-0.01545	0.006615445	0.103341	0.24029	0.270313582	0.009863	-0.75218	0.695847	1.3916946	0.997722273				
	z4	3.743294	-0.9057	0.4186779	6.540245	-46.6788	-52.51131019	-0.11453	8.734231	42.93555	85.87110002	47.72856103				

FIGURA 3.57: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 616m a 627m.*

N°	Dist	Cota	Y'
1	616.00	3817.623	
2	616.50	3817.622	-2.00
3	617.00	3817.622	0.00
4	617.50	3817.621	-2.00
5	618.00	3817.622	2.00
6	618.50	3817.624	4.00
7	619.00	3817.627	6.00
8	619.50	3817.630	6.00
9	620.00	3817.632	4.00
10	620.50	3817.634	4.00
11	621.00	3817.636	4.00
12	621.50	3817.637	2.00
13	622.00	3817.638	2.00
14	622.50	3817.639	2.00
15	623.00	3817.640	2.00
16	623.50	3817.641	2.00
17	624.00	3817.642	2.00
18	624.50	3817.644	4.00
19	625.00	3817.647	6.00
20	625.50	3817.651	8.00
21	626.00	3817.651	0.00
22	626.50	3817.652	2.00
23	627.00	3817.652	0.00

IRI 2.2942

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 2.636363636
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	2.605183	0.02128394	0	-0.02521	-0.066460908	0.000992	0	0.037038	-0.07407694	2.464644725	RS1 =	3.054482	IRI =	3.054482
	z2	-0.92852	-2.44791	0.9001616	0	-3.39137	-8.940881909	0.062802	0	4.319885	-8.63977	-20.02855773				
	z3	0.063863	0.168367	0.006615445	0	0.24029	0.633490764	0.009863	0	0.695847	-1.3916946	-0.58983706				
	z4	3.743294	9.868684	0.4186779	0	-46.6788	-123.06237	-0.11453	0	42.93555	-85.8711	-199.0647858				
2da Iteracion	z1	0.988173	2.435495	0.02128394	-0.42629	-0.02521	0.014863385	0.000992	-0.19754	0.037038	0	1.826542125	RS2 =	3.906684	IRI =	3.480583
	z2	-0.92852	-2.28846	0.9001616	-18.0289	-3.39137	2.000355121	0.062802	-12.5016	4.319885	0	-30.8186465				
	z3	0.063863	0.1574	0.006615445	-0.1325	0.24029	-0.141731711	0.009863	-1.96331	0.695847	0	-2.080141568				
	z4	3.743294	9.22589	0.4186779	-8.38551	-46.6788	27.53290386	-0.11453	22.79791	42.93555	0	51.17119369				
3ra Iteracion	z1	0.988173	1.804939	0.02128394	-0.65594	-0.02521	0.052438934	0.000992	0.050778	0.037038	-0.07407694	1.178136854	RS3 =	2.652213	IRI =	3.204459
	z2	-0.92852	-1.69597	0.9001616	-27.7418	-3.39137	7.054527631	0.062802	3.213636	4.319885	-8.63977	-27.80934168				
	z3	0.063863	0.116649	0.006615445	-0.20388	0.24029	-0.499836385	0.009863	0.504685	0.695847	-1.3916946	-1.474076003				
	z4	3.743294	6.837284	0.4186779	-12.9031	-46.6788	97.09857465	-0.11453	-5.86039	42.93555	-85.8711	-0.698713423				
4ta Iteracion	z1	0.988173	1.164203	0.02128394	-0.59189	-0.02521	0.037160439	0.000992	-0.00069	0.037038	0.07407694	0.68285435	RS4 =	0.239012	IRI =	2.463098
	z2	-0.92852	-1.09392	0.9001616	-25.0329	-3.39137	4.99913566	0.062802	-0.04388	4.319885	8.639769998	-12.53179513				
	z3	0.063863	0.07524	0.006615445	-0.18397	0.24029	-0.354205133	0.009863	-0.00689	0.695847	1.3916946	0.92186677				
	z4	3.743294	4.410113	0.4186779	-11.6432	-46.6788	68.80814314	-0.11453	0.08002	42.93555	85.87109998	147.5262192				
5ta Iteracion	z1	0.988173	0.674778	0.02128394	-0.26673	-0.02521	-0.023239625	0.000992	0.146393	0.037038	0.14815388	0.679359007	RS5 =	3.741255	IRI =	2.718729
	z2	-0.92852	-0.63404	0.9001616	-11.2806	-3.39137	-3.126390384	0.062802	9.264893	4.319885	17.27954	11.5033606				
	z3	0.063863	0.043609	0.006615445	-0.0829	0.24029	0.221514997	0.009863	1.455004	0.695847	2.7833892	4.420613992				
	z4	3.743294	2.556125	0.4186779	-5.24679	-46.6788	-43.03166222	-0.11453	-16.8955	42.93555	171.7422	109.1244217				

FIGURA 3.58: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 627m a 638m.*

N°	Dist	Cota	Y'
1	627.00	3817.652	
2	627.50	3817.653	2.00
3	628.00	3817.653	0.00
4	628.50	3817.652	-2.00
5	629.00	3817.651	-2.00
6	629.50	3817.649	-4.00
7	630.00	3817.647	-4.00
8	630.50	3817.645	-4.00
9	631.00	3817.643	-4.00
10	631.50	3817.641	-4.00
11	632.00	3817.640	-2.00
12	632.50	3817.638	-4.00
13	633.00	3817.638	0.00
14	633.50	3817.637	-2.00
15	634.00	3817.638	2.00
16	634.50	3817.639	2.00
17	635.00	3817.639	0.00
18	635.50	3817.640	2.00
19	636.00	3817.640	0.00
20	636.50	3817.641	2.00
21	637.00	3817.642	2.00
22	637.50	3817.642	0.00
23	638.00	3817.643	2.00

IRI **2.1110**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.81818182
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.8085	0.02128394	0	-0.02521	0.020625799	0.000992	0	0.037038	0.07407694	-0.713802197	RS1 =	1.856644	IRI =	1.856644
	z2	-0.92852	0.759695	0.9001616	0	-3.39137	2.774756455	0.062802	0	4.319885	8.639769998	12.17422136				
	z3	0.063863	-0.05225	0.006615445	0	0.24029	-0.196600582	0.009863	0	0.695847	1.3916946	1.14284226				
	z4	3.743294	-3.0627	0.4186779	0	-46.6788	38.19177	-0.11453	0	42.93555	85.87109998	121.0001749				
2da Iteracion	z1	0.988173	-0.70536	0.02128394	0.259115	-0.02521	-0.028810265	0.000992	0.12007	0.037038	0	-0.354984242	RS2 =	1.857936	IRI =	1.85729
	z2	-0.92852	0.662777	0.9001616	10.95877	-3.39137	-3.875799811	0.062802	7.599013	4.319885	0	15.34475658				
	z3	0.063863	-0.04559	0.006615445	0.080538	0.24029	0.274613109	0.009863	1.193386	0.695847	0	1.502951271				
	z4	3.743294	-2.67197	0.4186779	5.097077	-46.6788	-53.34653956	-0.11453	-13.8576	42.93555	0	-64.77899073				
3ra Iteracion	z1	0.988173	-0.35079	0.02128394	0.326597	-0.02521	-0.037888365	0.000992	-0.06428	0.037038	-0.07407694	-0.200435425	RS3 =	1.390168	IRI =	1.701583
	z2	-0.92852	0.329609	0.9001616	13.81276	-3.39137	-5.097062348	0.062802	-4.06823	4.319885	-8.63977	-3.662691959				
	z3	0.063863	-0.02267	0.006615445	0.101512	0.24029	0.36114356	0.009863	-0.63889	0.695847	-1.3916946	-1.590603554				
	z4	3.743294	-1.32881	0.4186779	6.42451	-46.6788	-70.15600687	-0.11453	7.41882	42.93555	-85.8711	-143.5125864				
4ta Iteracion	z1	0.988173	-0.19806	0.02128394	-0.07796	-0.02521	0.040098018	0.000992	-0.14241	0.037038	-0.07407694	-0.45241016	RS4 =	2.773939	IRI =	1.969672
	z2	-0.92852	0.186107	0.9001616	-3.29701	-3.39137	5.394323584	0.062802	-9.01283	4.319885	-8.63977	-15.36918366				
	z3	0.063863	-0.0128	0.006615445	-0.02423	0.24029	-0.382205492	0.009863	-1.41542	0.695847	-1.3916946	-3.226349604				
	z4	3.743294	-0.75029	0.4186779	-1.53349	-46.6788	74.2475129	-0.11453	16.43579	42.93555	-85.8711	2.528429285				
5ta Iteracion	z1	0.988173	-0.44706	0.02128394	-0.32712	-0.02521	0.081334047	0.000992	0.002509	0.037038	-0.14815388	-0.838486983	RS5 =	2.82579	IRI =	2.140895
	z2	-0.92852	0.42007	0.9001616	-13.8347	-3.39137	10.94174203	0.062802	0.15879	4.319885	-17.27954	-19.59368727				
	z3	0.063863	-0.02889	0.006615445	-0.10167	0.24029	-0.775258256	0.009863	0.024937	0.695847	-2.7833892	-3.664276744				
	z4	3.743294	-1.6935	0.4186779	-6.43474	-46.6788	150.6022247	-0.11453	-0.28957	42.93555	-171.7422	-29.55778563				

FIGURA 3.59: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 638m a 649m.*

N°	Dist	Cota	Y'
1	638.00	3817.643	
2	638.50	3817.645	4.00
3	639.00	3817.644	-2.00
4	639.50	3817.644	0.00
5	640.00	3817.643	-2.00
6	640.50	3817.641	-4.00
7	641.00	3817.638	-6.00
8	641.50	3817.636	-4.00
9	642.00	3817.633	-6.00
10	642.50	3817.631	-4.00
11	643.00	3817.630	-2.00
12	643.50	3817.628	-4.00
13	644.00	3817.629	2.00
14	644.50	3817.629	0.00
15	645.00	3817.629	0.00
16	645.50	3817.629	0.00
17	646.00	3817.629	0.00
18	646.50	3817.630	2.00
19	647.00	3817.630	0.00
20	647.50	3817.630	0.00
21	648.00	3817.632	4.00
22	648.50	3817.634	4.00
23	649.00	3817.636	4.00

IRI	2.8059

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.63636364
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.62884	0.02128394	0	-0.02521	0.016042288	0.000992	0	0.037038	0.14815388	-0.464641005	RS1 =	3.054478	IRI =	3.054478
	z2	-0.92852	0.590874	0.9001616	0	-3.39137	2.158143909	0.062802	0	4.319885	17.27954	20.02855773				
	z3	0.063863	-0.04064	0.006615445	0	0.24029	-0.152911564	0.003863	0	0.695847	2.7833892	2.58983738				
	z4	3.743294	-2.3821	0.4186779	0	-46.6788	29.70471	-0.11453	0	42.93555	171.7422	199.0648138				
2da Iteracion	z1	0.988173	-0.45915	0.02128394	0.426287	-0.02521	-0.065288013	0.000992	0.197535	0.037038	-0.07407694	0.025311411	RS2 =	1.271442	IRI =	2.16296
	z2	-0.92852	0.431427	0.9001616	18.02894	-3.39137	-8.783094205	0.062802	12.5016	4.319885	-8.63977	13.53910371				
	z3	0.063863	-0.02967	0.006615445	0.132498	0.24029	0.622310988	0.003863	1.963313	0.695847	-1.3916946	1.296753279				
	z4	3.743294	-1.73929	0.4186779	8.385514	-46.6788	-120.8905788	-0.11453	-22.7979	42.93555	-85.8711	-222.9133699				
3ra Iteracion	z1	0.988173	0.025012	0.02128394	0.288165	-0.02521	-0.032690255	0.000992	-0.2212	0.037038	0	0.059286646	RS3 =	1.85503	IRI =	2.060317
	z2	-0.92852	-0.0235	0.9001616	12.18738	-3.39137	-4.397768869	0.062802	-13.9993	4.319885	0	-6.233221552				
	z3	0.063863	0.001616	0.006615445	0.089567	0.24029	0.311596327	0.003863	-2.19852	0.695847	0	-1.795743243				
	z4	3.743294	0.094748	0.4186779	5.668524	-46.6788	-60.53092584	-0.11453	25.52918	42.93555	0	-29.2384783				
4ta Iteracion	z1	0.988173	0.058585	0.02128394	-0.13267	-0.02521	0.045269448	0.000992	-0.02901	0.037038	-0.07407694	-0.131903385	RS4 =	2.017109	IRI =	2.049515
	z2	-0.92852	-0.05505	0.9001616	-5.61091	-3.39137	6.090027967	0.062802	-1.83623	4.319885	-8.63977	-10.05192258				
	z3	0.063863	0.003786	0.006615445	-0.04124	0.24029	-0.431498426	0.003863	-0.28837	0.695847	-1.3916946	-2.149012076				
	z4	3.743294	0.221927	0.4186779	-2.60971	-46.6788	83.82319358	-0.11453	3.34854	42.93555	-85.8711	-1.087151512				
5ta Iteracion	z1	0.988173	-0.13034	0.02128394	-0.21394	-0.02521	0.054175112	0.000992	-0.00108	0.037038	-0.14815388	-0.439345408	RS5 =	2.946073	IRI =	2.228826
	z2	-0.92852	0.122474	0.9001616	-9.04835	-3.39137	7.288092936	0.062802	-0.06827	4.319885	-17.27954	-18.9856023				
	z3	0.063863	-0.00842	0.006615445	-0.0665	0.24029	-0.516385252	0.003863	-0.01072	0.695847	-2.7833892	-3.385418401				
	z4	3.743294	-0.49375	0.4186779	-4.20852	-46.6788	100.3133694	-0.11453	0.124506	42.93555	-171.7422	-76.00659547				

FIGURA 3.60: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 649m a 660m.*

N°	Dist	Cota	Y'
1	649.00	3817.636	
2	649.50	3817.637	2.00
3	650.00	3817.639	4.00
4	650.50	3817.641	4.00
5	651.00	3817.642	2.00
6	651.50	3817.643	2.00
7	652.00	3817.644	2.00
8	652.50	3817.646	4.00
9	653.00	3817.646	0.00
10	653.50	3817.646	0.00
11	654.00	3817.647	2.00
12	654.50	3817.648	2.00
13	655.00	3817.650	4.00
14	655.50	3817.652	4.00
15	656.00	3817.652	0.00
16	656.50	3817.651	-2.00
17	657.00	3817.650	-2.00
18	657.50	3817.649	-2.00
19	658.00	3817.649	0.00
20	658.50	3817.649	0.00
21	659.00	3817.650	2.00
22	659.50	3817.651	2.00
23	660.00	3817.648	-6.00

IRI **2.0067**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 1.090909091
z2' = **z4'** = 0

Y' = $(Y_1 - Y_{i-1})$ / dx = slope input (8)

and

Z_j' = Z_j from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	1.078007	0.02128394	0	-0.02521	-0.027501065	0.000992	0	0.037038	0.07407694	1.124582456	RS1 =	0.538915	IRI =	0.538915
	z2	-0.92852	-1.01293	0.9001616	0	-3.39137	-3.699675273	0.062802	0	4.319885	8.639769998	3.92716818				
	z3	0.063863	0.069669	0.006615445	0	0.24029	0.262134109	0.009863	0	0.695847	1.3916946	1.72349772				
	z4	3.743294	4.083593	0.4186779	0	-46.6788	-50.92236	-0.11453	0	42.93555	85.87109998	39.03233343				
2da Iteracion	z1	0.988173	1.111282	0.02128394	0.083586	-0.02521	-0.043448188	0.000992	0.038732	0.037038	0.14815388	1.338305414	RS2 =	2.341985	IRI =	1.47045
	z2	-0.92852	-1.04419	0.9001616	3.535086	-3.39137	-5.845016738	0.062802	2.451296	4.319885	17.27954	16.37671217				
	z3	0.063863	0.07182	0.006615445	0.02598	0.24029	0.414138578	0.009863	0.384963	0.695847	2.7833892	3.680290659				
	z4	3.743294	4.209643	0.4186779	1.644219	-46.6788	-80.45085706	-0.11453	-4.47018	42.93555	171.7422	92.67502233				
3ra Iteracion	z1	0.988173	1.322477	0.02128394	0.348561	-0.02521	-0.092777588	0.000992	0.091963	0.037038	0.14815388	1.81837708	RS3 =	2.35718	IRI =	1.966027
	z2	-0.92852	-1.24264	0.9001616	14.74169	-3.39137	-12.48122365	0.062802	5.820146	4.319885	17.27954	24.11751196				
	z3	0.063863	0.085469	0.006615445	0.108339	0.24029	0.88433557	0.009863	0.914024	0.695847	2.783389201	4.775556645				
	z4	3.743294	5.009671	0.4186779	6.856567	-46.6788	-171.791662	-0.11453	-10.6136	42.93555	171.7422	1.203159911				
4ta Iteracion	z1	0.988173	1.796871	0.02128394	0.513316	-0.02521	-0.120388488	0.000992	0.001194	0.037038	0.07407694	2.265068634	RS4 =	0.561685	IRI =	1.614941
	z2	-0.92852	-1.68839	0.9001616	21.70966	-3.39137	-16.19567477	0.062802	0.07556	4.319885	8.639769998	12.54092163				
	z3	0.063863	0.116127	0.006615445	0.159548	0.24029	1.147516596	0.009863	0.011866	0.695847	1.3916946	2.826753139				
	z4	3.743294	6.80672	0.4186779	10.09747	-46.6788	-222.9173968	-0.11453	-0.13779	42.93555	85.87109998	-120.2798996				
5ta Iteracion	z1	0.988173	2.238279	0.02128394	0.26692	-0.02521	-0.071260496	0.000992	-0.11936	0.037038	0.07407694	2.388659926	RS5 =	1.27639	IRI =	1.547231
	z2	-0.92852	-2.10315	0.9001616	11.28886	-3.39137	-9.586562967	0.062802	-7.55378	4.319885	8.639770002	0.685132088				
	z3	0.063863	0.144655	0.006615445	0.082964	0.24029	0.679239381	0.009863	-1.18628	0.695847	1.3916946	1.112270266				
	z4	3.743294	8.478818	0.4186779	5.250607	-46.6788	-131.9495292	-0.11453	13.77507	42.93555	85.87110002	-18.57393713				

FIGURA 3.61: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 660m a 671m.*

N°	Dist	Cota	Y'
1	660.00	3817.648	
2	660.50	3817.646	-4.00
3	661.00	3817.645	-2.00
4	661.50	3817.644	-2.00
5	662.00	3817.643	-2.00
6	662.50	3817.641	-4.00
7	663.00	3817.639	-4.00
8	663.50	3817.638	-2.00
9	664.00	3817.635	-6.00
10	664.50	3817.631	-8.00
11	665.00	3817.631	0.00
12	665.50	3817.630	-2.00
13	666.00	3817.628	-4.00
14	666.50	3817.625	-6.00
15	667.00	3817.625	0.00
16	667.50	3817.624	-2.00
17	668.00	3817.623	-2.00
18	668.50	3817.621	-4.00
19	669.00	3817.620	-2.00
20	669.50	3817.619	-2.00
21	670.00	3817.619	0.00
22	670.50	3817.618	-2.00
23	671.00	3817.617	-2.00

IRI	1.5783

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.81818182
z2' = **z4'** = 0

$$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.78485	0.02128394	0	-0.02521	0.071044419	0.000992	0	0.037038	-0.14815388	-2.861959797	**RS1** =	0.778587	**IRI** =	0.778587
	z2	-0.92852	2.616727	0.9001616	0	-3.39137	9.557494455	0.062802	0	4.319885	-17.27954	-5.105318636				
	z3	0.063863	-0.17998	0.006615445	0	0.24029	-0.677179782	0.009863	0	0.695847	-2.7833892	-3.64054726				
	z4	3.743294	-10.5493	0.4186779	0	-46.6788	131.54943	-0.11453	0	42.93555	-171.7422	-50.74205309				
2da Iteracion	z1	0.988173	-2.82811	0.02128394	-0.10866	-0.02521	0.091775684	0.000992	-0.05035	0.037038	-0.07407694	-2.969425268	**RS2** =	0.014056	**IRI** =	0.396322
	z2	-0.92852	2.657375	0.9001616	-4.59561	-3.39137	12.34643912	0.062802	-3.18669	4.319885	-8.63977	-1.418252879				
	z3	0.063863	-0.18277	0.006615445	-0.03377	0.24029	-0.874785645	0.009863	-0.50045	0.695847	-1.3916946	-2.983480914				
	z4	3.743294	-10.7132	0.4186779	-2.13748	-46.6788	169.9364867	-0.11453	5.811239	42.93555	-85.8711	77.02598436				
3ra Iteracion	z1	0.988173	-2.9343	0.02128394	-0.03019	-0.02521	0.075211495	0.000992	0.076434	0.037038	-0.07407694	-2.886922283	**RS3** =	1.338991	**IRI** =	0.710545
	z2	-0.92852	2.757159	0.9001616	-1.27666	-3.39137	10.11808468	0.062802	4.83736	4.319885	-8.63977	7.796177224				
	z3	0.063863	-0.18964	0.006615445	-0.00938	0.24029	-0.716899435	0.009863	0.759683	0.695847	-1.3916946	-1.547930952				
	z4	3.743294	-11.1154	0.4186779	-0.59379	-46.6788	139.2653984	-0.11453	-8.82141	42.93555	-85.8711	32.86366689				
4ta Iteracion	z1	0.988173	-2.85278	0.02128394	0.165933	-0.02521	0.039022271	0.000992	0.032611	0.037038	-0.07407694	-2.689287929	**RS4** =	1.116972	**IRI** =	0.812152
	z2	-0.92852	2.680554	0.9001616	7.017819	-3.39137	5.249605045	0.062802	2.063893	4.319885	-8.63977	8.372101104				
	z3	0.063863	-0.18437	0.006615445	0.051575	0.24029	-0.371951709	0.009863	0.324124	0.695847	-1.3916946	-1.572315566				
	z4	3.743294	-10.8066	0.4186779	3.264087	-46.6788	72.25560577	-0.11453	-3.76371	42.93555	-85.8711	-24.9217207				
5ta Iteracion	z1	0.988173	-2.65748	0.02128394	0.178191	-0.02521	0.039636991	0.000992	-0.02473	0.037038	-0.14815388	-2.61253674	**RS5** =	0.91082	**IRI** =	0.831885
	z2	-0.92852	2.497047	0.9001616	7.536244	-3.39137	5.332302267	0.062802	-1.56513	4.319885	-17.27954	-3.479072616				
	z3	0.063863	-0.17175	0.006615445	0.055385	0.24029	-0.377811078	0.009863	-0.24579	0.695847	-2.7833892	-3.523356754				
	z4	3.743294	-10.0668	0.4186779	3.505214	-46.6788	73.39385099	-0.11453	2.854163	42.93555	-171.7422	-102.0557681				

FIGURA 3.62: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 671m a 682m.*

N°	Dist	Cota	Y'
1	671.00	3817.617	
2	671.50	3817.615	-4.00
3	672.00	3817.615	0.00
4	672.50	3817.614	-2.00
5	673.00	3817.613	-2.00
6	673.50	3817.612	-2.00
7	674.00	3817.612	0.00
8	674.50	3817.611	-2.00
9	675.00	3817.612	2.00
10	675.50	3817.614	4.00
11	676.00	3817.615	2.00
12	676.50	3817.616	2.00
13	677.00	3817.616	0.00
14	677.50	3817.615	-2.00
15	678.00	3817.616	2.00
16	678.50	3817.617	2.00
17	679.00	3817.617	0.00
18	679.50	3817.618	2.00
19	680.00	3817.617	-2.00
20	680.50	3817.617	0.00
21	681.00	3817.616	-2.00
22	681.50	3817.616	0.00
23	682.00	3817.618	4.00

IRI	1.7918

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.090909091
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.089834	0.02128394	0	-0.02521	-0.002291755	0.000992	0	0.037038	-0.14815388	-0.060611754	RS1 =	2.695127	IRI =	2.695127
	z2	-0.92852	-0.08441	0.9001616	0	-3.39137	-0.308306273	0.062802	0	4.319885	-17.27954	-17.67225682				
	z3	0.063863	0.005806	0.006615445	0	0.24029	0.021844509	0.009863	0	0.695847	-2.7833892	-2.75573894				
	z4	3.743294	0.340299	0.4186779	0	-46.6788	-4.243530001	-0.11453	0	42.93555	-171.7422	-175.6454305				
2da Iteracion	z1	0.988173	-0.05989	0.02128394	-0.37614	-0.02521	0.069470277	0.000992	-0.1743	0.037038	0	-0.540855716	RS2 =	1.974435	IRI =	2.334781
	z2	-0.92852	0.056279	0.9001616	-15.9079	-3.39137	9.345727613	0.062802	-11.0308	4.319885	0	-17.53670674				
	z3	0.063863	-0.00387	0.006615445	-0.11691	0.24029	-0.662175408	0.009863	-1.73233	0.695847	0	-2.51529079				
	z4	3.743294	-0.22689	0.4186779	-7.39898	-46.6788	128.6346695	-0.11453	20.11581	42.93555	0	141.124609				
3ra Iteracion	z1	0.988173	-0.53446	0.02128394	-0.37325	-0.02521	0.063408745	0.000992	0.14004	0.037038	-0.07407694	-0.778336984	RS3 =	0.023557	IRI =	1.564373
	z2	-0.92852	0.502193	0.9001616	-15.7859	-3.39137	8.53027921	0.062802	8.862861	4.319885	-8.63977	-6.530306478				
	z3	0.063863	-0.03454	0.006615445	-0.11601	0.24029	-0.604398218	0.009863	1.391867	0.695847	-1.3916946	-0.754779887				
	z4	3.743294	-2.02458	0.4186779	-7.34223	-46.6788	117.4108312	-0.11453	-16.1623	42.93555	-85.8711	6.010607726				
4ta Iteracion	z1	0.988173	-0.76913	0.02128394	-0.13899	-0.02521	0.01902748	0.000992	0.005964	0.037038	-0.07407694	-0.957207045	RS4 =	0.649481	IRI =	1.33565
	z2	-0.92852	0.722698	0.9001616	-5.87833	-3.39137	2.55973711	0.062802	0.377476	4.319885	-8.63977	-10.85818947				
	z3	0.063863	-0.04971	0.006615445	-0.0432	0.24029	-0.181365757	0.009863	0.059281	0.695847	-1.3916946	-1.606687677				
	z4	3.743294	-2.91354	0.4186779	-2.7341	-46.6788	35.23224202	-0.11453	-0.68837	42.93555	-85.8711	-56.97486261				
5ta Iteracion	z1	0.988173	-0.94589	0.02128394	-0.23111	-0.02521	0.040503488	0.000992	-0.05654	0.037038	-0.07407694	-1.267101471	RS5 =	1.20555	IRI =	1.30963
	z2	-0.92852	0.888782	0.9001616	-9.77413	-3.39137	5.448870781	0.062802	-3.57812	4.319885	-8.63977	-15.65435889				
	z3	0.063863	-0.06113	0.006615445	-0.07183	0.24029	-0.386070339	0.009863	-0.56192	0.695847	-1.3916946	-2.472651895				
	z4	3.743294	-3.58311	0.4186779	-4.54608	-46.6788	74.99830095	-0.11453	6.525052	42.93555	-85.8711	-12.47693855				

FIGURA 3.63: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 682m a 693m.*

N°	Dist	Cota	Y'
1	682.00	3817.618	
2	682.50	3817.619	2.00
3	683.00	3817.620	2.00
4	683.50	3817.621	2.00
5	684.00	3817.622	2.00
6	684.50	3817.623	2.00
7	685.00	3817.625	4.00
8	685.50	3817.628	6.00
9	686.00	3817.628	0.00
10	686.50	3817.629	2.00
11	687.00	3817.625	-8.00
12	687.50	3817.622	-6.00
13	688.00	3817.622	0.00
14	688.50	3817.621	-2.00
15	689.00	3817.621	0.00
16	689.50	3817.621	0.00
17	690.00	3817.620	-2.00
18	690.50	3817.619	-2.00
19	691.00	3817.619	0.00
20	691.50	3817.620	2.00
21	692.00	3817.619	-2.00
22	692.50	3817.617	-4.00
23	693.00	3817.616	-2.00

IRI | **2.5188**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.18181818
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.17967	0.02128394	0	-0.02521	0.004583511	0.000992	0	0.037038	0.07407694	-0.101007313	RS1 =	1.437401	IRI =	1.437401
	z2	-0.92852	0.168821	0.9001616	0	-3.39137	0.616612545	0.062802	0	4.319885	8.639769998	9.425203634				
	z3	0.063863	-0.01161	0.006615445	0	0.24029	-0.043689018	0.009863	0	0.695847	1.3916946	1.33639408				
	z4	3.743294	-0.6806	0.4186779	0	-46.6788	8.48706	-0.11453	0	42.93555	85.87109998	93.67756107				
2da Iteracion	z1	0.988173	-0.09981	0.02128394	0.200605	-0.02521	-0.033689573	0.000992	0.092958	0.037038	0.07407694	0.234137957	RS2 =	2.458491	IRI =	1.947946
	z2	-0.92852	0.093787	0.9001616	8.484206	-3.39137	-4.532205454	0.062802	5.883107	4.319885	8.639770002	18.56866511				
	z3	0.063863	-0.00645	0.006615445	0.062352	0.24029	0.321121599	0.009863	0.923912	0.695847	1.3916946	2.692629267				
	z4	3.743294	-0.3781	0.4186779	3.946124	-46.6788	-62.38131206	-0.11453	-10.7284	42.93555	85.87110002	16.32938031				
3ra Iteracion	z1	0.988173	0.231369	0.02128394	0.395214	-0.02521	-0.067879326	0.000992	0.016204	0.037038	0.07407694	0.648984619	RS3 =	1.688565	IRI =	1.861486
	z2	-0.92852	-0.2174	0.9001616	16.7148	-3.39137	-9.131699425	0.062802	1.025512	4.319885	8.639770002	17.03098139				
	z3	0.063863	0.014953	0.006615445	0.12284	0.24029	0.64701081	0.009863	0.161051	0.695847	1.3916946	2.337549658				
	z4	3.743294	0.876447	0.4186779	7.77429	-46.6788	-125.6887838	-0.11453	-1.87012	42.93555	85.87110002	-33.03707078				
4ta Iteracion	z1	0.988173	0.641309	0.02128394	0.362486	-0.02521	-0.058928014	0.000992	-0.03278	0.037038	0.07407694	0.986160964	RS4 =	0.795502	IRI =	1.59499
	z2	-0.92852	-0.60259	0.9001616	15.33064	-3.39137	-7.927493447	0.062802	-2.07478	4.319885	8.639769998	13.36553619				
	z3	0.063863	0.041446	0.006615445	0.112668	0.24029	0.561688872	0.009863	-0.32583	0.695847	1.3916946	1.781663209				
	z4	3.743294	2.42934	0.4186779	7.130496	-46.6788	-109.1140831	-0.11453	3.783574	42.93555	85.87109998	-9.839573555				
5ta Iteracion	z1	0.988173	0.974497	0.02128394	0.284471	-0.02521	-0.0449145	0.000992	-0.00982	0.037038	0.07407694	1.278307543	RS5 =	0.595264	IRI =	1.395045
	z2	-0.92852	-0.91567	0.9001616	12.03114	-3.39137	-6.042277375	0.062802	-0.62171	4.319885	8.639770002	13.09125908				
	z3	0.063863	0.062979	0.006615445	0.088419	0.24029	0.42811514	0.009863	-0.09764	0.695847	1.3916946	1.873571838				
	z4	3.743294	3.69149	0.4186779	5.595855	-46.6788	-83.16595404	-0.11453	1.13375	42.93555	85.87110002	13.12624067				

FIGURA 3.64: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 693m a 704m.*

N°	Dist	Cota	Y'
1	693.00	3817.616	
2	693.50	3817.615	-2.00
3	694.00	3817.615	0.00
4	694.50	3817.614	-2.00
5	695.00	3817.614	0.00
6	695.50	3817.614	0.00
7	696.00	3817.616	4.00
8	696.50	3817.617	2.00
9	697.00	3817.616	-2.00
10	697.50	3817.615	-2.00
11	698.00	3817.617	4.00
12	698.50	3817.618	2.00
13	699.00	3817.616	-4.00
14	699.50	3817.615	-2.00
15	700.00	3817.618	6.00
16	700.50	3817.615	-6.00
17	701.00	3817.615	0.00
18	701.50	3817.615	0.00
19	702.00	3817.614	-2.00
20	702.50	3817.615	2.00
21	703.00	3817.617	4.00
22	703.50	3817.617	0.00
23	704.00	3817.618	2.00

IRI	1.9179

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 0.181818182
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.179668	0.02128394	0	-0.02521	-0.004583511	0.000992	0	0.037038	-0.07407694	0.101007313	RS1 =	1.437401	IRI =	1.437401
	z2	-0.92852	-0.16882	0.9001616	0	-3.39137	-0.616612545	0.062802	0	4.319885	-8.63977	-9.425203638				
	z3	0.063863	0.011612	0.006615445	0	0.24029	0.043689018	0.009863	0	0.695847	-1.3916946	-1.33639408				
	z4	3.743294	0.680599	0.4186779	0	-46.6788	-8.48706	-0.11453	0	42.93555	-85.8711	-93.67756111				
2da Iteracion	z1	0.988173	0.099813	0.02128394	-0.20061	-0.02521	0.033689573	0.000992	-0.09296	0.037038	0	-0.160061017	RS2 =	1.140874	IRI =	1.289138
	z2	-0.92852	-0.09379	0.9001616	-8.48421	-3.39137	4.532205456	0.062802	-5.88311	4.319885	0	-9.928895117				
	z3	0.063863	0.006451	0.006615445	-0.06235	0.24029	-0.321121599	0.009863	-0.92391	0.695847	0	-1.300934667				
	z4	3.743294	0.3781	0.4186779	-3.94612	-46.6788	62.38131209	-0.11453	10.72843	42.93555	0	69.54171974				
3ra Iteracion	z1	0.988173	-0.15817	0.02128394	-0.21133	-0.02521	0.032795665	0.000992	0.069007	0.037038	-0.07407694	-0.341767814	RS3 =	0.752566	IRI =	1.11028
	z2	-0.92852	0.148619	0.9001616	-8.93761	-3.39137	4.411949502	0.062802	4.367336	4.319885	-8.63977	-8.649475261				
	z3	0.063863	-0.01022	0.006615445	-0.06568	0.24029	-0.312601071	0.009863	0.685868	0.695847	-1.3916946	-1.09433402				
	z4	3.743294	-0.59916	0.4186779	-4.15701	-46.6788	60.72610818	-0.11453	-7.96427	42.93555	-85.8711	-37.86542861				
4ta Iteracion	z1	0.988173	-0.33773	0.02128394	-0.18409	-0.02521	0.027587406	0.000992	-0.03757	0.037038	0	-0.53180762	RS4 =	0.183651	IRI =	0.878623
	z2	-0.92852	0.317337	0.9001616	-7.78593	-3.39137	3.711290471	0.062802	-2.37801	4.319885	0	-6.135310287				
	z3	0.063863	-0.02183	0.006615445	-0.05722	0.24029	-0.262957084	0.009863	-0.37345	0.695847	0	-0.715458224				
	z4	3.743294	-1.27934	0.4186779	-3.62134	-46.6788	51.08223168	-0.11453	4.336542	42.93555	0	50.51809213				
5ta Iteracion	z1	0.988173	-0.52552	0.02128394	-0.13058	-0.02521	0.018036208	0.000992	0.05013	0.037038	0	-0.587935203	RS5 =	0.839711	IRI =	0.870841
	z2	-0.92852	0.493792	0.9001616	-5.52277	-3.39137	2.426382841	0.062802	3.172621	4.319885	0	0.570024552				
	z3	0.063863	-0.03396	0.006615445	-0.04059	0.24029	-0.17191717	0.009863	0.498244	0.695847	0	0.25177583				
	z4	3.743294	-1.99071	0.4186779	-2.56872	-46.6788	33.39675281	-0.11453	-5.78559	42.93555	0	23.05173215				

FIGURA 3.65: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 704m a 715m.*

N°	Dist	Cota	Y'
1	704.00	3817.618	
2	704.50	3817.618	0.00
3	705.00	3817.619	2.00
4	705.50	3817.620	2.00
5	706.00	3817.622	4.00
6	706.50	3817.622	0.00
7	707.00	3817.622	0.00
8	707.50	3817.623	2.00
9	708.00	3817.624	2.00
10	708.50	3817.625	2.00
11	709.00	3817.627	4.00
12	709.50	3817.629	4.00
13	710.00	3817.630	2.00
14	710.50	3817.631	2.00
15	711.00	3817.632	2.00
16	711.50	3817.633	2.00
17	712.00	3817.635	4.00
18	712.50	3817.635	0.00
19	713.00	3817.636	2.00
20	713.50	3817.635	-2.00
21	714.00	3817.635	0.00
22	714.50	3817.635	0.00
23	715.00	3817.636	2.00

IRI **1.3505**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 1.636363636
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	1.61701	0.02128394	0	-0.02521	-0.041251598	0.000992	0	0.037038	0	1.575758275	**RS1 =**	1.078054	**IRI =**	1.078054
	z2	-0.92852	-1.51939	0.9001616	0	-3.39137	-5.549512909	0.062802	0	4.319885	0	-7.068902727				
	z3	0.063863	0.104504	0.006615445	0	0.24029	0.393201164	0.009863	0	0.695847	0	0.49770468				
	z4	3.743294	6.12539	0.4186779	0	-46.6788	-76.38354	-0.11453	0	42.93555	0	-70.25814982				
2da Iteracion	z1	0.988173	1.557121	0.02128394	-0.15045	-0.02521	-0.012546792	0.000992	-0.06972	0.037038	0.07407694	1.398479034	**RS2 =**	0.526256	**IRI =**	0.802155
	z2	-0.92852	-1.46312	0.9001616	-6.36315	-3.39137	-1.687900223	0.062802	-4.41233	4.319885	8.639770002	-5.28673092				
	z3	0.063863	0.100633	0.006615445	-0.04676	0.24029	0.119593258	0.009863	-0.69293	0.695847	1.3916946	0.872223333				
	z4	3.743294	5.898526	0.4186779	-2.95959	-46.6788	-23.23227215	-0.11453	8.046322	42.93555	85.87110002	73.62408265				
3ra Iteracion	z1	0.988173	1.381939	0.02128394	-0.11252	-0.02521	-0.021988148	0.000992	0.073058	0.037038	0.07407694	1.394563523	**RS3 =**	0.987185	**IRI =**	0.863832
	z2	-0.92852	-1.29851	0.9001616	-4.75891	-3.39137	-2.958031172	0.062802	4.623715	4.319885	8.639770002	4.248031849				
	z3	0.063863	0.089311	0.006615445	-0.03497	0.24029	0.209586196	0.009863	0.726131	0.695847	1.3916946	2.381748916				
	z4	3.743294	5.234918	0.4186779	-2.21344	-46.6788	-40.71436468	-0.11453	-8.43181	42.93555	85.87110002	39.74641069				
4ta Iteracion	z1	0.988173	1.37807	0.02128394	0.090415	-0.02521	-0.060042247	0.000992	0.039441	0.037038	0.14815388	1.596037109	**RS4 =**	2.268832	**IRI =**	1.215082
	z2	-0.92852	-1.29487	0.9001616	3.823915	-3.39137	-8.07738944	0.062802	2.496141	4.319885	17.27954	14.22733213				
	z3	0.063863	0.089061	0.006615445	0.028103	0.24029	0.572309494	0.009863	0.392006	0.695847	2.7833892	3.864868818				
	z4	3.743294	5.220261	0.4186779	1.778557	-46.6788	-111.1772528	-0.11453	-4.55196	42.93555	171.7422	63.0118039				
5ta Iteracion	z1	0.988173	1.57716	0.02128394	0.302814	-0.02521	-0.097430676	0.000992	0.062528	0.037038	0	1.84507096	**RS5 =**	0.09887	**IRI =**	0.991839
	z2	-0.92852	-1.48195	0.9001616	12.8069	-3.39137	-13.1071963	0.062802	3.957247	4.319885	0	2.175002277				
	z3	0.063863	0.101928	0.006615445	0.09412	0.24029	0.928687782	0.009863	0.621465	0.695847	0	1.746201307				
	z4	3.743294	5.974436	0.4186779	5.95667	-46.6788	-180.4075545	-0.11453	-7.21643	42.93555	0	-175.692882				

FIGURA 3.66: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 715m a 726m.*

N°	Dist	Cota	Y'
1	715.00	3817.636	
2	715.50	3817.635	-2.00
3	716.00	3817.635	0.00
4	716.50	3817.636	2.00
5	717.00	3817.637	2.00
6	717.50	3817.636	-2.00
7	718.00	3817.636	0.00
8	718.50	3817.636	0.00
9	719.00	3817.637	2.00
10	719.50	3817.637	0.00
11	720.00	3817.638	2.00
12	720.50	3817.636	-4.00
13	721.00	3817.634	-4.00
14	721.50	3817.633	-2.00
15	722.00	3817.632	-2.00
16	722.50	3817.632	0.00
17	723.00	3817.631	-2.00
18	723.50	3817.631	0.00
19	724.00	3817.630	-2.00
20	724.50	3817.628	-4.00
21	725.00	3817.625	-6.00
22	725.50	3817.624	-2.00
23	726.00	3817.622	-4.00

IRI	1.6188

ya = cota N° 23 a=11/dx+1= 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -1.27272727
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.25767	0.02128394	0	-0.02521	0.032084576	0.000992	0	0.037038	-0.07407694	-1.299666709	RS1 =	0.479132	IRI =	0.479132
	z2	-0.92852	1.181748	0.9001616	0	-3.39137	4.316287818	0.062802	0	4.319885	-8.63977	-3.141734543				
	z3	0.063863	-0.08128	0.006615445	0	0.24029	-0.305823127	0.009863	0	0.695847	-1.3916946	-1.77879824				
	z4	3.743294	-4.76419	0.4186779	0	-46.6788	59.40942	-0.11453	0	42.93555	-85.8711	-31.22587234				
2da Iteracion	z1	0.988173	-1.2843	0.02128394	-0.06687	-0.02521	0.044842276	0.000992	-0.03099	0.037038	0	-1.337307323	RS2 =	0.498125	IRI =	0.488628
	z2	-0.92852	1.206761	0.9001616	-2.82807	-3.39137	6.032561207	0.062802	-1.96104	4.319885	0	2.450216817				
	z3	0.063863	-0.083	0.006615445	-0.02078	0.24029	-0.427426717	0.009863	-0.30797	0.695847	0	-0.839182429				
	z4	3.743294	-4.86503	0.4186779	-1.31537	-46.6788	83.03222063	-0.11453	3.576146	42.93555	0	80.42795737				
3ra Iteracion	z1	0.988173	-1.32149	0.02128394	0.05215	-0.02521	0.02115521	0.000992	0.07981	0.037038	0.07407694	-1.094298181	RS3 =	3.008386	IRI =	1.328547
	z2	-0.92852	1.241711	0.9001616	2.205591	-3.39137	2.845977276	0.062802	5.05101	4.319885	8.639769998	19.98405965				
	z3	0.063863	-0.0854	0.006615445	0.016209	0.24029	-0.20164681	0.009863	0.793235	0.695847	1.3916946	1.914087465				
	z4	3.743294	-5.00593	0.4186779	1.025852	-46.6788	39.17205395	-0.11453	-9.21102	42.93555	85.87109998	111.8520512				
4ta Iteracion	z1	0.988173	-1.08136	0.02128394	0.42534	-0.02521	-0.048252824	0.000992	0.110993	0.037038	0.07407694	-0.51919931	RS4 =	3.536308	IRI =	1.880488
	z2	-0.92852	1.016073	0.9001616	17.98888	-3.39137	-6.491376893	0.062802	7.024496	4.319885	8.639770002	28.17784519				
	z3	0.063863	-0.06989	0.006615445	0.132203	0.24029	0.459935311	0.009863	1.103161	0.695847	1.3916946	3.017108898				
	z4	3.743294	-4.09628	0.4186779	8.366884	-46.6788	-89.3473634	-0.11453	-12.8099	42.93555	85.87110002	-12.01552642				
5ta Iteracion	z1	0.988173	-0.51306	0.02128394	0.599736	-0.02521	-0.076059234	0.000992	-0.01192	0.037038	-0.07407694	-0.075382396	RS5 =	0.556586	IRI =	1.615707
	z2	-0.92852	0.482085	0.9001616	25.36461	-3.39137	-10.23212959	0.062802	-0.7546	4.319885	-8.63977	6.220204366				
	z3	0.063863	-0.03316	0.006615445	0.186409	0.24029	0.72497389	0.009863	-0.11851	0.695847	-1.3916946	-0.631968777				
	z4	3.743294	-1.94352	0.4186779	11.79744	-46.6788	-140.8351134	-0.11453	1.376079	42.93555	-85.8711	-215.4762086				

FIGURA 3.67: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 726m a 737m.*

N°	Dist	Cota	Y'
1	726.00	3817.622	
2	726.50	3817.621	-2.00
3	727.00	3817.619	-4.00
4	727.50	3817.620	2.00
5	728.00	3817.621	2.00
6	728.50	3817.623	4.00
7	729.00	3817.625	4.00
8	729.50	3817.630	10.00
9	730.00	3817.632	4.00
10	730.50	3817.632	0.00
11	731.00	3817.633	2.00
12	731.50	3817.632	-2.00
13	732.00	3817.631	-2.00
14	732.50	3817.632	2.00
15	733.00	3817.632	0.00
16	733.50	3817.633	2.00
17	734.00	3817.635	4.00
18	734.50	3817.636	2.00
19	735.00	3817.638	4.00
20	735.50	3817.640	4.00
21	736.00	3817.641	2.00
22	736.50	3817.643	4.00
23	737.00	3817.645	4.00

IRI 2.4259

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 2.090909091
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	2.066179	0.02128394	0	-0.02521	-0.052710375	0.000992	0	0.037038	-0.07407694	1.939391966	RS1 =	2.695131	IRI =	2.695131
	z2	-0.92852	-1.94144	0.9001616	0	-3.39137	-7.091044273	0.062802	0	4.319885	-8.63977	-17.67225682				
	z3	0.063863	0.133532	0.006615445	0	0.24029	0.502423709	0.009863	0	0.695847	-1.3916946	-0.75573862				
	z4	3.743294	7.826887	0.4186779	0	-46.6788	-97.60119	-0.11453	0	42.93555	-85.8711	-175.6454026				
2da Iteracion	z1	0.988173	1.916454	0.02128394	-0.37614	-0.02521	0.019051649	0.000992	-0.1743	0.037038	-0.14815388	1.23692088	RS2 =	5.927295	IRI =	4.311213
	z2	-0.92852	-1.80076	0.9001616	-15.9079	-3.39137	2.562988529	0.062802	-11.0308	4.319885	-17.27954	-43.45601952				
	z3	0.063863	0.123856	0.006615445	-0.11691	0.24029	-0.181596131	0.009863	-1.73233	0.695847	-2.7833892	-4.690373679				
	z4	3.743294	7.259714	0.4186779	-7.39898	-46.6788	35.27699458	-0.11453	20.11581	42.93555	-171.7422	-116.4886672				
3ra Iteracion	z1	0.988173	1.222291	0.02128394	-0.92492	-0.02521	0.118241084	0.000992	-0.11559	0.037038	0.07407694	0.374100531	RS3 =	1.466832	IRI =	3.363086
	z2	-0.92852	-1.1485	0.9001616	-39.1174	-3.39137	15.90678789	0.062802	-7.31568	4.319885	8.639770002	-23.03506583				
	z3	0.063863	0.078994	0.006615445	-0.28748	0.24029	-1.127048015	0.009863	-1.14889	0.695847	1.3916946	-1.09273097				
	z4	3.743294	4.630159	0.4186779	-18.1941	-46.6788	218.9411556	-0.11453	13.34088	42.93555	85.87110002	304.5892154				
4ta Iteracion	z1	0.988173	0.369676	0.02128394	-0.49028	-0.02521	0.027546994	0.000992	0.302249	0.037038	0.07407694	0.283271811	RS4 =	3.721421	IRI =	3.452669
	z2	-0.92852	-0.34736	0.9001616	-20.7353	-3.39137	3.705853938	0.062802	19.12871	4.319885	8.639769998	10.39169528				
	z3	0.063863	0.023891	0.006615445	-0.15239	0.24029	-0.262571888	0.009863	3.004066	0.695847	1.3916946	4.004692743				
	z4	3.743294	1.400368	0.4186779	-9.64427	-46.6788	51.0074032	-0.11453	-34.8831	42.93555	85.87109998	93.75148811				
5ta Iteracion	z1	0.988173	0.279921	0.02128394	0.221176	-0.02521	-0.100955541	0.000992	0.093031	0.037038	0.14815388	0.641327177	RS5 =	4.115825	IRI =	3.585301
	z2	-0.92852	-0.26302	0.9001616	9.354205	-3.39137	-13.58139082	0.062802	5.88775	4.319885	17.27954	18.67708184				
	z3	0.063863	0.018091	0.006615445	0.068746	0.24029	0.962286017	0.009863	0.924641	0.695847	2.7833892	4.757152494				
	z4	3.743294	1.06037	0.4186779	4.350773	-46.6788	-186.9343718	-0.11453	-10.7369	42.93555	171.7422	-20.51792749				

FIGURA 3.68: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 737m a 748m.*

N°	Dist	Cota	Y'
1	737.00	3817.645	
2	737.50	3817.645	0.00
3	738.00	3817.644	-2.00
4	738.50	3817.644	0.00
5	739.00	3817.645	2.00
6	739.50	3817.642	-6.00
7	740.00	3817.641	-2.00
8	740.50	3817.641	0.00
9	741.00	3817.640	-2.00
10	741.50	3817.639	-2.00
11	742.00	3817.638	-2.00
12	742.50	3817.639	2.00
13	743.00	3817.639	0.00
14	743.50	3817.640	2.00
15	744.00	3817.642	4.00
16	744.50	3817.642	0.00
17	745.00	3817.643	2.00
18	745.50	3817.644	2.00
19	746.00	3817.646	4.00
20	746.50	3817.649	6.00
21	747.00	3817.651	4.00
22	747.50	3817.651	0.00
23	748.00	3817.652	2.00

IRI	2.2990

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.636363636
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.628837	0.02128394	0	-0.02521	-0.016042288	0.000992	0	0.037038	0	0.612794885	RS1 =	0.419243	IRI =	0.419243
	z2	-0.92852	-0.59087	0.9001616	0	-3.39137	-2.158143909	0.062802	0	4.319885	0	-2.749017727				
	z3	0.063863	0.04064	0.006615445	0	0.24029	0.152911564	0.009863	0	0.695847	0	0.19355182				
	z4	3.743294	2.382096	0.4186779	0	-46.6788	-29.70471	-0.11453	0	42.93555	0	-27.32261382				
2da Iteracion	z1	0.988173	0.605547	0.02128394	-0.05851	-0.02521	-0.004879308	0.000992	-0.02711	0.037038	-0.07407694	0.440968319	RS2 =	2.03468	IRI =	1.226961
	z2	-0.92852	-0.56899	0.9001616	-2.47456	-3.39137	-0.656405642	0.062802	-1.71591	4.319885	-8.63977	-14.05563147				
	z3	0.063863	0.039135	0.006615445	-0.01819	0.24029	0.046508489	0.009863	-0.26947	0.695847	-1.3916946	-1.593711204				
	z4	3.743294	2.293871	0.4186779	-1.15095	-46.6788	-9.034772502	-0.11453	3.129125	42.93555	-85.8711	-90.63382896				
3ra Iteracion	z1	0.988173	0.435753	0.02128394	-0.29916	-0.02521	0.04017636	0.000992	-0.08994	0.037038	0	0.086832553	RS3 =	1.4285	IRI =	1.294141
	z2	-0.92852	-0.40945	0.9001616	-12.6523	-3.39137	5.404862771	0.062802	-5.69196	4.319885	0	-13.3488789				
	z3	0.063863	0.028162	0.006615445	-0.09298	0.24029	-0.382952228	0.009863	-0.89389	0.695847	0	-1.341667262				
	z4	3.743294	1.650674	0.4186779	-5.88478	-46.6788	74.39257434	-0.11453	10.37985	42.93555	0	80.53831446				
4ta Iteracion	z1	0.988173	0.085806	0.02128394	-0.28412	-0.02521	0.033822506	0.000992	0.079919	0.037038	0.07407694	-0.010492235	RS4 =	1.791358	IRI =	1.418445
	z2	-0.92852	-0.08063	0.9001616	-12.0161	-3.39137	4.550088762	0.062802	5.057941	4.319885	8.639769998	6.151025806				
	z3	0.063863	0.005545	0.006615445	-0.08831	0.24029	-0.32238869	0.009863	0.794324	0.695847	1.3916946	1.780866169				
	z4	3.743294	0.32504	0.4186779	-5.58888	-46.6788	62.62745805	-0.11453	-9.22366	42.93555	85.87109998	134.0110587				
5ta Iteracion	z1	0.988173	-0.01037	0.02128394	0.130918	-0.02521	-0.044894407	0.000992	0.132981	0.037038	-0.22223082	-0.013593918	RS5 =	2.371836	IRI =	1.609123
	z2	-0.92852	0.009742	0.9001616	5.536917	-3.39137	-6.039574319	0.062802	8.416118	4.319885	-25.91931	-17.99610659				
	z3	0.063863	-0.00067	0.006615445	0.040692	0.24029	0.427923619	0.009863	1.321708	0.695847	-4.1750838	-2.385430287				
	z4	3.743294	-0.03928	0.4186779	2.575299	-46.6788	-83.12874915	-0.11453	-15.3476	42.93555	-257.6133	-353.553656				

FIGURA 3.69: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 748m a 759m.*

N°	Dist	Cota	Y'
1	748.00	3817.652	
2	748.50	3817.653	2.00
3	749.00	3817.655	4.00
4	749.50	3817.656	2.00
5	750.00	3817.657	2.00
6	750.50	3817.659	4.00
7	751.00	3817.661	4.00
8	751.50	3817.662	2.00
9	752.00	3817.664	4.00
10	752.50	3817.666	4.00
11	753.00	3817.668	4.00
12	753.50	3817.669	2.00
13	754.00	3817.670	2.00
14	754.50	3817.671	2.00
15	755.00	3817.672	2.00
16	755.50	3817.672	0.00
17	756.00	3817.673	2.00
18	756.50	3817.672	-2.00
19	757.00	3817.672	0.00
20	757.50	3817.672	0.00
21	758.00	3817.672	0.00
22	758.50	3817.670	-4.00
23	759.00	3817.668	-4.00

IRI | **1.6844**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 1.454545455
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	1.437342	0.02128394	0	-0.02521	-0.036668087	0.000992	0	0.037038	0.07407694	1.474750962	RS1 =	0.359348	IRI =	0.359348
	z2	-0.92852	-1.35057	0.9001616	0	-3.39137	-4.932900364	0.062802	0	4.319885	8.639770002	2.356300911				
	z3	0.063863	0.092892	0.006615445	0	0.24029	0.349512145	0.009863	0	0.695847	1.3916946	1.83409876				
	z4	3.743294	5.444791	0.4186779	0	-46.6788	-67.89648	-0.11453	0	42.93555	85.87110002	23.41941129				
2da Iteracion	z1	0.988173	1.457309	0.02128394	0.050151	-0.02521	-0.046236364	0.000992	0.023239	0.037038	0.14815388	1.632616931	RS2 =	1.932236	IRI =	1.145792
	z2	-0.92852	-1.36933	0.9001616	2.121052	-3.39137	-6.220105679	0.062802	1.470778	4.319885	17.27954	13.28193419				
	z3	0.063863	0.094182	0.006615445	0.015588	0.24029	0.440714857	0.009863	0.230978	0.695847	2.7833892	3.5648526				
	z4	3.743294	5.520426	0.4186779	0.986531	-46.6788	-85.61358423	-0.11453	-2.68211	42.93555	171.7422	89.95346289				
3ra Iteracion	z1	0.988173	1.613308	0.02128394	0.282692	-0.02521	-0.089867474	0.000992	0.089262	0.037038	0.07407694	1.969471202	RS3 =	1.358133	IRI =	1.216572
	z2	-0.92852	-1.51591	0.9001616	11.95589	-3.39137	-12.0897306	0.062802	5.649228	4.319885	8.639769998	12.63924323				
	z3	0.063863	0.104264	0.006615445	0.087866	0.24029	0.856597005	0.009863	0.887182	0.695847	1.3916946	3.327603973				
	z4	3.743294	6.111365	0.4186779	5.560852	-46.6788	-166.4031485	-0.11453	-10.3019	42.93555	85.87109998	-79.16176014				
4ta Iteracion	z1	0.988173	1.946178	0.02128394	0.269013	-0.02521	-0.0838866	0.000992	-0.07855	0.037038	0.07407694	2.126827389	RS4 =	0.5069	IRI =	1.039154
	z2	-0.92852	-1.82869	0.9001616	11.37736	-3.39137	-11.28513296	0.062802	-4.97149	4.319885	8.639770002	1.931822193				
	z3	0.063863	0.125777	0.006615445	0.083614	0.24029	0.799588628	0.009863	-0.78075	0.695847	1.3916946	1.619927189				
	z4	3.743294	7.37231	0.4186779	5.291772	-46.6788	-155.3286602	-0.11453	9.066008	42.93555	85.87110002	-47.7274701				
5ta Iteracion	z1	0.988173	2.101673	0.02128394	0.041117	-0.02521	-0.040837247	0.000992	-0.04736	0.037038	0.14815388	2.202745428	RS5 =	0.647781	IRI =	0.960879
	z2	-0.92852	-1.97479	0.9001616	1.738952	-3.39137	-5.493770852	0.062802	-2.99736	4.319885	17.27954	8.552563218				
	z3	0.063863	0.135826	0.006615445	0.01278	0.24029	0.389251656	0.009863	-0.47072	0.695847	2.7833892	2.850526085				
	z4	3.743294	7.96134	0.4186779	0.808811	-46.6788	-75.61630588	-0.11453	5.465993	42.93555	171.7422	110.3620389				

FIGURA 3.70: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 759m a 770m.*

N°	Dist	Cota	Y'
1	759.00	3817.668	
2	759.50	3817.668	0.00
3	760.00	3817.667	-2.00
4	760.50	3817.666	-2.00
5	761.00	3817.664	-4.00
6	761.50	3817.663	-2.00
7	762.00	3817.662	-2.00
8	762.50	3817.661	-2.00
9	763.00	3817.659	-4.00
10	763.50	3817.659	0.00
11	764.00	3817.658	-2.00
12	764.50	3817.659	2.00
13	765.00	3817.659	0.00
14	765.50	3817.657	-4.00
15	766.00	3817.655	-4.00
16	766.50	3817.657	4.00
17	767.00	3817.658	2.00
18	767.50	3817.660	4.00
19	768.00	3817.662	4.00
20	768.50	3817.662	0.00
21	769.00	3817.661	-2.00
22	769.50	3817.661	0.00
23	770.00	3817.660	-2.00

IRI **2.0846**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.72727273
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.71867	0.02128394	0	-0.02521	0.018334044	0.000992	0	0.037038	0	-0.700337011	RS1 =	0.479135	IRI =	0.479135
	z2	-0.92852	0.675284	0.9001616	0	-3.39137	2.466450182	0.062802	0	4.319885	0	3.141734545				
	z3	0.063863	-0.04645	0.006615445	0	0.24029	-0.174756073	0.009863	0	0.695847	0	-0.22120208				
	z4	3.743294	-2.7224	0.4186779	0	-46.6788	33.94824	-0.11453	0	42.93555	0	31.22584436				
2da Iteracion	z1	0.988173	-0.69205	0.02128394	0.066868	-0.02521	0.005576352	0.000992	0.030986	0.037038	-0.07407694	-0.662700093	RS2 =	0.498118	IRI =	0.488627
	z2	-0.92852	0.650274	0.9001616	2.828069	-3.39137	0.750177877	0.062802	1.961035	4.319885	-8.63977	-2.450214037				
	z3	0.063863	-0.04473	0.006615445	0.020784	0.24029	-0.053152559	0.009863	0.307971	0.695847	-1.3916946	-1.160818481				
	z4	3.743294	-2.62157	0.4186779	1.315375	-46.6788	10.32545429	-0.11453	-3.57614	42.93555	-85.8711	-80.42798119				
3ra Iteracion	z1	0.988173	-0.65486	0.02128394	-0.05215	-0.02521	0.029263433	0.000992	-0.07981	0.037038	-0.07407694	-0.831635869	RS3 =	1.690758	IRI =	0.889337
	z2	-0.92852	0.615328	0.9001616	-2.20559	-3.39137	3.936763813	0.062802	-5.05101	4.319885	-8.63977	-11.34427867				
	z3	0.063863	-0.04232	0.006615445	-0.01621	0.24029	-0.278932609	0.009863	-0.79324	0.695847	-1.3916946	-2.522394094				
	z4	3.743294	-2.48068	0.4186779	-1.02585	-46.6788	54.18564856	-0.11453	9.211023	42.93555	-85.8711	-25.98096058				
4ta Iteracion	z1	0.988173	-0.8218	0.02128394	-0.24145	-0.02521	0.063587815	0.000992	-0.02578	0.037038	-0.14815388	-1.173598209	RS4 =	2.600296	IRI =	1.317077
	z2	-0.92852	0.772187	0.9001616	-10.2117	-3.39137	8.554369137	0.062802	-1.63165	4.319885	-17.27954	-19.7963154				
	z3	0.063863	-0.05311	0.006615445	-0.07505	0.24029	-0.606105068	0.009863	-0.25624	0.695847	-2.7833892	-3.773894597				
	z4	3.743294	-3.11306	0.4186779	-4.7496	-46.6788	117.7424051	-0.11453	2.975472	42.93555	-171.7422	-58.88697909				
5ta Iteracion	z1	0.988173	-1.15972	0.02128394	-0.42134	-0.02521	0.095137279	0.000992	-0.05843	0.037038	-0.07407694	-1.618435483	RS5 =	1.466781	IRI =	1.347018
	z2	-0.92852	1.089705	0.9001616	-17.8199	-3.39137	12.79866915	0.062802	-3.6982	4.319885	-8.63977	-16.26947971				
	z3	0.063863	-0.07495	0.006615445	-0.13096	0.24029	-0.906827623	0.009863	-0.58078	0.695847	-1.3916946	-3.085216898				
	z4	3.743294	-4.39312	0.4186779	-8.28828	-46.6788	176.1609844	-0.11453	6.744037	42.93555	-85.8711	84.35251861				

FIGURA 3.71: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 770m a 781m.*

N°	Dist	Cota	Y'
1	770.00	3817.660	
2	770.50	3817.660	0.00
3	771.00	3817.659	-2.00
4	771.50	3817.660	2.00
5	772.00	3817.660	0.00
6	772.50	3817.660	0.00
7	773.00	3817.660	0.00
8	773.50	3817.660	0.00
9	774.00	3817.659	-2.00
10	774.50	3817.658	-2.00
11	775.00	3817.657	-2.00
12	775.50	3817.656	-2.00
13	776.00	3817.654	-4.00
14	776.50	3817.654	0.00
15	777.00	3817.653	-2.00
16	777.50	3817.653	0.00
17	778.00	3817.652	-2.00
18	778.50	3817.653	2.00
19	779.00	3817.654	2.00
20	779.50	3817.653	-2.00
21	780.00	3817.653	0.00
22	780.50	3817.655	4.00
23	781.00	3817.656	2.00

IRI **1.4382**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.36363636
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.35934	0.02128394	0	-0.02521	0.009167022	0.000992	0	0.037038	0	-0.350168505	RS1 =	0.239567	IRI =	0.239567
	z2	-0.92852	0.337642	0.9001616	0	-3.39137	1.233225091	0.062802	0	4.319885	0	1.570867273				
	z3	0.063863	-0.02322	0.006615445	0	0.24029	-0.087378036	0.009863	0	0.695847	0	-0.11060104				
	z4	3.743294	-1.3612	0.4186779	0	-46.6788	16.97412	-0.11453	0	42.93555	0	15.61292218				
2da Iteracion	z1	0.988173	-0.34603	0.02128394	0.033434	-0.02521	0.002788176	0.000992	0.015493	0.037038	-0.07407694	-0.368388517	RS2 =	0.907868	IRI =	0.573718
	z2	-0.92852	0.325137	0.9001616	1.414034	-3.39137	0.375088938	0.062802	0.980518	4.319885	-8.63977	-5.544992019				
	z3	0.063863	-0.02236	0.006615445	0.010392	0.24029	-0.02657628	0.009863	0.153985	0.695847	-1.3916946	-1.276256541				
	z4	3.743294	-1.31078	0.4186779	0.657687	-46.6788	5.162727144	-0.11453	-1.78807	42.93555	-85.8711	-83.1495406				
3ra Iteracion	z1	0.988173	-0.36403	0.02128394	-0.11802	-0.02521	0.032173547	0.000992	-0.08251	0.037038	0.07407694	-0.458310927	RS3 =	0.663048	IRI =	0.603494
	z2	-0.92852	0.342055	0.9001616	-4.99139	-3.39137	4.328256869	0.062802	-5.22193	4.319885	8.639770002	3.096762605				
	z3	0.063863	-0.02353	0.006615445	-0.03668	0.24029	-0.306671174	0.009863	-0.82008	0.695847	1.3916946	0.204737034				
	z4	3.743294	-1.37899	0.4186779	-2.32157	-46.6788	59.57416211	-0.11453	9.522709	42.93555	85.87110002	151.2674194				
4ta Iteracion	z1	0.988173	-0.45289	0.02128394	0.065911	-0.02521	-0.005161279	0.000992	0.150105	0.037038	0	-0.24203516	RS4 =	1.774351	IRI =	0.896209
	z2	-0.92852	0.425549	0.9001616	2.787587	-3.39137	-0.694338831	0.062802	9.499847	4.319885	0	12.01864354				
	z3	0.063863	-0.02927	0.006615445	0.020486	0.24029	0.04919618	0.009863	1.491902	0.695847	0	1.532315565				
	z4	3.743294	-1.71559	0.4186779	1.296546	-46.6788	-9.556885211	-0.11453	-17.3239	42.93555	0	-27.29384803				
5ta Iteracion	z1	0.988173	-0.23917	0.02128394	0.255804	-0.02521	-0.038628618	0.000992	-0.02709	0.037038	0	-0.049087157	RS5 =	0.212089	IRI =	0.759385
	z2	-0.92852	0.224734	0.9001616	10.81872	-3.39137	-5.196647506	0.062802	-1.71448	4.319885	0	4.132331361				
	z3	0.063863	-0.01546	0.006615445	0.079509	0.24029	0.368199494	0.009863	-0.26925	0.695847	0	0.16300135				
	z4	3.743294	-0.90601	0.4186779	5.03194	-46.6788	-71.52669777	-0.11453	3.126518	42.93555	0	-64.27424827				

FIGURA 3.72: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 781m a 792m.*

N°	Dist	Cota	Y'
1	781.00	3817.656	
2	781.50	3817.657	2.00
3	782.00	3817.658	2.00
4	782.50	3817.658	0.00
5	783.00	3817.659	2.00
6	783.50	3817.659	0.00
7	784.00	3817.659	0.00
8	784.50	3817.660	2.00
9	785.00	3817.660	0.00
10	785.50	3817.660	0.00
11	786.00	3817.661	2.00
12	786.50	3817.660	-2.00
13	787.00	3817.659	-2.00
14	787.50	3817.659	0.00
15	788.00	3817.658	-2.00
16	788.50	3817.658	0.00
17	789.00	3817.657	-2.00
18	789.50	3817.656	-2.00
19	790.00	3817.655	-2.00
20	790.50	3817.655	0.00
21	791.00	3817.655	0.00
22	791.50	3817.654	-2.00
23	792.00	3817.653	-2.00

IRI	1.0179

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.27272727
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.2695	0.02128394	0	-0.02521	0.006875266	0.000992	0	0.037038	0.07407694	-0.188549439	RS1 =	1.497293	IRI =	1.497293
	z2	-0.92852	0.253232	0.9001616	0	-3.39137	0.924918818	0.062802	0	4.319885	8.639770002	9.817920456				
	z3	0.063863	-0.01742	0.006615445	0	0.24029	-0.065533527	0.009863	0	0.695847	1.3916946	1.30874382				
	z4	3.743294	-1.0209	0.4186779	0	-46.6788	12.73059	-0.11453	0	42.93555	85.87110002	97.58079165				
2da Iteracion	z1	0.988173	-0.18632	0.02128394	0.208964	-0.02521	-0.032992529	0.000992	0.096831	0.037038	0.07407694	0.160560063	RS2 =	2.560929	IRI =	2.029111
	z2	-0.92852	0.175071	0.9001616	8.837715	-3.39137	-4.438433221	0.062802	6.128237	4.319885	8.639769998	19.34235961				
	z3	0.063863	-0.01204	0.006615445	0.06495	0.24029	0.314477529	0.009863	0.962408	0.695847	1.3916946	2.721488782				
	z4	3.743294	-0.7058	0.4186779	4.110546	-46.6788	-61.0906303	-0.11453	-11.1754	42.93555	85.87109998	17.00977009				
3ra Iteracion	z1	0.988173	0.158661	0.02128394	0.411682	-0.02521	-0.068606854	0.000992	0.016879	0.037038	0	0.518614913	RS3 =	0.441305	IRI =	1.439842
	z2	-0.92852	-0.14908	0.9001616	17.41125	-3.39137	-9.229572689	0.062802	1.068242	4.319885	0	9.100836066				
	z3	0.063863	0.010254	0.006615445	0.127958	0.24029	0.653945451	0.009863	0.167762	0.695847	0	0.959319575				
	z4	3.743294	0.601024	0.4186779	8.098219	-46.6788	-127.0359122	-0.11453	-1.94805	42.93555	0	-120.2847158				
4ta Iteracion	z1	0.988173	0.512481	0.02128394	0.193702	-0.02521	-0.02419891	0.000992	-0.11936	0.037038	0.07407694	0.636700269	RS4 =	0.10735	IRI =	1.151719
	z2	-0.92852	-0.48154	0.9001616	8.192223	-3.39137	-3.25544149	0.062802	-7.55408	4.319885	8.639770002	5.540928394				
	z3	0.063863	0.03312	0.006615445	0.060206	0.24029	0.230658691	0.009863	-1.18633	0.695847	1.3916946	0.52935015				
	z4	3.743294	1.941328	0.4186779	3.810319	-46.6788	-44.80792267	-0.11453	13.77562	42.93555	85.87110002	60.59044348				
5ta Iteracion	z1	0.988173	0.62917	0.02128394	0.117933	-0.02521	-0.013344552	0.000992	0.060125	0.037038	0	0.793882957	RS5 =	0.008216	IRI =	0.923019
	z2	-0.92852	-0.59119	0.9001616	4.987731	-3.39137	-1.795221688	0.062802	3.805181	4.319885	0	6.40650393				
	z3	0.063863	0.040662	0.006615445	0.036656	0.24029	0.127197336	0.009863	0.597584	0.695847	0	0.802098953				
	z4	3.743294	2.383356	0.4186779	2.319864	-46.6788	-24.70944565	-0.11453	-6.93913	42.93555	0	-26.94535169				

FIGURA 3.73: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 792m a 803m.*

N°	Dist	Cota	Y'
1	792.00	3817.653	
2	792.50	3817.652	-2.00
3	793.00	3817.652	0.00
4	793.50	3817.650	-4.00
5	794.00	3817.648	-4.00
6	794.50	3817.649	2.00
7	795.00	3817.649	0.00
8	795.50	3817.649	0.00
9	796.00	3817.650	2.00
10	796.50	3817.649	-2.00
11	797.00	3817.649	0.00
12	797.50	3817.649	0.00
13	798.00	3817.649	0.00
14	798.50	3817.648	-2.00
15	799.00	3817.647	-2.00
16	799.50	3817.647	0.00
17	800.00	3817.647	0.00
18	800.50	3817.646	-2.00
19	801.00	3817.645	-2.00
20	801.50	3817.644	-2.00
21	802.00	3817.644	0.00
22	802.50	3817.643	-2.00
23	803.00	3817.642	-2.00

IRI **1.2484**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.98817	0.02128394	0	-0.02521	0.02520931	0.000992	0	0.037038	-0.07407694	-1.03704033	RS1 =	0.658807	IRI =	0.658807
	z2	-0.92852	0.928516	0.9001616	0	-3.39137	3.391369	0.062802	0	4.319885	-8.63977	-4.319885002				
	z3	0.063863	-0.06386	0.006615445	0	0.24029	-0.2402896	0.009863	0	0.695847	-1.3916946	-1.69584746				
	z4	3.743294	-3.74329	0.4186779	0	-46.6788	46.67883	-0.11453	0	42.93555	-85.8711	-42.93556402				
2da Iteracion	z1	0.988173	-1.02477	0.02128394	-0.09194	-0.02521	0.042751144	0.000992	-0.04261	0.037038	0	-1.11657364	RS2 =	0.190813	IRI =	0.42481
	z2	-0.92852	0.962909	0.9001616	-3.88859	-3.39137	5.751244506	0.062802	-2.69643	4.319885	0	0.129133327				
	z3	0.063863	-0.06623	0.006615445	-0.02858	0.24029	-0.407494508	0.009863	-0.42346	0.695847	0	-0.925760974				
	z4	3.743294	-3.88195	0.4186779	-1.80864	-46.6788	79.16017531	-0.11453	4.9172	42.93555	0	78.38678784				
3ra Iteracion	z1	0.988173	-1.10337	0.02128394	0.002748	-0.02521	0.023337795	0.000992	0.077785	0.037038	-0.14815388	-1.147650705	RS3 =	1.155539	IRI =	0.668386
	z2	-0.92852	1.036756	0.9001616	0.116241	-3.39137	3.13959707	0.062802	4.922821	4.319885	-17.27954	-8.064124395				
	z3	0.063863	-0.07131	0.006615445	0.000854	0.24029	-0.222450734	0.009863	0.773104	0.695847	-2.7833892	-2.303189888				
	z4	3.743294	-4.17966	0.4186779	0.054065	-46.6788	43.21343914	-0.11453	-8.97725	42.93555	-171.7422	-141.6316137				
4ta Iteracion	z1	0.988173	-1.13408	0.02128394	-0.17164	-0.02521	0.058061828	0.000992	-0.14054	0.037038	-0.14815388	-1.536348875	RS4 =	3.323981	IRI =	1.332285
	z2	-0.92852	1.065612	0.9001616	-7.25902	-3.39137	7.810966786	0.062802	-8.8947	4.319885	-17.27954	-24.55667816				
	z3	0.063863	-0.07329	0.006615445	-0.05335	0.24029	-0.553432577	0.009863	-1.39687	0.695847	-2.7833892	-4.860329547				
	z4	3.743294	-4.29599	0.4186779	-3.37627	-46.6788	107.5102092	-0.11453	16.22037	42.93555	-171.7422	-55.68388071				
5ta Iteracion	z1	0.988173	-1.51818	0.02128394	-0.52266	-0.02521	0.122525554	0.000992	-0.05526	0.037038	0.07407694	-1.893494419	RS5 =	1.31354	IRI =	1.328536
	z2	-0.92852	1.426525	0.9001616	-22.105	-3.39137	16.48317096	0.062802	-3.49704	4.319885	8.639770002	0.947446071				
	z3	0.063863	-0.09812	0.006615445	-0.16245	0.24029	-1.167886643	0.009863	-0.54919	0.695847	1.3916946	-0.58595394				
	z4	3.743294	-5.75101	0.4186779	-10.2813	-46.6788	226.8744967	-0.11453	6.377202	42.93555	85.87110002	303.0904547				

FIGURA 3.74: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 803m a 814m.*

N°	Dist	Cota	Y'
1	803.00	3817.642	
2	803.50	3817.641	-2.00
3	804.00	3817.640	-2.00
4	804.50	3817.639	-2.00
5	805.00	3817.637	-4.00
6	805.50	3817.638	2.00
7	806.00	3817.638	0.00
8	806.50	3817.637	-2.00
9	807.00	3817.637	0.00
10	807.50	3817.637	0.00
11	808.00	3817.637	0.00
12	808.50	3817.638	2.00
13	809.00	3817.638	0.00
14	809.50	3817.637	-2.00
15	810.00	3817.637	0.00
16	810.50	3817.636	-2.00
17	811.00	3817.635	-2.00
18	811.50	3817.634	-2.00
19	812.00	3817.632	-4.00
20	812.50	3817.632	0.00
21	813.00	3817.631	-2.00
22	813.50	3817.631	0.00
23	814.00	3817.631	0.00

IRI	1.2972

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.98817	0.02128394	0	-0.02521	0.02520931	0.000992	0	0.037038	-0.07407694	-1.03704033	RS1 =	0.658807	IRI =	0.658807
	z2	-0.92852	0.928516	0.9001616	0	-3.39137	3.391369	0.062802	0	4.319885	-8.63977	-4.319885002				
	z3	0.063863	-0.06386	0.006615445	0	0.24029	-0.2402896	0.009863	0	0.695847	-1.3916946	-1.69584746				
	z4	3.743294	-3.74329	0.4186779	0	-46.6788	46.67883	-0.11453	0	42.93555	-85.8711	-42.93556402				
2da Iteracion	z1	0.988173	-1.02477	0.02128394	-0.09194	-0.02521	0.042751144	0.000992	-0.04261	0.037038	-0.07407694	-1.19065058	RS2 =	1.126805	IRI =	0.892806
	z2	-0.92852	0.962909	0.9001616	-3.88859	-3.39137	5.751244506	0.062802	-2.69643	4.319885	-8.63977	-8.510636671				
	z3	0.063863	-0.06623	0.006615445	-0.02858	0.24029	-0.407494508	0.009863	-0.42346	0.695847	-1.3916946	-2.317455574				
	z4	3.743294	-3.88195	0.4186779	-1.80864	-46.6788	79.1601753	-0.11453	4.9172	42.93555	-85.8711	-7.484312137				
3ra Iteracion	z1	0.988173	-1.17657	0.02128394	-0.18114	-0.02521	0.058421456	0.000992	-0.00743	0.037038	-0.07407694	-1.380790569	RS3 =	0.77392	IRI =	0.853177
	z2	-0.92852	1.105538	0.9001616	-7.66095	-3.39137	7.859346992	0.062802	-0.47003	4.319885	-8.63977	-7.805860519				
	z3	0.063863	-0.07604	0.006615445	-0.0563	0.24029	-0.556860473	0.009863	-0.07382	0.695847	-1.3916946	-2.154710925				
	z4	3.743294	-4.45696	0.4186779	-3.56322	-46.6788	108.1761148	-0.11453	0.857142	42.93555	-85.8711	15.14198568				
4ta Iteracion	z1	0.988173	-1.36446	0.02128394	-0.16614	-0.02521	0.054318776	0.000992	0.015026	0.037038	-0.14815388	-1.609408474	RS4 =	1.682216	IRI =	1.060437
	z2	-0.92852	1.282086	0.9001616	-7.02654	-3.39137	7.307419836	0.062802	0.950942	4.319885	-17.27954	-14.76562793				
	z3	0.063863	-0.08818	0.006615445	-0.05164	0.24029	-0.517754626	0.009863	0.149341	0.695847	-2.7833892	-3.291624295				
	z4	3.743294	-5.16871	0.4186779	-3.26814	-46.6788	100.579385	-0.11453	-1.73414	42.93555	-171.7422	-81.33379879				
5ta Iteracion	z1	0.988173	-1.59037	0.02128394	-0.31427	-0.02521	0.082979577	0.000992	-0.08071	0.037038	0.07407694	-1.82829661	RS5 =	1.426416	IRI =	1.133633
	z2	-0.92852	1.494362	0.9001616	-13.2915	-3.39137	11.16311259	0.062802	-5.1079	4.319885	8.639770002	2.897894457				
	z3	0.063863	-0.10278	0.006615445	-0.09768	0.24029	-0.790943085	0.009863	-0.80217	0.695847	1.3916946	-0.401880987				
	z4	3.743294	-6.02449	0.4186779	-6.18204	-46.6788	153.6491709	-0.11453	9.314761	42.93555	85.87110002	236.6285012				

FIGURA 3.75: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 814m a 825m.*

N°	Dist	Cota	Y'
1	814.00	3817.631	
2	814.50	3817.631	0.00
3	815.00	3817.630	-2.00
4	815.50	3817.630	0.00
5	816.00	3817.629	-2.00
6	816.50	3817.629	0.00
7	817.00	3817.628	-2.00
8	817.50	3817.628	0.00
9	818.00	3817.628	0.00
10	818.50	3817.627	-2.00
11	819.00	3817.627	0.00
12	819.50	3817.626	-2.00
13	820.00	3817.625	-2.00
14	820.50	3817.624	-2.00
15	821.00	3817.623	-2.00
16	821.50	3817.621	-4.00
17	822.00	3817.618	-6.00
18	822.50	3817.614	-8.00
19	823.00	3817.612	-4.00
20	823.50	3817.611	-2.00
21	824.00	3817.609	-4.00
22	824.50	3817.607	-4.00
23	825.00	3817.604	-6.00

IRI	1.6000

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.45454545
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.42551	0.02128394	0	-0.02521	0.061877397	0.000992	0	0.037038	0	-2.363637412	RS1 =	1.61708	IRI =	1.61708
	z2	-0.92852	2.279085	0.9001616	0	-3.39137	8.324269364	0.062802	0	4.319885	0	10.60335409				
	z3	0.063863	-0.15676	0.006615445	0	0.24029	-0.589801745	0.009863	0	0.695847	0	-0.74655702				
	z4	3.743294	-9.18809	0.4186779	0	-46.6788	114.57531	-0.11453	0	42.93555	0	105.3872247				
2da Iteracion	z1	0.988173	-2.33568	0.02128394	0.225681	-0.02521	0.018820187	0.000992	0.104577	0.037038	-0.07407694	-2.060680081	RS2 =	1.448192	IRI =	1.532636
	z2	-0.92852	2.194675	0.9001616	9.544732	-3.39137	2.531850334	0.062802	6.618494	4.319885	-8.63977	12.24998138				
	z3	0.063863	-0.15095	0.006615445	0.070146	0.24029	-0.179389888	0.009863	1.0394	0.695847	-1.3916946	-0.612487699				
	z4	3.743294	-8.84779	0.4186779	4.43939	-46.6788	34.84840822	-0.11453	-12.0695	42.93555	-85.8711	-67.50057396				
3ra Iteracion	z1	0.988173	-2.03631	0.02128394	0.260728	-0.02521	0.015440392	0.000992	-0.06698	0.037038	0	-1.827121472	RS3 =	0.963648	IRI =	1.342974
	z2	-0.92852	1.913374	0.9001616	11.02696	-3.39137	2.077171796	0.062802	-4.23915	4.319885	0	10.77836029				
	z3	0.063863	-0.1316	0.006615445	0.081039	0.24029	-0.147174424	0.009863	-0.66574	0.695847	0	-0.863473655				
	z4	3.743294	-7.71373	0.4186779	5.128796	-46.6788	28.59020919	-0.11453	7.73051	42.93555	0	33.73578427				
4ta Iteracion	z1	0.988173	-1.80551	0.02128394	0.229406	-0.02521	0.021767575	0.000992	0.033477	0.037038	-0.07407694	-1.594938374	RS4 =	0.283103	IRI =	1.078006
	z2	-0.92852	1.696512	0.9001616	9.702266	-3.39137	2.928357785	0.062802	2.118664	4.319885	-8.63977	7.806028944				
	z3	0.063863	-0.11669	0.006615445	0.071304	0.24029	-0.207483739	0.009863	0.332725	0.695847	-1.3916946	-1.311835378				
	z4	3.743294	-6.83945	0.4186779	4.512661	-46.6788	40.30593994	-0.11453	-3.86359	42.93555	-85.8711	-51.75554569				
5ta Iteracion	z1	0.988173	-1.57607	0.02128394	0.166143	-0.02521	0.033070465	0.000992	-0.05136	0.037038	0	-1.428218925	RS5 =	0.552333	IRI =	0.972871
	z2	-0.92852	1.480926	0.9001616	7.026688	-3.39137	4.448317834	0.062802	-3.25033	4.319885	0	9.706196436				
	z3	0.063863	-0.10186	0.006615445	0.05164	0.24029	-0.315220398	0.009863	-0.51045	0.695847	0	-0.875886393				
	z4	3.743294	-5.97032	0.4186779	3.268212	-46.6788	61.2349406	-0.11453	5.927309	42.93555	0	64.4601382				

FIGURA 3.76: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 825m a 836m.*

N°	Dist	Cota	Y'
1	825.00	3817.604	
2	825.50	3817.604	0.00
3	826.00	3817.603	-2.00
4	826.50	3817.604	2.00
5	827.00	3817.605	2.00
6	827.50	3817.603	-4.00
7	828.00	3817.599	-8.00
8	828.50	3817.595	-8.00
9	829.00	3817.593	-4.00
10	829.50	3817.594	2.00
11	830.00	3817.592	-4.00
12	830.50	3817.589	-6.00
13	831.00	3817.587	-4.00
14	831.50	3817.586	-2.00
15	832.00	3817.585	-2.00
16	832.50	3817.583	-4.00
17	833.00	3817.582	-2.00
18	833.50	3817.581	-2.00
19	834.00	3817.579	-4.00
20	834.50	3817.577	-4.00
21	835.00	3817.574	-6.00
22	835.50	3817.573	-2.00
23	836.00	3817.572	-2.00

IRI | **2.6751**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -2.90909091
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.87468	0.02128394	0	-0.02521	0.073336175	0.000932	0	0.037038	0	-2.801348044	RS1 =	1.91654	IRI =	1.91654
	z2	-0.92852	2.701137	0.9001616	0	-3.39137	9.865800727	0.062802	0	4.319885	0	12.56693818				
	z3	0.063863	-0.18578	0.006615445	0	0.24029	-0.699024291	0.009863	0	0.695847	0	-0.88480832				
	z4	3.743294	-10.8896	0.4186779	0	-46.6788	135.79296	-0.11453	0	42.93555	0	124.9033775				
2da Iteracion	z1	0.988173	-2.76822	0.02128394	0.267474	-0.02521	0.022305407	0.000932	0.123944	0.037038	-0.07407694	-2.428569552	RS2 =	1.960379	IRI =	1.93846
	z2	-0.92852	2.601096	0.9001616	11.31228	-3.39137	3.000711507	0.062802	7.844141	4.319885	-8.63977	16.11845386				
	z3	0.063863	-0.1789	0.006615445	0.083136	0.24029	-0.212610237	0.009863	1.231882	0.695847	-1.3916946	-0.468190124				
	z4	3.743294	-10.4863	0.4186779	5.261499	-46.6788	41.30181715	-0.11453	-14.3046	42.93555	-85.8711	-64.09862466				
3ra Iteracion	z1	0.988173	-2.39985	0.02128394	0.343064	-0.02521	0.01180275	0.000932	-0.06361	0.037038	0.07407694	-2.034508359	RS3 =	2.633052	IRI =	2.16999
	z2	-0.92852	2.254966	0.9001616	14.50921	-3.39137	1.587805474	0.062802	-4.0255	4.319885	8.639769998	22.9662537				
	z3	0.063863	-0.1551	0.006615445	0.106631	0.24029	-0.112501218	0.009863	-0.63218	0.695847	1.3916946	0.598543535				
	z4	3.743294	-9.09085	0.4186779	6.74844	-46.6788	21.85456722	-0.11453	7.340901	42.93555	85.87109998	112.7241592				
4ta Iteracion	z1	0.988173	-2.01045	0.02128394	0.488812	-0.02521	-0.01508887	0.000932	0.111858	0.037038	0.07407694	-1.350787139	RS4 =	4.020069	IRI =	2.63251
	z2	-0.92852	1.889074	0.9001616	20.67334	-3.39137	-2.029881989	0.062802	7.079265	4.319885	8.639770002	36.2515667				
	z3	0.063863	-0.12993	0.006615445	0.151932	0.24029	0.143823787	0.009863	1.111762	0.695847	1.3916946	2.669282349				
	z4	3.743294	-7.61576	0.4186779	9.615463	-46.6788	-27.93931191	-0.11453	-12.9097	42.93555	85.87110002	47.02174244				
5ta Iteracion	z1	0.988173	-1.33481	0.02128394	0.771576	-0.02521	-0.067290766	0.000932	0.04666	0.037038	-0.14815388	-0.732018999	RS5 =	0.792654	IRI =	2.264539
	z2	-0.92852	1.254227	0.9001616	32.63227	-3.39137	-9.052521411	0.062802	2.953044	4.319885	-17.27954	10.5074783				
	z3	0.063863	-0.08627	0.006615445	0.23982	0.24029	0.641400788	0.009863	0.46376	0.695847	-2.7833892	-1.524673438				
	z4	3.743294	-5.05639	0.4186779	15.17773	-46.6788	-124.598977	-0.11453	-5.38517	42.93555	-171.7422	-291.6050103				

FIGURA 3.77: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 836m a 847m.*

N°	Dist	Cota	Y'
1	836.00	3817.572	
2	836.50	3817.571	-2.00
3	837.00	3817.570	-2.00
4	837.50	3817.562	-16.00
5	838.00	3817.561	-2.00
6	838.50	3817.563	4.00
7	839.00	3817.564	2.00
8	839.50	3817.562	-4.00
9	840.00	3817.563	2.00
10	840.50	3817.562	-2.00
11	841.00	3817.561	-2.00
12	841.50	3817.561	0.00
13	842.00	3817.560	-2.00
14	842.50	3817.559	-2.00
15	843.00	3817.558	-2.00
16	843.50	3817.557	-2.00
17	844.00	3817.555	-4.00
18	844.50	3817.554	-2.00
19	845.00	3817.553	-2.00
20	845.50	3817.552	-2.00
21	846.00	3817.551	-2.00
22	846.50	3817.549	-4.00
23	847.00	3817.548	-2.00

IRI **2.4206**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.18181818
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.15601	0.02128394	0	-0.02521	0.055002131	0.000992	0	0.037038	-0.07407694	-2.175087973	RS1 =	0.119787	IRI =	0.119787
	z2	-0.92852	2.025853	0.9001616	0	-3.39137	7.399350545	0.062802	0	4.319885	-8.63977	0.785433638				
	z3	0.063863	-0.13934	0.006615445	0	0.24029	-0.524268218	0.009863	0	0.695847	-1.3916946	-2.05530084				
	z4	3.743294	-8.16719	0.4186779	0	-46.6788	101.84472	-0.11453	0	42.93555	-85.8711	7.806433112				
2da Iteracion	z1	0.988173	-2.14936	0.02128394	0.016717	-0.02521	0.051812716	0.000992	0.007746	0.037038	-0.07407694	-2.147163204	RS2 =	0.204881	IRI =	0.162334
	z2	-0.92852	2.019604	0.9001616	0.707017	-3.39137	6.970283553	0.062802	0.490257	4.319885	-8.63977	1.547391772				
	z3	0.063863	-0.13891	0.006615445	0.005196	0.24029	-0.493867417	0.009863	0.076392	0.695847	-1.3916946	-1.942281881				
	z4	3.743294	-8.14199	0.4186779	0.328844	-46.6788	95.93903849	-0.11453	-0.89403	42.93555	-85.8711	1.360755891				
3ra Iteracion	z1	0.988173	-2.12177	0.02128394	0.032935	-0.02521	0.048963586	0.000992	0.00135	0.037038	-0.59261552	-2.6311351	RS3 =	9.082599	IRI =	3.135756
	z2	-0.92852	1.993675	0.9001616	1.392903	-3.39137	6.58639456	0.062802	0.085458	4.319885	-69.11816	-59.05912965				
	z3	0.063863	-0.13712	0.006615445	0.010237	0.24029	-0.466710136	0.009863	0.013421	0.695847	-11.1335568	-11.71373439				
	z4	3.743294	-8.03746	0.4186779	0.647859	-46.6788	90.66344573	-0.11453	-0.15584	42.93555	-686.9688	-603.8507994				
4ta Iteracion	z1	0.988173	-2.60002	0.02128394	-1.25701	-0.02521	0.295295162	0.000992	-0.59921	0.037038	-0.07407694	-4.235019738	RS4 =	6.485686	IRI =	3.973238
	z2	-0.92852	2.443051	0.9001616	-53.1628	-3.39137	39.72559569	0.062802	-37.9228	4.319885	-8.63977	-57.55672254				
	z3	0.063863	-0.16803	0.006615445	-0.3907	0.24029	-2.814688552	0.009863	-5.95559	0.695847	-1.3916946	-10.72070564				
	z4	3.743294	-9.84911	0.4186779	-24.7268	-46.6788	546.7834164	-0.11453	69.15607	42.93555	-85.8711	495.4925249				
5ta Iteracion	z1	0.988173	-4.18493	0.02128394	-1.22503	-0.02521	0.270261592	0.000992	0.491685	0.037038	0.14815388	-4.499863838	RS5 =	8.942838	IRI =	4.967158
	z2	-0.92852	3.932284	0.9001616	-51.8104	-3.39137	36.35786878	0.062802	31.11776	4.319885	17.27954	36.87709895				
	z3	0.063863	-0.27046	0.006615445	-0.38076	0.24029	-2.576074071	0.009863	4.886884	0.695847	2.7833892	4.442973846				
	z4	3.743294	-15.8529	0.4186779	-24.0977	-46.6788	500.4299962	-0.11453	-56.7463	42.93555	171.7422	575.4752135				

FIGURA 3.78: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 847m a 858m.*

N°	Dist	Cota	Y'
1	847.00	3817.548	
2	847.50	3817.547	-2.00
3	848.00	3817.546	-2.00
4	848.50	3817.545	-2.00
5	849.00	3817.543	-4.00
6	849.50	3817.541	-4.00
7	850.00	3817.543	4.00
8	850.50	3817.539	-8.00
9	851.00	3817.538	-2.00
10	851.50	3817.537	-2.00
11	852.00	3817.535	-4.00
12	852.50	3817.539	8.00
13	853.00	3817.532	-14.00
14	853.50	3817.531	-2.00
15	854.00	3817.530	-2.00
16	854.50	3817.528	-4.00
17	855.00	3817.524	-8.00
18	855.50	3817.526	4.00
19	856.00	3817.524	-4.00
20	856.50	3817.523	-2.00
21	857.00	3817.521	-4.00
22	857.50	3817.519	-4.00
23	858.00	3817.517	-4.00

IRI **2.6656**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -2.81818182
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.78485	0.02128394	0	-0.02521	0.071044419	0.000992	0	0.037038	-0.07407694	-2.787882857	RS1 =	0.53903	IRI =	0.53903
	z2	-0.92852	2.616727	0.9001616	0	-3.39137	9.557494455	0.062802	0	4.319885	-8.63977	3.534451366				
	z3	0.063863	-0.17998	0.006615445	0	0.24029	-0.677179782	0.009863	0	0.695847	-1.3916946	-2.24885266				
	z4	3.743294	-10.5493	0.4186779	0	-46.6788	131.54943	-0.11453	0	42.93555	-85.8711	35.12904693				
2da Iteracion	z1	0.988173	-2.75491	0.02128394	0.075227	-0.02521	0.056692024	0.000992	0.034859	0.037038	-0.07407694	-2.662208463	RS2 =	0.921943	IRI =	0.730487
	z2	-0.92852	2.588594	0.9001616	3.181577	-3.39137	7.626689196	0.062802	2.206163	4.319885	-8.63977	6.963253242				
	z3	0.063863	-0.17804	0.006615445	0.023382	0.24029	-0.540375906	0.009863	0.346467	0.695847	-1.3916946	-1.740265277				
	z4	3.743294	-10.4359	0.4186779	1.479797	-46.6788	104.973811	-0.11453	-4.02316	42.93555	-85.8711	6.123484868				
3ra Iteracion	z1	0.988173	-2.63072	0.02128394	0.148205	-0.02521	0.043870887	0.000992	0.006076	0.037038	-0.07407694	-2.506645879	RS3 =	0.633225	IRI =	0.698066
	z2	-0.92852	2.471903	0.9001616	6.268053	-3.39137	5.901881712	0.062802	0.384565	4.319885	-8.63977	6.386633119				
	z3	0.063863	-0.17002	0.006615445	0.046065	0.24029	-0.418167647	0.009863	0.060394	0.695847	-1.3916946	-1.873420568				
	z4	3.743294	-9.96543	0.4186779	2.91536	-46.6788	81.23354702	-0.11453	-0.70129	42.93555	-85.8711	-12.38891444				
4ta Iteracion	z1	0.988173	-2.477	0.02128394	0.135933	-0.02521	0.04722764	0.000992	-0.01229	0.037038	-0.14815388	-2.454286274	RS4 =	1.019286	IRI =	0.778371
	z2	-0.92852	2.327461	0.9001616	5.749002	-3.39137	6.353460439	0.062802	-0.77804	4.319885	-17.27954	-3.627661386				
	z3	0.063863	-0.16008	0.006615445	0.04225	0.24029	-0.450163479	0.009863	-0.12219	0.695847	-2.7833892	-3.473572735				
	z4	3.743294	-9.38311	0.4186779	2.673942	-46.6788	87.44908022	-0.11453	1.418842	42.93555	-171.7422	-89.58344844				
5ta Iteracion	z1	0.988173	-2.42526	0.02128394	-0.07721	-0.02521	0.087566372	0.000992	-0.0889	0.037038	-0.14815388	-2.651952263	RS5 =	2.030371	IRI =	1.028771
	z2	-0.92852	2.278844	0.9001616	-3.26548	-3.39137	11.78016689	0.062802	-5.62599	4.319885	-17.27954	-12.11200068				
	z3	0.063863	-0.15674	0.006615445	-0.024	0.24029	-0.834663403	0.009863	-0.88353	0.695847	-2.7833892	-4.682322805				
	z4	3.743294	-9.18712	0.4186779	-1.51882	-46.6788	162.1423112	-0.11453	10.25955	42.93555	-171.7422	-10.04627215				

FIGURA 3.79: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 858m a 869m.*

N°	Dist	Cota	Y'
1	858.00	3817.517	
2	858.50	3817.513	-8.00
3	859.00	3817.509	-8.00
4	859.50	3817.507	-4.00
5	860.00	3817.503	-8.00
6	860.50	3817.504	2.00
7	861.00	3817.503	-2.00
8	861.50	3817.502	-2.00
9	862.00	3817.501	-2.00
10	862.50	3817.502	2.00
11	863.00	3817.501	-2.00
12	863.50	3817.500	-2.00
13	864.00	3817.499	-2.00
14	864.50	3817.498	-2.00
15	865.00	3817.498	0.00
16	865.50	3817.498	0.00
17	866.00	3817.497	-2.00
18	866.50	3817.497	0.00
19	867.00	3817.496	-2.00
20	867.50	3817.495	-2.00
21	868.00	3817.495	0.00
22	868.50	3817.494	-2.00
23	869.00	3817.494	0.00

IRI | **1.9580**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.09090909
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.06618	0.02128394	0	-0.02521	0.052710375	0.000992	0	0.037038	-0.29630776	-2.309776666	RS1 =	3.892958	IRI =	3.892958
	z2	-0.92852	1.941443	0.9001616	0	-3.39137	7.091044273	0.062802	0	4.319885	-34.55908	-25.52659318				
	z3	0.063863	-0.13353	0.006615445	0	0.24029	-0.502423709	0.009863	0	0.695847	-5.5667784	-6.20273438				
	z4	3.743294	-7.82689	0.4186779	0	-46.6788	97.60119	-0.11453	0	42.93555	-343.4844	-253.7100974				
2da Iteracion	z1	0.988173	-2.28246	0.02128394	-0.54331	-0.02521	0.156366654	0.000992	-0.25176	0.037038	-0.29630776	-3.217466545	RS2 =	6.658406	IRI =	5.275682
	z2	-0.92852	2.144665	0.9001616	-22.9781	-3.39137	21.03576109	0.062802	-15.9334	4.319885	-34.55908	-50.29013109				
	z3	0.063863	-0.14751	0.006615445	-0.16887	0.24029	-1.490452563	0.009863	-2.50226	0.695847	-5.5667784	-9.875872108				
	z4	3.743294	-8.64617	0.4186779	-10.6874	-46.6788	289.5363837	-0.11453	29.05617	42.93555	-343.4844	-44.22543562				
3ra Iteracion	z1	0.988173	-3.17941	0.02128394	-1.07037	-0.02521	0.248963921	0.000992	-0.04389	0.037038	-0.14815388	-4.192860323	RS3 =	1.937949	IRI =	4.163104
	z2	-0.92852	2.987469	0.9001616	-45.2692	-3.39137	33.49272651	0.062802	-2.77743	4.319885	-17.27954	-28.8460204				
	z3	0.063863	-0.20548	0.006615445	-0.33269	0.24029	-2.373069358	0.009863	-0.43618	0.695847	-2.7833892	-6.130809377				
	z4	3.743294	-12.0439	0.4186779	-21.0554	-46.6788	460.9941552	-0.11453	5.064922	42.93555	-171.7422	261.217588				
4ta Iteracion	z1	0.988173	-4.14327	0.02128394	-0.61396	-0.02521	0.154553474	0.000992	0.259211	0.037038	-0.29630776	-4.639770837	RS4 =	0.282471	IRI =	3.192946
	z2	-0.92852	3.893138	0.9001616	-25.9661	-3.39137	20.79183686	0.062802	16.4049	4.319885	-34.55908	-19.43528436				
	z3	0.063863	-0.26777	0.006615445	-0.19083	0.24029	-1.473169733	0.009863	2.576305	0.695847	-5.5667784	-4.922241643				
	z4	3.743294	-15.6951	0.4186779	-12.0772	-46.6788	286.1790086	-0.11453	-29.916	42.93555	-343.4844	-114.9936619				
5ta Iteracion	z1	0.988173	-4.58489	0.02128394	-0.41366	-0.02521	0.124086315	0.000992	-0.11411	0.037038	0.07407694	-4.914501154	RS5 =	3.564403	IRI =	3.267237
	z2	-0.92852	4.308101	0.9001616	-17.4949	-3.39137	16.69313772	0.062802	-7.22179	4.319885	8.639770002	4.924318504				
	z3	0.063863	-0.29631	0.006615445	-0.12857	0.24029	-1.182763476	0.009863	-1.13415	0.695847	1.3916946	-1.350098511				
	z4	3.743294	-17.368	0.4186779	-8.13712	-46.6788	229.7644809	-0.11453	13.16966	42.93555	85.87110002	303.3000911				

FIGURA 3.80: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 869m a 880m.*

N°	Dist	Cota	Y'
1	869.00	3817.494	
2	869.50	3817.493	-2.00
3	870.00	3817.493	0.00
4	870.50	3817.492	-2.00
5	871.00	3817.491	-2.00
6	871.50	3817.491	0.00
7	872.00	3817.490	-2.00
8	872.50	3817.490	0.00
9	873.00	3817.489	-2.00
10	873.50	3817.489	0.00
11	874.00	3817.489	0.00
12	874.50	3817.489	-0.80
13	875.00	3817.488	-1.20
14	875.50	3817.485	-6.00
15	876.00	3817.483	-4.00
16	876.50	3817.481	-4.00
17	877.00	3817.480	-2.00
18	877.50	3817.478	-4.00
19	878.00	3817.476	-4.00
20	878.50	3817.475	-2.00
21	879.00	3817.474	-2.00
22	879.50	3817.473	-2.00
23	880.00	3817.472	-2.00

IRI	1.1834

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.97635	0.02128394	0	-0.02521	0.05041862	0.000992	0	0.037038	-0.07407694	-2.00000372	RS1 =	3.4E-06	IRI =	3.4E-06
	z2	-0.92852	1.857032	0.9001616	0	-3.39137	6.782738	0.062802	0	4.319885	-8.63977	2.14304E-09				
	z3	0.063863	-0.12773	0.006615445	0	0.24029	-0.4805792	0.009863	0	0.695847	-1.3916946	-2.00000032				
	z4	3.743294	-7.48659	0.4186779	0	-46.6788	93.35766	-0.11453	0	42.93555	-85.8711	-2.79787E-05				
2da Iteracion	z1	0.988173	-1.97635	0.02128394	4.56E-11	-0.02521	0.050418628	0.000992	-2.8E-08	0.037038	0	-1.925930476	RS2 =	1.317624	IRI =	0.658814
	z2	-0.92852	1.857035	0.9001616	1.93E-09	-3.39137	6.782739084	0.062802	-1.8E-06	4.319885	0	8.639772783				
	z3	0.063863	-0.12773	0.006615445	1.42E-11	0.24029	-0.480579277	0.009863	-2.8E-07	0.695847	0	-0.60830631				
	z4	3.743294	-7.4866	0.4186779	8.97E-10	-46.6788	93.35767492	-0.11453	3.2E-06	42.93555	0	85.8710762				
3ra Iteracion	z1	0.988173	-1.90315	0.02128394	0.183888	-0.02521	0.015334982	0.000992	0.085211	0.037038	-0.07407694	-1.692794184	RS3 =	0.936009	IRI =	0.751212
	z2	-0.92852	1.788257	0.9001616	7.777192	-3.39137	2.062991163	0.062802	5.392847	4.319885	-8.63977	8.381517105				
	z3	0.063863	-0.123	0.006615445	0.057156	0.24029	-0.14616968	0.009863	0.846919	0.695847	-1.3916946	-0.756785531				
	z4	3.743294	-7.20932	0.4186779	3.617282	-46.6788	28.39502685	-0.11453	-9.83439	42.93555	-85.8711	-70.90250883				
4ta Iteracion	z1	0.988173	-1.67277	0.02128394	0.178392	-0.02521	0.019078043	0.000992	-0.07036	0.037038	-0.07407694	-1.619737919	RS4 =	0.705753	IRI =	0.739847
	z2	-0.92852	1.571786	0.9001616	7.54472	-3.39137	2.566539195	0.062802	-4.4528	4.319885	-8.63977	-1.409520432				
	z3	0.063863	-0.10811	0.006615445	0.055447	0.24029	-0.181847707	0.009863	-0.69929	0.695847	-1.3916946	-2.325490952				
	z4	3.743294	-6.33663	0.4186779	3.509156	-46.6788	35.32586597	-0.11453	8.120117	42.93555	-85.8711	-45.25258743				
5ta Iteracion	z1	0.988173	-1.60058	0.02128394	-0.03	-0.02521	0.058624022	0.000992	-0.0449	0.037038	0	-1.616861808	RS5 =	0.498992	IRI =	0.691676
	z2	-0.92852	1.503953	0.9001616	-1.2688	-3.39137	7.886597925	0.062802	-2.84194	4.319885	0	5.279816269				
	z3	0.063863	-0.10344	0.006615445	-0.00932	0.24029	-0.558791291	0.009863	-0.44631	0.695847	0	-1.117869428				
	z4	3.743294	-6.06316	0.4186779	-0.59014	-46.6788	108.5511968	-0.11453	5.182557	42.93555	0	107.0804636				

FIGURA 3.81: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 880m a 891m.*

N°	Dist	Cota	Y'
1	880.00	3817.472	
2	880.50	3817.471	-2.00
3	881.00	3817.471	0.00
4	881.50	3817.470	-2.00
5	882.00	3817.470	0.00
6	882.50	3817.470	0.00
7	883.00	3817.473	6.00
8	883.50	3817.474	2.00
9	884.00	3817.475	2.00
10	884.50	3817.474	-2.00
11	885.00	3817.475	2.00
12	885.50	3817.472	-6.00
13	886.00	3817.469	-6.00
14	886.50	3817.465	-8.00
15	887.00	3817.465	0.00
16	887.50	3817.464	-2.00
17	888.00	3817.464	0.00
18	888.50	3817.463	-2.00
19	889.00	3817.462	-2.00
20	889.50	3817.462	0.00
21	890.00	3817.461	-2.00
22	890.50	3817.462	2.00
23	891.00	3817.461	-2.00

IRI	2.2067

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.98817	0.02128394	0	-0.02521	0.02520931	0.000992	0	0.037038	-0.07407694	-1.03704033	RS1 =	0.658807	IRI =	0.658807
	z2	-0.92852	0.928516	0.9001616	0	-3.39137	3.391369	0.062802	0	4.319885	-8.63977	-4.319884998				
	z3	0.063863	-0.06386	0.006615445	0	0.24029	-0.2402896	0.009863	0	0.695847	-1.3916946	-1.69584746				
	z4	3.743294	-3.74329	0.4186779	0	-46.6788	46.67883	-0.11453	0	42.93555	-85.8711	-42.93556398				
2da Iteracion	z1	0.988173	-1.02477	0.02128394	-0.09194	-0.02521	0.042751144	0.000992	-0.04261	0.037038	0	-1.11657364	RS2 =	0.190813	IRI =	0.42481
	z2	-0.92852	0.962909	0.9001616	-3.88859	-3.39137	5.751244503	0.062802	-2.69643	4.319885	0	0.129133331				
	z3	0.063863	-0.06623	0.006615445	-0.02858	0.24029	-0.407494508	0.009863	-0.42346	0.695847	0	-0.925760974				
	z4	3.743294	-3.88195	0.4186779	-1.80864	-46.6788	79.16017527	-0.11453	4.9172	42.93555	0	78.38678781				
3ra Iteracion	z1	0.988173	-1.10337	0.02128394	0.002748	-0.02521	0.023337795	0.000992	0.077785	0.037038	-0.07407694	-1.073573764	RS3 =	0.162078	IRI =	0.337233
	z2	-0.92852	1.036756	0.9001616	0.116241	-3.39137	3.139597068	0.062802	4.922821	4.319885	-8.63977	0.575645602				
	z3	0.063863	-0.07131	0.006615445	0.000854	0.24029	-0.222450734	0.009863	0.773104	0.695847	-1.3916946	-0.911495288				
	z4	3.743294	-4.17966	0.4186779	0.054065	-46.6788	43.21343911	-0.11453	-8.97725	42.93555	-85.8711	-55.76051375				
4ta Iteracion	z1	0.988173	-1.06088	0.02128394	0.012252	-0.02521	0.022978167	0.000992	-0.05533	0.037038	0	-1.08097819	RS4 =	0.247253	IRI =	0.314738
	z2	-0.92852	0.99683	0.9001616	0.518174	-3.39137	3.091216864	0.062802	-3.50185	4.319885	0	1.104367964				
	z3	0.063863	-0.06856	0.006615445	0.003808	0.24029	-0.219022838	0.009863	-0.54995	0.695847	0	-0.833724711				
	z4	3.743294	-4.0187	0.4186779	0.24101	-46.6788	42.5475336	-0.11453	6.385978	42.93555	0	45.15581988				
5ta Iteracion	z1	0.988173	-1.06819	0.02128394	0.023505	-0.02521	0.021017625	0.000992	0.044809	0.037038	0	-0.978861345	RS5 =	1.162154	IRI =	0.484221
	z2	-0.92852	1.003706	0.9001616	0.99411	-3.39137	2.827468138	0.062802	2.835861	4.319885	0	7.661144215				
	z3	0.063863	-0.06903	0.006615445	0.007306	0.24029	-0.200335377	0.009863	0.445357	0.695847	0	0.183293119				
	z4	3.743294	-4.04642	0.4186779	0.462374	-46.6788	38.91729403	-0.11453	-5.17147	42.93555	0	30.16177454				

FIGURA 3.82: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 891m a 902m.*

N°	Dist	Cota	Y'
1	891.00	3817.461	
2	891.50	3817.461	0.00
3	892.00	3817.461	0.00
4	892.50	3817.462	2.00
5	893.00	3817.462	0.00
6	893.50	3817.461	-2.00
7	894.00	3817.461	0.00
8	894.50	3817.461	0.00
9	895.00	3817.460	-2.00
10	895.50	3817.458	-4.00
11	896.00	3817.456	-4.00
12	896.50	3817.454	-4.00
13	897.00	3817.452	-4.00
14	897.50	3817.450	-4.00
15	898.00	3817.448	-4.00
16	898.50	3817.446	-4.00
17	899.00	3817.444	-4.00
18	899.50	3817.442	-4.00
19	900.00	3817.440	-4.00
20	900.50	3817.440	0.00
21	901.00	3817.440	0.00
22	901.50	3817.441	2.00
23	902.00	3817.441	0.00

IRI 2.1409

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.81818182
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.79668	0.02128394	0	-0.02521	0.045835109	0.000992	0	0.037038	0	-1.750842527	**RS1** =	1.197837	**IRI** =	1.197837
	z2	-0.92852	1.688211	0.9001616	0	-3.39137	6.166125454	0.062802	0	4.319885	0	7.854336363				
	z3	0.063863	-0.11612	0.006615445	0	0.24029	-0.436890182	0.009863	0	0.695847	0	-0.5530052				
	z4	3.743294	-6.80599	0.4186779	0	-46.6788	84.8706	-0.11453	0	42.93555	0	78.06461091				
2da Iteracion	z1	0.988173	-1.73013	0.02128394	0.167171	-0.02521	0.01394088	0.000992	0.077465	0.037038	0	-1.471557883	**RS2** =	2.048748	**IRI** =	1.623293
	z2	-0.92852	1.625685	0.9001616	7.070172	-3.39137	1.875444692	0.062802	4.902588	4.319885	0	15.47388391				
	z3	0.063863	-0.11181	0.006615445	0.05196	0.24029	-0.132881398	0.009863	0.769326	0.695847	0	0.577190297				
	z4	3.743294	-6.55392	0.4186779	3.288437	-46.6788	25.81363572	-0.11453	-8.94036	42.93555	0	13.60779708				
3ra Iteracion	z1	0.988173	-1.45415	0.02128394	0.329345	-0.02521	-0.014550569	0.000992	0.013503	0.037038	0.07407694	-1.051778369	**RS3** =	2.724763	**IRI** =	1.99045
	z2	-0.92852	1.366365	0.9001616	13.929	-3.39137	-1.957465281	0.062802	0.854592	4.319885	8.639770002	22.83226364				
	z3	0.063863	-0.09398	0.006615445	0.102367	0.24029	0.138692826	0.009863	0.134209	0.695847	1.3916946	1.672984958				
	z4	3.743294	-5.50847	0.4186779	6.478576	-46.6788	-26.94256776	-0.11453	-1.55843	42.93555	85.87110002	58.34019988				
4ta Iteracion	z1	0.988173	-1.03934	0.02128394	0.485961	-0.02521	-0.042174796	0.000992	0.057892	0.037038	0	-0.537660995	**RS4** =	1.598928	**IRI** =	1.892569
	z2	-0.92852	0.976593	0.9001616	20.55273	-3.39137	-5.673709324	0.062802	3.663862	4.319885	0	19.51947267				
	z3	0.063863	-0.06717	0.006615445	0.151046	0.24029	0.402000886	0.009863	0.575391	0.695847	0	1.061267198				
	z4	3.743294	-3.93712	0.4186779	9.559364	-46.6788	-78.09298045	-0.11453	-6.68142	42.93555	0	-79.15214913				
5ta Iteracion	z1	0.988173	-0.5313	0.02128394	0.415451	-0.02521	-0.026753814	0.000992	-0.07854	0.037038	-0.07407694	-0.295225369	**RS5** =	1.527317	**IRI** =	1.819519
	z2	-0.92852	0.499227	0.9001616	17.57068	-3.39137	-3.599148675	0.062802	-4.97089	4.319885	-8.63977	0.860100763				
	z3	0.063863	-0.03434	0.006615445	0.12913	0.24029	0.25501147	0.009863	-0.78065	0.695847	-1.3916946	-1.822542234				
	z4	3.743294	-2.01262	0.4186779	8.172372	-46.6788	-49.53871111	-0.11453	9.064908	42.93555	-85.8711	-120.1851547				

FIGURA 3.83: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 902m a 913m.*

N°	Dist	Cota	Y'
1	902.00	3817.441	
2	902.50	3817.441	0.00
3	903.00	3817.442	2.00
4	903.50	3817.442	0.00
5	904.00	3817.441	-2.00
6	904.50	3817.442	2.00
7	905.00	3817.443	2.00
8	905.50	3817.440	-6.00
9	906.00	3817.438	-4.00
10	906.50	3817.436	-4.00
11	907.00	3817.435	-2.00
12	907.50	3817.434	-2.00
13	908.00	3817.433	-2.00
14	908.50	3817.432	-2.00
15	909.00	3817.430	-4.00
16	909.50	3817.429	-2.00
17	910.00	3817.428	-2.00
18	910.50	3817.429	2.00
19	911.00	3817.430	2.00
20	911.50	3817.430	0.00
21	912.00	3817.431	2.00
22	912.50	3817.431	0.00
23	913.00	3817.431	0.00

IRI **2.0735**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.90909091
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.89834	0.02128394	0	-0.02521	0.022917555	0.000992	0	0.037038	0	-0.875421264	RS1 =	0.598919	IRI =	0.598919
	z2	-0.92852	0.844105	0.9001616	0	-3.39137	3.083062727	0.062802	0	4.319885	0	3.927168182				
	z3	0.063863	-0.05806	0.006615445	0	0.24029	-0.218445091	0.009863	0	0.695847	0	-0.2765026				
	z4	3.743294	-3.40299	0.4186779	0	-46.6788	42.4353	-0.11453	0	42.93555	0	39.03230546				
2da Iteracion	z1	0.988173	-0.86507	0.02128394	0.083586	-0.02521	0.00697044	0.000992	0.038732	0.037038	0.07407694	-0.661702001	RS2 =	2.341992	IRI =	1.470455
	z2	-0.92852	0.812843	0.9001616	3.535086	-3.39137	0.937722346	0.062802	2.451294	4.319885	8.639769998	16.37671495				
	z3	0.063863	-0.05591	0.006615445	0.02598	0.24029	-0.066440699	0.009863	0.384963	0.695847	1.3916946	1.680289748				
	z4	3.743294	-3.27696	0.4186779	1.644219	-46.6788	12.90681786	-0.11453	-4.47018	42.93555	85.87109998	92.67499852				
3ra Iteracion	z1	0.988173	-0.65388	0.02128394	0.348561	-0.02521	-0.042358945	0.000992	0.091963	0.037038	0	-0.25571085	RS3 =	1.639572	IRI =	1.526827
	z2	-0.92852	0.614401	0.9001616	14.74169	-3.39137	-5.698482563	0.062802	5.820145	4.319885	0	15.47775294				
	z3	0.063863	-0.04226	0.006615445	0.108339	0.24029	0.403756151	0.009863	0.914024	0.695847	0	1.383860816				
	z4	3.743294	-2.47695	0.4186779	6.856563	-46.6788	-78.43395951	-0.11453	-10.6136	42.93555	0	-84.66794949				
4ta Iteracion	z1	0.988173	-0.25263	0.02128394	0.329428	-0.02521	-0.034886176	0.000992	-0.08402	0.037038	-0.07407694	-0.116239435	RS4 =	1.691919	IRI =	1.5681
	z2	-0.92852	0.237432	0.9001616	13.93248	-3.39137	-4.693182672	0.062802	-5.31729	4.319885	-8.63977	-4.480330824				
	z3	0.063863	-0.01633	0.006615445	0.102392	0.24029	0.332527362	0.009863	-0.83505	0.695847	-1.3916946	-1.808158435				
	z4	3.743294	-0.9572	0.4186779	6.480193	-46.6788	-64.59700377	-0.11453	9.696605	42.93555	-85.8711	-135.2485062				
5ta Iteracion	z1	0.988173	-0.11486	0.02128394	-0.09536	-0.02521	0.045582427	0.000992	-0.13421	0.037038	0.07407694	-0.224773687	RS5 =	0.188989	IRI =	1.292278
	z2	-0.92852	0.10793	0.9001616	-4.03302	-3.39137	6.132132463	0.062802	-8.49383	4.319885	8.639769998	2.352978822				
	z3	0.063863	-0.00742	0.006615445	-0.02964	0.24029	-0.434481667	0.009863	-1.33391	0.695847	1.3916946	-0.413762616				
	z4	3.743294	-0.43512	0.4186779	-1.87582	-46.6788	84.4027202	-0.11453	15.48935	42.93555	85.87109998	183.452235				

FIGURA 3.84: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 913m a 924m.*

N°	Dist	Cota	Y'
1	913.00	3817.431	
2	913.50	3817.431	0.00
3	914.00	3817.432	2.00
4	914.50	3817.432	0.00
5	915.00	3817.433	2.00
6	915.50	3817.432	-2.00
7	916.00	3817.431	-2.00
8	916.50	3817.431	0.00
9	917.00	3817.430	-2.00
10	917.50	3817.431	2.00
11	918.00	3817.431	0.00
12	918.50	3817.431	0.00
13	919.00	3817.431	0.00
14	919.50	3817.430	-2.00
15	920.00	3817.430	0.00
16	920.50	3817.431	2.00
17	921.00	3817.433	4.00
18	921.50	3817.435	4.00
19	922.00	3817.437	4.00
20	922.50	3817.438	2.00
21	923.00	3817.440	4.00
22	923.50	3817.443	6.00
23	924.00	3817.445	4.00

IRI **1.6469**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 1.272727273
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	1.257674	0.02128394	0	-0.02521	-0.032084576	0.000992	0	0.037038	0	1.225589769	RS1 =	0.838486	IRI =	0.838486
	z2	-0.92852	-1.18175	0.9001616	0	-3.39137	-4.316287818	0.062802	0	4.319885	0	-5.498035455				
	z3	0.063863	0.081281	0.006615445	0	0.24029	0.305823127	0.009863	0	0.695847	0	0.38710364				
	z4	3.743294	4.764192	0.4186779	0	-46.6788	-59.40942	-0.11453	0	42.93555	0	-54.64522764				
2da Iteracion	z1	0.988173	1.211094	0.02128394	-0.11702	-0.02521	-0.009758616	0.000992	-0.05423	0.037038	0.07407694	1.104167458	RS2 =	0.116506	IRI =	0.477496
	z2	-0.92852	-1.13798	0.9001616	-4.94912	-3.39137	-1.312811284	0.062802	-3.43181	4.319885	8.639770002	-2.191952938				
	z3	0.063863	0.07827	0.006615445	-0.03637	0.24029	0.093016979	0.009863	-0.53895	0.695847	1.3916946	0.987661392				
	z4	3.743294	4.587743	0.4186779	-2.30191	-46.6788	-18.069545	-0.11453	6.25825	42.93555	85.87110002	76.34564206				
3ra Iteracion	z1	0.988173	1.091108	0.02128394	-0.04665	-0.02521	-0.024898262	0.000992	0.075759	0.037038	0	1.095315521	RS3 =	0.049003	IRI =	0.334665
	z2	-0.92852	-1.02524	0.9001616	-1.97311	-3.39137	-3.349524228	0.062802	4.794634	4.319885	0	-1.553239424				
	z3	0.063863	0.070516	0.006615445	-0.0145	0.24029	0.237324761	0.009863	0.752973	0.695847	0	1.046312387				
	z4	3.743294	4.133223	0.4186779	-0.91772	-46.6788	-46.10287823	-0.11453	-8.74349	42.93555	0	-51.63086935				
4ta Iteracion	z1	0.988173	1.082361	0.02128394	-0.03306	-0.02521	-0.026376813	0.000992	-0.05123	0.037038	0.07407694	1.045767804	RS4 =	0.147801	IRI =	0.287949
	z2	-0.92852	-1.01702	0.9001616	-1.39817	-3.39137	-3.548431395	0.062802	-3.2425	4.319885	8.639769998	-0.566350688				
	z3	0.063863	0.06995	0.006615445	-0.01028	0.24029	0.251417985	0.009863	-0.50922	0.695847	1.3916946	1.193568892				
	z4	3.743294	4.100088	0.4186779	-0.65031	-46.6788	-48.84063805	-0.11453	5.91303	42.93555	85.87109998	46.3932734				
5ta Iteracion	z1	0.988173	1.033399	0.02128394	-0.01205	-0.02521	-0.030089048	0.000992	0.046037	0.037038	-0.07407694	0.963215843	RS5 =	1.547507	IRI =	0.539861
	z2	-0.92852	-0.97101	0.9001616	-0.50981	-3.39137	-4.04783254	0.062802	2.913575	4.319885	-8.63977	-11.25484677				
	z3	0.063863	0.066786	0.006615445	-0.00375	0.24029	0.286802192	0.009863	0.457562	0.695847	-1.3916946	-0.584290919				
	z4	3.743294	3.914616	0.4186779	-0.23712	-46.6788	-55.71439941	-0.11453	-5.31319	42.93555	-85.8711	-143.2211958				

FIGURA 3.85: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 924m a 935m.*

N°	Dist	Cota	Y'
1	924.00	3817.445	
2	924.50	3817.448	6.00
3	925.00	3817.450	4.00
4	925.50	3817.447	-6.00
5	926.00	3817.445	-4.00
6	926.50	3817.444	-2.00
7	927.00	3817.443	-2.00
8	927.50	3817.441	-4.00
9	928.00	3817.440	-2.00
10	928.50	3817.439	-2.00
11	929.00	3817.438	-2.00
12	929.50	3817.437	-2.00
13	930.00	3817.435	-4.00
14	930.50	3817.436	2.00
15	931.00	3817.436	0.00
16	931.50	3817.437	2.00
17	932.00	3817.438	2.00
18	932.50	3817.438	0.00
19	933.00	3817.437	-2.00
20	933.50	3817.436	-2.00
21	934.00	3817.437	2.00
22	934.50	3817.437	0.00
23	935.00	3817.437	0.00

IRI | **2.5861**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.72727273
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.71867	0.02128394	0	-0.02521	0.018334044	0.000992	0	0.037038	0.22223082	-0.478106191	**RS1** =	4.431988	**IRI** =	4.431988
	z2	-0.92852	0.675284	0.9001616	0	-3.39137	2.466450182	0.062802	0	4.319885	25.91931	29.06104454				
	z3	0.063863	-0.04645	0.006615445	0	0.24029	-0.174756073	0.009863	0	0.695847	4.1750838	3.95388172				
	z4	3.743294	-2.7224	0.4186779	0	-46.6788	33.94824	-0.11453	0	42.93555	257.6133	288.8391443				
2da Iteracion	z1	0.988173	-0.47245	0.02128394	0.618534	-0.02521	-0.09967463	0.000992	0.28662	0.037038	0.14815388	0.481181142	**RS2** =	6.262731	**IRI** =	5.34736
	z2	-0.92852	0.443929	0.9001616	26.15964	-3.39137	-13.40907189	0.062802	18.13958	4.319885	17.27954	48.61361434				
	z3	0.063863	-0.03053	0.006615445	0.192252	0.24029	0.950076657	0.009863	2.848728	0.695847	2.783389201	6.743912231				
	z4	3.743294	-1.78969	0.4186779	12.16722	-46.6788	-184.5625726	-0.11453	-33.0793	42.93555	171.7422	-35.52217942				
3ra Iteracion	z1	0.988173	0.47549	0.02128394	1.034689	-0.02521	-0.170009374	0.000992	-0.03525	0.037038	-0.22223082	1.08268988	**RS3** =	3.635295	**IRI** =	4.776671
	z2	-0.92852	-0.44678	0.9001616	43.76011	-3.39137	-22.87109488	0.062802	-2.23085	4.319885	-25.91931	-7.707932596				
	z3	0.063863	0.03073	0.006615445	0.321601	0.24029	1.620491973	0.009863	-0.35034	0.695847	-4.1750838	-2.552605228				
	z4	3.743294	1.801202	0.4186779	20.35345	-46.6788	-314.7979326	-0.11453	4.068181	42.93555	-257.6133	-546.188403				
4ta Iteracion	z1	0.988173	1.069885	0.02128394	-0.16406	-0.02521	0.064349416	0.000992	-0.54199	0.037038	-0.14815388	0.280033179	**RS4** =	9.045516	**IRI** =	5.843882
	z2	-0.92852	-1.00529	0.9001616	-6.93838	-3.39137	8.656826239	0.062802	-34.3015	4.319885	-17.27954	-50.86793742				
	z3	0.063863	0.069144	0.006615445	-0.05099	0.24029	-0.613364489	0.009863	-5.38688	0.695847	-2.7833892	-8.765482426				
	z4	3.743294	4.052827	0.4186779	-3.22714	-46.6788	119.1526255	-0.11453	62.55228	42.93555	-171.7422	10.78839247				
5ta Iteracion	z1	0.988173	0.276721	0.02128394	-1.08267	-0.02521	0.220971764	0.000992	0.010705	0.037038	-0.07407694	-0.648348662	**RS5** =	3.061828	**IRI** =	5.287472
	z2	-0.92852	-0.26002	0.9001616	-45.7894	-3.39137	29.72698537	0.062802	0.677529	4.319885	-8.63977	-24.28463479				
	z3	0.063863	0.017884	0.006615445	-0.33651	0.24029	-2.106254266	0.009863	0.106402	0.695847	-1.3916946	-3.710176614				
	z4	3.743294	1.048247	0.4186779	-21.2973	-46.6788	409.1624641	-0.11453	-1.23554	42.93555	-85.8711	301.8067876				

FIGURA 3.86: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 935m a 946m.*

N°	Dist	Cota	Y'
1	935.00	3817.437	
2	935.50	3817.438	2.00
3	936.00	3817.438	0.00
4	936.50	3817.439	2.00
5	937.00	3817.440	2.00
6	937.50	3817.440	0.00
7	938.00	3817.441	2.00
8	938.50	3817.442	2.00
9	939.00	3817.443	2.00
10	939.50	3817.443	0.00
11	940.00	3817.443	0.00
12	940.50	3817.441	-4.00
13	941.00	3817.440	-2.00
14	941.50	3817.438	-4.00
15	942.00	3817.436	-4.00
16	942.50	3817.434	-4.00
17	943.00	3817.432	-4.00
18	943.50	3817.430	-4.00
19	944.00	3817.428	-4.00
20	944.50	3817.426	-4.00
21	945.00	3817.423	-6.00
22	945.50	3817.424	2.00
23	946.00	3817.424	0.00

IRI	2.3218

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.18181818
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.16784	0.02128394	0	-0.02521	0.029792821	0.000992	0	0.037038	0.07407694	-1.063970703	RS1 =	2.096212	IRI =	2.096212
	z2	-0.92852	1.097337	0.9001616	0	-3.39137	4.007981545	0.062802	0	4.319885	8.639770002	13.74508864				
	z3	0.063863	-0.07547	0.006615445	0	0.24029	-0.283978618	0.009863	0	0.695847	1.3916946	1.03224122				
	z4	3.743294	-4.42389	0.4186779	0	-46.6788	55.16589	-0.11453	0	42.93555	85.87110002	136.6130971				
2da Iteracion	z1	0.988173	-1.05139	0.02128394	0.29255	-0.02521	-0.026022089	0.000992	0.135563	0.037038	0	-0.649295819	RS2 =	2.267685	IRI =	2.181949
	z2	-0.92852	0.987914	0.9001616	12.3728	-3.39137	-3.500710875	0.062802	8.579531	4.319885	0	18.43953457				
	z3	0.063863	-0.06795	0.006615445	0.09093	0.24029	0.24803683	0.009863	1.347371	0.695847	0	1.618389331				
	z4	3.743294	-3.98276	0.4186779	5.754765	-46.6788	-48.18381244	-0.11453	-15.6456	42.93555	0	-62.05743135				
3ra Iteracion	z1	0.988173	-0.64162	0.02128394	0.392466	-0.02521	-0.040798478	0.000992	-0.06158	0.037038	0.07407694	-0.277452606	RS3 =	1.526496	IRI =	1.963464
	z2	-0.92852	0.602882	0.9001616	16.59856	-3.39137	-5.488555406	0.062802	-3.89731	4.319885	8.639770002	16.45534677				
	z3	0.063863	-0.04147	0.006615445	0.121986	0.24029	0.388882125	0.009863	-0.61205	0.695847	1.3916946	1.249043717				
	z4	3.743294	-2.43051	0.4186779	7.720226	-46.6788	-75.54452045	-0.11453	7.107134	42.93555	85.87110002	22.72343357				
4ta Iteracion	z1	0.988173	-0.27417	0.02128394	0.350235	-0.02521	-0.03148753	0.000992	0.022549	0.037038	0.07407694	0.14120177	RS4 =	1.865879	IRI =	1.939068
	z2	-0.92852	0.257619	0.9001616	14.81247	-3.39137	-4.235968142	0.062802	1.42707	4.319885	8.639769998	20.90096189				
	z3	0.063863	-0.01772	0.006615445	0.108859	0.24029	0.300132215	0.009863	0.224114	0.695847	1.3916946	2.007081182				
	z4	3.743294	-1.03859	0.4186779	6.88949	-46.6788	-58.30389934	-0.11453	-2.6024	42.93555	85.87109998	30.81570049				
5ta Iteracion	z1	0.988173	0.139532	0.02128394	0.444855	-0.02521	-0.050597132	0.000992	0.030579	0.037038	0	0.564368349	RS5 =	0.369125	IRI =	1.625079
	z2	-0.92852	-0.13111	0.9001616	18.81424	-3.39137	-6.806752902	0.062802	1.935277	4.319885	0	13.81165975				
	z3	0.063863	0.009018	0.006615445	0.138269	0.24029	0.482280734	0.009863	0.303925	0.695847	0	0.933492897				
	z4	3.743294	0.52856	0.4186779	8.750771	-46.6788	-93.6882013	-0.11453	-3.52917	42.93555	0	-87.93804191				

FIGURA 3.87: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 946m a 957m.*

N°	Dist	Cota	Y'
1	946.00	3817.424	
2	946.50	3817.423	-2.00
3	947.00	3817.422	-2.00
4	947.50	3817.422	0.00
5	948.00	3817.421	-2.00
6	948.50	3817.421	0.00
7	949.00	3817.420	-2.00
8	949.50	3817.420	0.00
9	950.00	3817.419	-2.00
10	950.50	3817.417	-4.00
11	951.00	3817.415	-4.00
12	951.50	3817.412	-6.00
13	952.00	3817.409	-6.00
14	952.50	3817.407	-4.00
15	953.00	3817.406	-2.00
16	953.50	3817.404	-4.00
17	954.00	3817.404	0.00
18	954.50	3817.403	-2.00
19	955.00	3817.402	-2.00
20	955.50	3817.403	2.00
21	956.00	3817.403	0.00
22	956.50	3817.404	2.00
23	957.00	3817.404	0.00

IRI	1.7742

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.81818182
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.79668	0.02128394	0	-0.02521	0.045835109	0.000992	0	0.037038	-0.07407694	-1.824919467	RS1 =	0.11978	IRI =	0.11978
	z2	-0.92852	1.688211	0.9001616	0	-3.39137	6.166125455	0.062802	0	4.319885	-8.63977	-0.785433634				
	z3	0.063863	-0.11612	0.006615445	0	0.24029	-0.436890182	0.009863	0	0.695847	-1.3916946	-1.9446998				
	z4	3.743294	-6.80599	0.4186779	0	-46.6788	84.8706	-0.11453	0	42.93555	-85.8711	-7.806489069				
2da Iteracion	z1	0.988173	-1.80334	0.02128394	-0.01672	-0.02521	0.04902454	0.000992	-0.00775	0.037038	-0.07407694	-1.852851627	RS2 =	0.204868	IRI =	0.162324
	z2	-0.92852	1.694467	0.9001616	-0.70702	-3.39137	6.595194615	0.062802	-0.49026	4.319885	-8.63977	-1.54738621				
	z3	0.063863	-0.11655	0.006615445	-0.0052	0.24029	-0.467291137	0.009863	-0.07699	0.695847	-1.3916946	-2.05771994				
	z4	3.743294	-6.83121	0.4186779	-0.32884	-46.6788	90.77631135	-0.11453	0.894039	42.93555	-85.8711	-1.360803524				
3ra Iteracion	z1	0.988173	-1.83094	0.02128394	-0.03293	-0.02521	0.0518737	0.000992	-0.00135	0.037038	0	-1.813348519	RS3 =	1.176913	IRI =	0.50052
	z2	-0.92852	1.720402	0.9001616	-1.3929	-3.39137	6.978487616	0.062802	-0.08546	4.319885	0	7.220531617				
	z3	0.063863	-0.11833	0.006615445	-0.01024	0.24029	-0.494448701	0.009863	-0.01342	0.695847	0	-0.636435665				
	z4	3.743294	-6.93577	0.4186779	-0.64786	-46.6788	96.05195928	-0.11453	0.155846	42.93555	0	88.62418065				
4ta Iteracion	z1	0.988173	-1.7919	0.02128394	0.153681	-0.02521	0.016044104	0.000992	0.087943	0.037038	-0.07407694	-1.608309739	RS4 =	0.869719	IRI =	0.59282
	z2	-0.92852	1.683723	0.9001616	6.499645	-3.39137	2.158388184	0.062802	5.565747	4.319885	-8.63977	7.26773314				
	z3	0.063863	-0.11581	0.006615445	0.047767	0.24029	-0.152928871	0.009863	0.874072	0.695847	-1.3916946	-0.738590855				
	z4	3.743294	-6.7879	0.4186779	3.023077	-46.6788	29.7080722	-0.11453	-10.1497	42.93555	-85.8711	-70.07754055				
5ta Iteracion	z1	0.988173	-1.58929	0.02128394	0.154686	-0.02521	0.018619366	0.000992	-0.06954	0.037038	0	-1.485521515	RS5 =	0.562261	IRI =	0.586708
	z2	-0.92852	1.493341	0.9001616	6.542134	-3.39137	2.504834129	0.062802	-4.40099	4.319885	0	6.139323171				
	z3	0.063863	-0.10271	0.006615445	0.048079	0.24029	-0.177475701	0.009863	-0.69115	0.695847	0	-0.923260673				
	z4	3.743294	-6.02038	0.4186779	3.042839	-46.6788	34.47655696	-0.11453	8.025637	42.93555	0	39.52465735				

FIGURA 3.88: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 957m a 968m.*

N°	Dist	Cota	Y'
1	957.00	3817.404	
2	957.50	3817.403	-2.00
3	958.00	3817.404	2.00
4	958.50	3817.405	2.00
5	959.00	3817.406	2.00
6	959.50	3817.406	0.00
7	960.00	3817.407	2.00
8	960.50	3817.408	2.00
9	961.00	3817.409	2.00
10	961.50	3817.410	2.00
11	962.00	3817.412	4.00
12	962.50	3817.413	2.00
13	963.00	3817.414	2.00
14	963.50	3817.415	2.00
15	964.00	3817.416	2.00
16	964.50	3817.416	0.00
17	965.00	3817.417	2.00
18	965.50	3817.420	6.00
19	966.00	3817.422	4.00
20	966.50	3817.425	6.00
21	967.00	3817.427	4.00
22	967.50	3817.430	6.00
23	968.00	3817.433	6.00

IRI | **1.5384**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 2.636363636
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	2.605183	0.02128394	0	-0.02521	-0.066460908	0.000992	0	0.037038	-0.07407694	2.464644725	**RS1 =**	3.054482	**IRI =**	3.054482
	z2	-0.92852	-2.44731	0.9001616	0	-3.39137	-8.940881909	0.062802	0	4.319885	-8.63977	-20.02855773				
	z3	0.063863	0.168367	0.006615445	0	0.24029	0.633490764	0.009863	0	0.695847	-1.3916946	-0.58983706				
	z4	3.743294	9.868684	0.4186779	0	-46.6788	-123.06237	-0.11453	0	42.93555	-85.8711	-199.0647858				
2da Iteracion	z1	0.988173	2.435495	0.02128394	-0.42629	-0.02521	0.014869385	0.000992	-0.19754	0.037038	0.07407694	1.900619065	**RS2 =**	2.589066	**IRI =**	2.821774
	z2	-0.92852	-2.28846	0.9001616	-18.0289	-3.39137	2.000355119	0.062802	-12.5016	4.319885	8.639769998	-22.1788765				
	z3	0.063863	0.1574	0.006615445	-0.1325	0.24029	-0.141731711	0.009863	-1.96331	0.695847	1.3916946	-0.688446968				
	z4	3.743294	9.22589	0.4186779	-8.38551	-46.6788	27.53290384	-0.11453	22.79791	42.93555	85.87109998	137.0422936				
3ra Iteracion	z1	0.988173	1.87814	0.02128394	-0.47205	-0.02521	0.017355273	0.000992	0.135989	0.037038	0.07407694	1.633507539	**RS3 =**	0.919021	**IRI =**	2.187523
	z2	-0.92852	-1.76476	0.9001616	-19.9646	-3.39137	2.334777706	0.062802	8.606485	4.319885	8.639770002	-2.148295557				
	z3	0.063863	0.12138	0.006615445	-0.14672	0.24029	-0.165426647	0.009863	1.351604	0.695847	1.3916946	2.552528834				
	z4	3.743294	7.114576	0.4186779	-9.28581	-46.6788	32.135899	-0.11453	-15.6948	42.93555	85.87110002	100.1409871				
4ta Iteracion	z1	0.988173	1.614188	0.02128394	-0.04572	-0.02521	-0.064347491	0.000992	0.099372	0.037038	0.07407694	1.677564364	**RS4 =**	1.405244	**IRI =**	1.991953
	z2	-0.92852	-1.51674	0.9001616	-1.93381	-3.39137	-8.65656716	0.062802	6.289021	4.319885	8.639769998	2.821673014				
	z3	0.063863	0.104321	0.006615445	-0.01421	0.24029	0.613346133	0.009863	0.987659	0.695847	1.3916946	3.082808429				
	z4	3.743294	6.114699	0.4186779	-0.89944	-46.6788	-119.1490595	-0.11453	-11.4687	42.93555	85.87109998	-39.53136101				
5ta Iteracion	z1	0.988173	1.657723	0.02128394	0.060056	-0.02521	-0.077715473	0.000992	-0.03923	0.037038	0	1.600836531	**RS5 =**	1.124154	**IRI =**	1.818393
	z2	-0.92852	-1.55765	0.9001616	2.539962	-3.39137	-10.45494094	0.062802	-2.48264	4.319885	0	-11.95526009				
	z3	0.063863	0.107135	0.006615445	0.018667	0.24029	0.740766804	0.009863	-0.38989	0.695847	0	0.476682992				
	z4	3.743294	6.279617	0.4186779	1.181372	-46.6788	-143.9018906	-0.11453	4.527333	42.93555	0	-131.9135687				

FIGURA 3.89: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 968m a 979m.*

N°	Dist	Cota	Y'
1	968.00	3817.433	
2	968.50	3817.436	6.00
3	969.00	3817.439	6.00
4	969.50	3817.442	6.00
5	970.00	3817.445	6.00
6	970.50	3817.442	-6.00
7	971.00	3817.439	-6.00
8	971.50	3817.436	-6.00
9	972.00	3817.433	-6.00
10	972.50	3817.429	-8.00
11	973.00	3817.426	-6.00
12	973.50	3817.423	-6.00
13	974.00	3817.417	-12.00
14	974.50	3817.413	-8.00
15	975.00	3817.408	-10.00
16	975.50	3817.407	-2.00
17	976.00	3817.406	-2.00
18	976.50	3817.405	-2.00
19	977.00	3817.404	-2.00
20	977.50	3817.403	-2.00
21	978.00	3817.401	-4.00
22	978.50	3817.400	-2.00
23	979.00	3817.399	-2.00

IRI 5.5457

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -3.09090909
z2' = z4' = 0

$$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-3.05435	0.02128394	0	-0.02521	0.077919685	0.000992	0	0.037038	0.22223082	-2.754201476	RS1 =	5.989176	IRI =	5.989176
	z2	-0.92852	2.869959	0.9001616	0	-3.39137	10.48241327	0.062802	0	4.319885	25.91931	39.27168182				
	z3	0.063863	-0.1974	0.006615445	0	0.24029	-0.742713309	0.009863	0	0.695847	4.1750838	3.23497496				
	z4	3.743294	-11.5702	0.4186779	0	-46.6788	144.28002	-0.11453	0	42.93555	257.6133	390.3231386				
2da Iteracion	z1	0.988173	-2.72163	0.02128394	0.835856	-0.02521	-0.081551487	0.000992	0.387324	0.037038	0.22223082	-1.357767166	RS2 =	10.24372	IRI =	8.116449
	z2	-0.92852	2.55732	0.9001616	35.35086	-3.39137	-10.9709938	0.062802	24.51294	4.319885	25.91931	77.36944123				
	z3	0.063863	-0.17589	0.006615445	0.2598	0.24029	0.777330839	0.009863	3.849632	0.695847	4.1750838	8.885954218				
	z4	3.743294	-10.3098	0.4186779	16.44219	-46.6788	-151.0048462	-0.11453	-44.7018	42.93555	257.6133	68.03905673				
3ra Iteracion	z1	0.988173	-1.34171	0.02128394	1.646727	-0.02521	-0.224008775	0.000992	0.067516	0.037038	0.22223082	0.370756423	RS3 =	7.035699	IRI =	7.756199
	z2	-0.92852	1.260709	0.9001616	69.645	-3.39137	-30.13554967	0.062802	4.272966	4.319885	25.91931	70.96243526				
	z3	0.063863	-0.08671	0.006615445	0.511833	0.24029	2.135202385	0.009863	0.671047	0.695847	4.1750838	7.406455474				
	z4	3.743294	-5.08252	0.4186779	32.39288	-46.6788	-414.7859463	-0.11453	-7.79218	42.93555	257.6133	-137.6544726				
4ta Iteracion	z1	0.988173	0.366371	0.02128394	1.51036	-0.02521	-0.186711632	0.000992	-0.1366	0.037038	0.22223082	1.775653973	RS4 =	3.314608	IRI =	6.645801
	z2	-0.92852	-0.34425	0.9001616	63.87766	-3.39137	-25.11802349	0.062802	-8.64493	4.319885	25.91931	55.68976173				
	z3	0.063863	0.023678	0.006615445	0.469448	0.24029	1.779694223	0.009863	-1.35764	0.695847	4.1750838	5.090261811				
	z4	3.743294	1.38785	0.4186779	29.7104	-46.6788	-345.724676	-0.11453	15.76489	42.93555	257.6133	-41.24823004				
5ta Iteracion	z1	0.988173	1.754653	0.02128394	1.185298	-0.02521	-0.128321988	0.000992	-0.04093	0.037038	-0.22223082	2.548466221	RS5 =	5.42542	IRI =	6.401725
	z2	-0.92852	-1.64872	0.9001616	50.12979	-3.39137	-17.26295611	0.062802	-2.59046	4.319885	-25.91931	2.708338063				
	z3	0.063863	0.113399	0.006615445	0.368413	0.24029	1.223136974	0.009863	-0.40682	0.695847	-4.1750838	-2.876953312				
	z4	3.743294	6.646795	0.4186779	23.31607	-46.6788	-237.6074657	-0.11453	4.723958	42.93555	-257.6133	-460.5339407				

FIGURA 3.90: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 979m a 990m.*

N°	Dist	Cota	Y'
1	979.00	3817.399	
2	979.50	3817.398	-2.00
3	980.00	3817.397	-2.00
4	980.50	3817.395	-4.00
5	981.00	3817.393	-4.00
6	981.50	3817.391	-4.00
7	982.00	3817.389	-4.00
8	982.50	3817.387	-4.00
9	983.00	3817.385	-4.00
10	983.50	3817.383	-4.00
11	984.00	3817.381	-4.00
12	984.50	3817.379	-4.00
13	985.00	3817.376	-6.00
14	985.50	3817.377	2.00
15	986.00	3817.375	-4.00
16	986.50	3817.374	-2.00
17	987.00	3817.373	-2.00
18	987.50	3817.372	-2.00
19	988.00	3817.371	-2.00
20	988.50	3817.370	-2.00
21	989.00	3817.369	-2.00
22	989.50	3817.368	-2.00
23	990.00	3817.367	-2.00

IRI	0.9472

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.90909091
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.87468	0.02128394	0	-0.02521	0.073336175	0.000992	0	0.037038	-0.07407694	-2.875424984	RS1 =	0.598922	IRI =	0.598922
	z2	-0.92852	2.701137	0.9001616	0	-3.39137	9.865800727	0.062802	0	4.319885	-8.63977	3.927168184				
	z3	0.063863	-0.18578	0.006615445	0	0.24029	-0.699024291	0.009863	0	0.695847	-1.3916946	-2.27650292				
	z4	3.743294	-10.8896	0.4186779	0	-46.6788	135.79296	-0.11453	0	42.93555	-85.8711	39.03227747				
2da Iteracion	z1	0.988173	-2.84142	0.02128394	0.083586	-0.02521	0.057389068	0.000992	0.038732	0.037038	-0.07407694	-2.735786357	RS2 =	1.024381	IRI =	0.811651
	z2	-0.92852	2.669878	0.9001616	3.535086	-3.39137	7.72046143	0.062802	2.451292	4.319885	-8.63977	7.736947738				
	z3	0.063863	-0.18363	0.006615445	0.02598	0.24029	-0.547019976	0.009863	0.384963	0.695847	-1.3916946	-1.711405762				
	z4	3.743294	-10.7636	0.4186779	1.644219	-46.6788	106.2644928	-0.11453	-4.47018	42.93555	-85.8711	6.803874722				
3ra Iteracion	z1	0.988173	-2.70343	0.02128394	0.164673	-0.02521	0.043143358	0.000992	0.006752	0.037038	-0.14815388	-2.637015584	RS3 =	0.614035	IRI =	0.745779
	z2	-0.92852	2.540221	0.9001616	6.964503	-3.39137	5.804008448	0.062802	0.427295	4.319885	-17.27954	-1.543512197				
	z3	0.063863	-0.17472	0.006615445	0.051183	0.24029	-0.411233006	0.009863	0.067104	0.695847	-2.7833892	-3.25105065				
	z4	3.743294	-10.2409	0.4186779	3.239289	-46.6788	79.88641863	-0.11453	-0.77921	42.93555	-171.7422	-99.63655943				
4ta Iteracion	z1	0.988173	-2.60583	0.02128394	-0.03285	-0.02521	0.081956744	0.000992	-0.09887	0.037038	-0.14815388	-2.803746969	RS4 =	1.922139	IRI =	1.039869
	z2	-0.92852	2.448511	0.9001616	-1.38941	-3.39137	11.02551239	0.062802	-6.25734	4.319885	-17.27954	-11.45226918				
	z3	0.063863	-0.16841	0.006615445	-0.01021	0.24029	-0.78119366	0.009863	-0.98268	0.695847	-2.7833892	-4.725885794				
	z4	3.743294	-9.87112	0.4186779	-0.64623	-46.6788	151.7552406	-0.11453	11.41089	42.93555	-171.7422	-19.09343151				
5ta Iteracion	z1	0.988173	-2.77059	0.02128394	-0.24375	-0.02521	0.11913632	0.000992	-0.01895	0.037038	-0.14815388	-3.062299909	RS5 =	1.299801	IRI =	1.091856
	z2	-0.92852	2.603324	0.9001616	-10.3089	-3.39137	16.02722258	0.062802	-1.1991	4.319885	-17.27954	-10.15698583				
	z3	0.063863	-0.17906	0.006615445	-0.07576	0.24029	-1.135581207	0.009863	-0.18831	0.695847	-2.7833892	-4.362101091				
	z4	3.743294	-10.4952	0.4186779	-4.79481	-46.6788	220.5988196	-0.11453	2.186677	42.93555	-171.7422	35.75323552				

FIGURA 3.91: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 990m a 1001m.*

N°	Dist	Cota	Y'
1	990.00	3817.367	
2	990.50	3817.366	-2.00
3	991.00	3817.365	-2.00
4	991.50	3817.364	-2.00
5	992.00	3817.363	-2.00
6	992.50	3817.362	-2.00
7	993.00	3817.361	-2.00
8	993.50	3817.360	-2.00
9	994.00	3817.359	-2.00
10	994.50	3817.358	-2.00
11	995.00	3817.356	-4.00
12	995.50	3817.357	2.00
13	996.00	3817.357	0.00
14	996.50	3817.358	2.00
15	997.00	3817.359	2.00
16	997.50	3817.359	0.00
17	998.00	3817.358	-2.00
18	998.50	3817.359	2.00
19	999.00	3817.359	0.00
20	999.50	3817.360	2.00
21	1000.00	3817.360	0.00
22	1000.50	3817.359	-2.00
23	1001.00	3817.358	-2.00

IRI 1.3792

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.81818182
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.8085	0.02128394	0	-0.02521	0.020625799	0.000992	0	0.037038	-0.07407694	-0.861956077	RS1 =	0.778591	IRI =	0.778591
	z2	-0.92852	0.759695	0.9001616	0	-3.39137	2.774756455	0.062802	0	4.319885	-8.63977	-5.105318638				
	z3	0.063863	-0.05225	0.006615445	0	0.24029	-0.196600582	0.009863	0	0.695847	-1.3916946	-1.64054694				
	z4	3.743294	-3.0627	0.4186779	0	-46.6788	38.19177	-0.11453	0	42.93555	-85.8711	-50.74202511				
2da Iteracion	z1	0.988173	-0.85176	0.02128394	-0.10866	-0.02521	0.041357056	0.000992	-0.05035	0.037038	-0.07407694	-1.043494792	RS2 =	1.33168	IRI =	1.055135
	z2	-0.92852	0.80034	0.9001616	-4.59561	-3.39137	5.563700036	0.062802	-3.18668	4.319885	-8.63977	-10.05802566				
	z3	0.063863	-0.05505	0.006615445	-0.03377	0.24029	-0.394206368	0.009863	-0.50045	0.695847	-1.3916946	-2.375174604				
	z4	3.743294	-3.22656	0.4186779	-2.13748	-46.6788	76.57881173	-0.11453	5.811235	42.93555	-85.8711	-8.845091845				
3ra Iteracion	z1	0.988173	-1.03115	0.02128394	-0.21407	-0.02521	0.059876513	0.000992	-0.00878	0.037038	-0.07407694	-1.268205039	RS3 =	0.914635	IRI =	1.008302
	z2	-0.92852	0.968902	0.9001616	-9.05385	-3.39137	8.05509352	0.062802	-0.55549	4.319885	-8.63977	-9.225109883				
	z3	0.063863	-0.06664	0.006615445	-0.06654	0.24029	-0.570729755	0.009863	-0.08724	0.695847	-1.3916946	-2.182839961				
	z4	3.743294	-3.90611	0.4186779	-4.21107	-46.6788	110.8703715	-0.11453	1.012985	42.93555	-85.8711	17.8950757				
4ta Iteracion	z1	0.988173	-1.25321	0.02128394	-0.19635	-0.02521	0.055027889	0.000992	0.017758	0.037038	-0.07407694	-1.450843754	RS4 =	0.430891	IRI =	0.863949
	z2	-0.92852	1.177549	0.9001616	-8.30409	-3.39137	7.402815776	0.062802	1.123841	4.319885	-8.63977	-7.239654587				
	z3	0.063863	-0.08099	0.006615445	-0.06103	0.24029	-0.524513741	0.009863	0.176493	0.695847	-1.3916946	-1.881734851				
	z4	3.743294	-4.74726	0.4186779	-3.86235	-46.6788	101.8924155	-0.11453	-2.04944	42.93555	-85.8711	5.362266197				
5ta Iteracion	z1	0.988173	-1.43368	0.02128394	-0.15409	-0.02521	0.047437237	0.000992	0.005321	0.037038	-0.07407694	-1.609091201	RS5 =	0.322428	IRI =	0.755645
	z2	-0.92852	1.347132	0.9001616	-6.51686	-3.39137	6.381657239	0.062802	0.336759	4.319885	-8.63977	-7.091080908				
	z3	0.063863	-0.09266	0.006615445	-0.04789	0.24029	-0.452161315	0.009863	0.052886	0.695847	-1.3916946	-1.931518748				
	z4	3.743294	-5.43093	0.4186779	-3.03108	-46.6788	87.8371812	-0.11453	-0.61411	42.93555	-85.8711	-7.110050988				

FIGURA 3.92: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1001m a 1012m.*

N°	Dist	Cota	Y'
1	1001.00	3817.358	
2	1001.50	3817.357	-2.00
3	1002.00	3817.355	-4.00
4	1002.50	3817.354	-2.00
5	1003.00	3817.353	-2.00
6	1003.50	3817.352	-2.00
7	1004.00	3817.351	-2.00
8	1004.50	3817.350	-2.00
9	1005.00	3817.349	-2.00
10	1005.50	3817.350	2.00
11	1006.00	3817.349	-2.00
12	1006.50	3817.349	0.00
13	1007.00	3817.350	2.00
14	1007.50	3817.349	-2.00
15	1008.00	3817.350	2.00
16	1008.50	3817.349	-2.00
17	1009.00	3817.348	-2.00
18	1009.50	3817.348	0.00
19	1010.00	3817.348	0.00
20	1010.50	3817.349	2.00
21	1011.00	3817.349	0.00
22	1011.50	3817.350	2.00
23	1012.00	3817.350	0.00

IRI **1.0906**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.72727273
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

Z_j' = Z_j from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.71867	0.02128394	0	-0.02521	0.018334044	0.000992	0	0.037038	-0.07407694	-0.774413951	RS1 =	0.838483	IRI =	0.838483
	z2	-0.92852	0.675284	0.9001616	0	-3.39137	2.466450182	0.062802	0	4.319885	-8.63977	-5.498035452				
	z3	0.063863	-0.04645	0.006615445	0	0.24029	-0.174756073	0.009863	0	0.695847	-1.3916946	-1.61289668				
	z4	3.743294	-2.7224	0.4186779	0	-46.6788	33.94824	-0.11453	0	42.93555	-85.8711	-54.64525562				
2da Iteracion	z1	0.988173	-0.76525	0.02128394	-0.11702	-0.02521	0.040660012	0.000992	-0.05423	0.037038	-0.14815388	-1.043993838	RS2 =	2.751735	IRI =	1.795109
	z2	-0.92852	0.719056	0.9001616	-4.94912	-3.39137	5.4699278	0.062802	-3.43181	4.319885	-17.27954	-19.47149016				
	z3	0.063863	-0.04946	0.006615445	-0.03637	0.24029	-0.387562298	0.009863	-0.53895	0.695847	-2.7833892	-3.795728718				
	z4	3.743294	-2.89886	0.4186779	-2.30191	-46.6788	75.28812392	-0.11453	6.258253	42.93555	-171.7422	-95.39658175				
3ra Iteracion	z1	0.988173	-1.03165	0.02128394	-0.41443	-0.02521	0.095687702	0.000992	-0.09466	0.037038	-0.07407694	-1.519129078	RS3 =	1.920991	IRI =	1.83707
	z2	-0.92852	0.969365	0.9001616	-17.5275	-3.39137	12.87271671	0.062802	-5.99106	4.319885	-8.63977	-18.31624069				
	z3	0.063863	-0.06667	0.006615445	-0.12881	0.24029	-0.912074135	0.009863	-0.94087	0.695847	-1.3916946	-3.440120117				
	z4	3.743294	-3.90798	0.4186779	-8.15228	-46.6788	177.1801756	-0.11453	10.9253	42.93555	-85.8711	90.17412013				
4ta Iteracion	z1	0.988173	-1.50116	0.02128394	-0.38984	-0.02521	0.086723054	0.000992	0.089481	0.037038	-0.07407694	-1.788876269	RS4 =	0.241728	IRI =	1.438234
	z2	-0.92852	1.410536	0.9001616	-16.4876	-3.39137	11.66671672	0.062802	5.663085	4.319885	-8.63977	-6.387008815				
	z3	0.063863	-0.09702	0.006615445	-0.12117	0.24029	-0.826625087	0.009863	0.889358	0.695847	-1.3916946	-1.547147813				
	z4	3.743294	-5.68655	0.4186779	-7.66861	-46.6788	160.5807821	-0.11453	-10.3272	42.93555	-85.8711	51.02733005				
5ta Iteracion	z1	0.988173	-1.76772	0.02128394	-0.13594	-0.02521	0.039002529	0.000992	0.050635	0.037038	-0.07407694	-1.888098554	RS5 =	0.47141	IRI =	1.244869
	z2	-0.92852	1.661	0.9001616	-5.74934	-3.39137	5.246949133	0.062802	3.204602	4.319885	-8.63977	-4.276559162				
	z3	0.063863	-0.11424	0.006615445	-0.04225	0.24029	-0.371763529	0.009863	0.503266	0.695847	-1.3916946	-1.416688278				
	z4	3.743294	-6.69629	0.4186779	-2.6741	-46.6788	72.21904977	-0.11453	-5.84391	42.93555	-85.8711	-28.86634957				

FIGURA 3.93: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1012m a 1023m.*

N°	Dist	Cota	Y'
1	1012.00	3817.350	
2	1012.50	3817.351	2.00
3	1013.00	3817.352	2.00
4	1013.50	3817.353	2.00
5	1014.00	3817.354	2.00
6	1014.50	3817.354	0.00
7	1015.00	3817.355	2.00
8	1015.50	3817.355	0.00
9	1016.00	3817.354	-2.00
10	1016.50	3817.353	-2.00
11	1017.00	3817.353	0.00
12	1017.50	3817.353	0.00
13	1018.00	3817.352	-2.00
14	1018.50	3817.352	0.00
15	1019.00	3817.352	0.00
16	1019.50	3817.351	-2.00
17	1020.00	3817.351	0.00
18	1020.50	3817.352	2.00
19	1021.00	3817.351	-2.00
20	1021.50	3817.351	0.00
21	1022.00	3817.351	0.00
22	1022.50	3817.352	2.00
23	1023.00	3817.352	0.00

IRI	1.2680

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.181818182
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.179668	0.02128394	0	-0.02521	-0.004583511	0.000992	0	0.037038	0.07407694	0.249161193	RS1 =	1.197834	IRI =	1.197834
	z2	-0.92852	-0.16882	0.9001616	0	-3.39137	-0.616612545	0.062802	0	4.319885	8.639770002	7.854336365				
	z3	0.063863	0.011612	0.006615445	0	0.24029	0.043689018	0.009863	0	0.695847	1.3916946	1.44699512				
	z4	3.743294	0.680599	0.4186779	0	-46.6788	-8.48706	-0.11453	0	42.93555	85.87110002	78.06463893				
2da Iteracion	z1	0.988173	0.246214	0.02128394	0.167171	-0.02521	-0.036477749	0.000992	0.077465	0.037038	0.07407694	0.528449533	RS2 =	2.048742	IRI =	1.623288
	z2	-0.92852	-0.23135	0.9001616	7.070172	-3.39137	-4.907294394	0.062802	4.90259	4.319885	8.639769998	15.47388713				
	z3	0.063863	0.015912	0.006615445	0.05196	0.24029	0.347697879	0.009863	0.769327	0.695847	1.3916946	2.577191208				
	z4	3.743294	0.932684	0.4186779	3.288437	-46.6788	-67.54403923	-0.11453	-8.94036	42.93555	85.87109998	13.60782082				
3ra Iteracion	z1	0.988173	0.522199	0.02128394	0.329345	-0.02521	-0.064969212	0.000992	0.013503	0.037038	0.07407694	0.87415568	RS3 =	1.407136	IRI =	1.551237
	z2	-0.92852	-0.49067	0.9001616	13.929	-3.39137	-8.740206369	0.062802	0.854594	4.319885	8.639770002	14.19248266				
	z3	0.063863	0.033749	0.006615445	0.102367	0.24029	0.619272244	0.009863	0.13421	0.695847	1.3916946	2.281291586				
	z4	3.743294	1.978142	0.4186779	6.478575	-46.6788	-120.3002703	-0.11453	-1.55844	42.93555	85.87110002	-27.53089074				
4ta Iteracion	z1	0.988173	0.863817	0.02128394	0.302072	-0.02521	-0.057509787	0.000992	-0.02732	0.037038	0.07407694	1.155136524	RS4 =	0.662916	IRI =	1.329157
	z2	-0.92852	-0.81167	0.9001616	12.77553	-3.39137	-7.736701565	0.062802	-1.72899	4.319885	8.639769998	11.13794288				
	z3	0.063863	0.055826	0.006615445	0.09389	0.24029	0.548170643	0.009863	-0.27153	0.695847	1.3916946	1.818052897				
	z4	3.743294	3.272222	0.4186779	5.942079	-46.6788	-106.4880221	-0.11453	3.152978	42.93555	85.87109998	-8.249643587				
5ta Iteracion	z1	0.988173	1.141474	0.02128394	0.237059	-0.02521	-0.045831859	0.000992	-0.00819	0.037038	0	1.32451557	RS5 =	0.821567	IRI =	1.227639
	z2	-0.92852	-1.07256	0.9001616	10.02595	-3.39137	-6.165688234	0.062802	-0.51809	4.319885	0	2.269606109				
	z3	0.063863	0.073771	0.006615445	0.073682	0.24029	0.436859203	0.009863	-0.08136	0.695847	0	0.502948841				
	z4	3.743294	4.324016	0.4186779	4.663211	-46.6788	-84.8645821	-0.11453	0.944791	42.93555	0	-74.93256469				

FIGURA 3.94: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1023m a 1034m.*

N°	Dist	Cota	Y'
1	1023.00	3817.352	
2	1023.50	3817.352	0.00
3	1024.00	3817.351	-2.00
4	1024.50	3817.351	0.00
5	1025.00	3817.351	0.00
6	1025.50	3817.352	2.00
7	1026.00	3817.353	2.00
8	1026.50	3817.352	-2.00
9	1027.00	3817.352	0.00
10	1027.50	3817.353	2.00
11	1028.00	3817.353	0.00
12	1028.50	3817.353	0.00
13	1029.00	3817.354	2.00
14	1029.50	3817.354	0.00
15	1030.00	3817.354	0.00
16	1030.50	3817.354	0.00
17	1031.00	3817.353	-2.00
18	1031.50	3817.353	0.00
19	1032.00	3817.353	0.00
20	1032.50	3817.352	-2.00
21	1033.00	3817.352	0.00
22	1033.50	3817.352	0.00
23	1034.00	3817.352	0.00

IRI **1.0809**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0
z2' = **z4'** = 0

$Y' = (Y_1 - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0	0.02128394	0	-0.02521	0	0.000992	0	0.037038	0	0	RS1 =	0	IRI =	0
	z2	-0.92852	0	0.9001616	0	-3.39137	0	0.062802	0	4.319885	0	0				
	z3	0.063863	0	0.006615445	0	0.24029	0	0.003863	0	0.695847	0	0				
	z4	3.743294	0	0.4186779	0	-46.6788	0	-0.11453	0	42.93555	0	0				
2da Iteracion	z1	0.988173	0	0.02128394	0	-0.02521	0	0.000992	0	0.037038	-0.07407694	-0.07407694	RS2 =	1.317618	IRI =	0.658809
	z2	-0.92852	0	0.9001616	0	-3.39137	0	0.062802	0	4.319885	-8.63977	-8.639769998				
	z3	0.063863	0	0.006615445	0	0.24029	0	0.003863	0	0.695847	-1.3916946	-1.3916946				
	z4	3.743294	0	0.4186779	0	-46.6788	0	-0.11453	0	42.93555	-85.8711	-85.87109998				
3ra Iteracion	z1	0.988173	-0.0732	0.02128394	-0.18389	-0.02521	0.035083661	0.000992	-0.08521	0.037038	0	-0.307216805	RS3 =	0.935999	IRI =	0.751205
	z2	-0.92852	0.068782	0.9001616	-7.77719	-3.39137	4.719749923	0.062802	-5.39285	4.319885	0	-8.381506122				
	z3	0.063863	-0.00473	0.006615445	-0.05716	0.24029	-0.334409739	0.003863	-0.84692	0.695847	0	-1.243215637				
	z4	3.743294	-0.27729	0.4186779	-3.61728	-46.6788	64.96267563	-0.11453	9.834396	42.93555	0	70.90249942				
4ta Iteracion	z1	0.988173	-0.30358	0.02128394	-0.17839	-0.02521	0.031340608	0.000992	0.070358	0.037038	0	-0.380276404	RS4 =	0.705766	IRI =	0.739846
	z2	-0.92852	0.285256	0.9001616	-7.54471	-3.39137	4.216202972	0.062802	4.452795	4.319885	0	1.409544101				
	z3	0.063863	-0.01962	0.006615445	-0.05545	0.24029	-0.298731788	0.003863	0.693289	0.695847	0	0.325489615				
	z4	3.743294	-1.15	0.4186779	-3.50915	-46.6788	58.03185138	-0.11453	-8.12012	42.93555	0	45.25258134				
5ta Iteracion	z1	0.988173	-0.37578	0.02128394	0.030001	-0.02521	-0.008205369	0.000992	0.044905	0.037038	0.07407694	-0.235001655	RS5 =	2.136259	IRI =	1.019128
	z2	-0.92852	0.353093	0.9001616	1.268817	-3.39137	-1.103855391	0.062802	2.841938	4.319885	8.639769998	11.99976249				
	z3	0.063863	-0.02429	0.006615445	0.009325	0.24029	0.078211769	0.003863	0.446312	0.695847	1.3916946	1.901257169				
	z4	3.743294	-1.42349	0.4186779	0.590145	-46.6788	-15.19347442	-0.11453	-5.18256	42.93555	85.87109998	64.66172773				

FIGURA 3.95: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1034m a 1045m.*

N°	Dist	Cota	Y'
1	1034.00	3817.352	
2	1034.50	3817.351	-2.00
3	1035.00	3817.351	0.00
4	1035.50	3817.350	-2.00
5	1036.00	3817.349	-2.00
6	1036.50	3817.348	-2.00
7	1037.00	3817.352	8.00
8	1037.50	3817.353	2.00
9	1038.00	3817.352	-2.00
10	1038.50	3817.350	-4.00
11	1039.00	3817.348	-4.00
12	1039.50	3817.346	-4.00
13	1040.00	3817.344	-4.00
14	1040.50	3817.340	-8.00
15	1041.00	3817.339	-2.00
16	1041.50	3817.339	0.00
17	1042.00	3817.338	-2.00
18	1042.50	3817.337	-2.00
19	1043.00	3817.337	0.00
20	1043.50	3817.336	-2.00
21	1044.00	3817.335	-2.00
22	1044.50	3817.335	0.00
23	1045.00	3817.334	-2.00

IRI 2.4840

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.63636364
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.61701	0.02128394	0	-0.02521	0.041251598	0.000992	0	0.037038	-0.07407694	-1.649835215	RS1 =	0.239564	IRI =	0.239564
	z2	-0.92852	1.51939	0.9001616	0	-3.39137	5.549512909	0.062802	0	4.319885	-8.63977	-1.570867271				
	z3	0.063863	-0.1045	0.006615445	0	0.24029	-0.393201164	0.009863	0	0.695847	-1.3916946	-1.88939928				
	z4	3.743294	-6.12539	0.4186779	0	-46.6788	76.38354	-0.11453	0	42.93555	-85.8711	-15.61295016				
2da Iteracion	z1	0.988173	-1.63032	0.02128394	-0.03343	-0.02521	0.047630452	0.000992	-0.01549	0.037038	0	-1.631618899	RS2 =	0.907875	IRI =	0.573719
	z2	-0.92852	1.531898	0.9001616	-1.41403	-3.39137	6.407650146	0.062802	-0.98052	4.319885	0	5.5449948				
	z3	0.063863	-0.10536	0.006615445	-0.01039	0.24029	-0.454002997	0.009863	-0.15399	0.695847	0	-0.72374437				
	z4	3.743294	-6.17582	0.4186779	-0.65769	-46.6788	88.19494778	-0.11453	1.788075	42.93555	0	83.14951679				
3ra Iteracion	z1	0.988173	-1.61232	0.02128394	0.118019	-0.02521	0.018245096	0.000992	0.082511	0.037038	-0.07407694	-1.467623123	RS3 =	0.654579	IRI =	0.600673
	z2	-0.92852	1.514984	0.9001616	4.991391	-3.39137	2.454484219	0.062802	5.221929	4.319885	-8.63977	5.543018377				
	z3	0.063863	-0.1042	0.006615445	0.036683	0.24029	-0.173908245	0.009863	0.820077	0.695847	-1.3916946	-0.813043663				
	z4	3.743294	-6.10763	0.4186779	2.321567	-46.6788	33.7835404	-0.11453	-9.52271	42.93555	-85.8711	-65.3963288				
4ta Iteracion	z1	0.988173	-1.45027	0.02128394	0.117977	-0.02521	0.02049627	0.000992	-0.06489	0.037038	-0.07407694	-1.45076236	RS4 =	0.838339	IRI =	0.660089
	z2	-0.92852	1.362712	0.9001616	4.989612	-3.39137	2.757331074	0.062802	-4.107	4.319885	-8.63977	-3.637113746				
	z3	0.063863	-0.09373	0.006615445	0.03667	0.24029	-0.195365937	0.009863	-0.64498	0.695847	-1.3916946	-2.289101265				
	z4	3.743294	-5.49374	0.4186779	2.320739	-46.6788	37.95192693	-0.11453	7.489521	42.93555	-85.8711	-43.60265753				
5ta Iteracion	z1	0.988173	-1.4336	0.02128394	-0.07741	-0.02521	0.057706663	0.000992	-0.04327	0.037038	-0.07407694	-1.570653782	RS5 =	0.917839	IRI =	0.711639
	z2	-0.92852	1.347056	0.9001616	-3.27399	-3.39137	7.763187067	0.062802	-2.73832	4.319885	-8.63977	-5.541836705				
	z3	0.063863	-0.09265	0.006615445	-0.02406	0.24029	-0.550047227	0.009863	-0.43004	0.695847	-1.3916946	-2.488492425				
	z4	3.743294	-5.43063	0.4186779	-1.52278	-46.6788	106.8525688	-0.11453	4.993599	42.93555	-85.8711	19.02165835				

FIGURA 3.96: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1045m a 1056m.*

N°	Dist	Cota	Y'
1	1045.00	3817.334	
2	1045.50	3817.333	-2.00
3	1046.00	3817.332	-2.00
4	1046.50	3817.332	0.00
5	1047.00	3817.331	-2.00
6	1047.50	3817.331	0.00
7	1048.00	3817.330	-2.00
8	1048.50	3817.330	0.00
9	1049.00	3817.329	-2.00
10	1049.50	3817.328	-2.00
11	1050.00	3817.327	-2.00
12	1050.50	3817.325	-4.00
13	1051.00	3817.323	-4.00
14	1051.50	3817.320	-6.00
15	1052.00	3817.317	-6.00
16	1052.50	3817.314	-6.00
17	1053.00	3817.313	-2.00
18	1053.50	3817.310	-6.00
19	1054.00	3817.308	-4.00
20	1054.50	3817.305	-6.00
21	1055.00	3817.302	-6.00
22	1055.50	3817.303	2.00
23	1056.00	3817.301	-4.00

IRI | **1.8289**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -3
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.96452	0.02128394	0	-0.02521	0.07562793	0.000992	0	0.037038	-0.07407694	-2.96296711	RS1 =	0.658814	IRI =	0.658814
	z2	-0.92852	2.785548	0.9001616	0	-3.39137	10.174107	0.062802	0	4.319885	-8.63977	4.319885002				
	z3	0.063863	-0.19159	0.006615445	0	0.24029	-0.7208688	0.009863	0	0.695847	-1.3916946	-2.30415318				
	z4	3.743294	-11.2299	0.4186779	0	-46.6788	140.03649	-0.11453	0	42.93555	-85.8711	42.93550802				
2da Iteracion	z1	0.988173	-2.92792	0.02128394	0.091944	-0.02521	0.058086112	0.000992	0.042606	0.037038	-0.07407694	-2.809364251	RS2 =	1.126818	IRI =	0.892816
	z2	-0.92852	2.751162	0.9001616	3.888595	-3.39137	7.814233665	0.062802	2.696422	4.319885	-8.63977	8.510642233				
	z3	0.063863	-0.18922	0.006615445	0.028578	0.24029	-0.553664046	0.009863	0.423459	0.695847	-1.3916946	-1.682546247				
	z4	3.743294	-11.0913	0.4186779	1.80864	-46.6788	107.5551746	-0.11453	-4.91719	42.93555	-85.8711	7.484264576				
3ra Iteracion	z1	0.988173	-2.77614	0.02128394	0.18114	-0.02521	0.04241583	0.000992	0.007427	0.037038	0	-2.545154469	RS3 =	2.091558	IRI =	1.292396
	z2	-0.92852	2.60854	0.9001616	7.660953	-3.39137	5.706135184	0.062802	0.470024	4.319885	0	16.44565248				
	z3	0.063863	-0.17942	0.006615445	0.056302	0.24029	-0.404298365	0.009863	0.073815	0.695847	0	-0.453596932				
	z4	3.743294	-10.5163	0.4186779	3.563218	-46.6788	78.53929024	-0.11453	-0.85714	42.93555	0	70.72909556				
4ta Iteracion	z1	0.988173	-2.51505	0.02128394	0.350028	-0.02521	0.011434866	0.000992	0.070186	0.037038	-0.07407694	-2.157480309	RS4 =	1.300623	IRI =	1.294453
	z2	-0.92852	2.363217	0.9001616	14.80374	-3.39137	1.538314574	0.062802	4.441905	4.319885	-8.63977	14.50741139				
	z3	0.063863	-0.16254	0.006615445	0.108795	0.24029	-0.108994625	0.009863	0.697578	0.695847	-1.3916946	-0.856857342				
	z4	3.743294	-9.52726	0.4186779	6.885431	-46.6788	21.17337409	-0.11453	-8.10026	42.93555	-85.8711	-75.43981288				
5ta Iteracion	z1	0.988173	-2.13196	0.02128394	0.308775	-0.02521	0.021600782	0.000992	-0.07486	0.037038	0	-1.876447657	RS5 =	0.884704	IRI =	1.212503
	z2	-0.92852	2.003255	0.9001616	13.05901	-3.39137	2.905919426	0.062802	-4.73775	4.319885	0	13.23044283				
	z3	0.063863	-0.13778	0.006615445	0.095973	0.24029	-0.205893908	0.009863	-0.74404	0.695847	0	-0.931743385				
	z4	3.743294	-8.07608	0.4186779	6.073933	-46.6788	39.99709818	-0.11453	8.639752	42.93555	0	46.63469374				

FIGURA 3.97: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1056m a 1067m.*

N°	Dist	Cota	Y'
1	1056.00	3817.301	
2	1056.50	3817.300	-2.00
3	1057.00	3817.299	-2.00
4	1057.50	3817.298	-2.00
5	1058.00	3817.297	-2.00
6	1058.50	3817.296	-2.00
7	1059.00	3817.295	-2.00
8	1059.50	3817.294	-2.00
9	1060.00	3817.293	-2.00
10	1060.50	3817.293	0.00
11	1061.00	3817.294	2.00
12	1061.50	3817.295	2.00
13	1062.00	3817.295	0.00
14	1062.50	3817.294	-2.00
15	1063.00	3817.294	0.00
16	1063.50	3817.293	-2.00
17	1064.00	3817.294	2.00
18	1064.50	3817.294	0.00
19	1065.00	3817.295	2.00
20	1065.50	3817.293	-4.00
21	1066.00	3817.293	0.00
22	1066.50	3817.293	0.00
23	1067.00	3817.292	-2.00

IRI | **1.3259**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.81818182
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.8085	0.02128394	0	-0.02521	0.020625799	0.000932	0	0.037038	-0.07407694	-0.861956077	RS1 =	0.778591	IRI =	0.778591
	z2	-0.92852	0.759695	0.9001616	0	-3.39137	2.774756455	0.062802	0	4.319885	-8.63977	-5.105318638				
	z3	0.063863	-0.05225	0.006615445	0	0.24029	-0.196600582	0.009863	0	0.695847	-1.3916946	-1.64054694				
	z4	3.743294	-3.0627	0.4186779	0	-46.6788	38.19177	-0.11453	0	42.93555	-85.8711	-50.74202511				
2da Iteracion	z1	0.988173	-0.85176	0.02128394	-0.10866	-0.02521	0.041357056	0.000932	-0.05035	0.037038	-0.07407694	-1.043494792	RS2 =	1.33168	IRI =	1.055135
	z2	-0.92852	0.80034	0.9001616	-4.59561	-3.39137	5.563700036	0.062802	-3.18668	4.319885	-8.63977	-10.05802566				
	z3	0.063863	-0.05505	0.006615445	-0.03377	0.24029	-0.394206368	0.009863	-0.50045	0.695847	-1.3916946	-2.375174604				
	z4	3.743294	-3.22656	0.4186779	-2.13748	-46.6788	76.57881173	-0.11453	5.811235	42.93555	-85.8711	-8.845091845				
3ra Iteracion	z1	0.988173	-1.03115	0.02128394	-0.21407	-0.02521	0.059876513	0.000932	-0.00878	0.037038	-0.07407694	-1.268205039	RS3 =	0.914635	IRI =	1.008302
	z2	-0.92852	0.968902	0.9001616	-9.05385	-3.39137	8.05509352	0.062802	-0.55549	4.319885	-8.63977	-9.225109883				
	z3	0.063863	-0.06664	0.006615445	-0.06654	0.24029	-0.570729755	0.009863	-0.08724	0.695847	-1.3916946	-2.182839361				
	z4	3.743294	-3.90611	0.4186779	-4.21107	-46.6788	110.8703715	-0.11453	1.012985	42.93555	-85.8711	17.8950757				
4ta Iteracion	z1	0.988173	-1.25321	0.02128394	-0.19635	-0.02521	0.055027889	0.000932	0.017758	0.037038	-0.07407694	-1.450843754	RS4 =	0.430891	IRI =	0.863949
	z2	-0.92852	1.177549	0.9001616	-8.30409	-3.39137	7.402815776	0.062802	1.123841	4.319885	-8.63977	-7.239654587				
	z3	0.063863	-0.08099	0.006615445	-0.06103	0.24029	-0.524513741	0.009863	0.176493	0.695847	-1.3916946	-1.881734851				
	z4	3.743294	-4.74726	0.4186779	-3.86235	-46.6788	101.8924155	-0.11453	-2.04944	42.93555	-85.8711	5.362266197				
5ta Iteracion	z1	0.988173	-1.43368	0.02128394	-0.15409	-0.02521	0.047437237	0.000932	0.005321	0.037038	-0.07407694	-1.609091201	RS5 =	0.322428	IRI =	0.755645
	z2	-0.92852	1.347132	0.9001616	-6.51686	-3.39137	6.381657239	0.062802	0.336759	4.319885	-8.63977	-7.091080908				
	z3	0.063863	-0.09266	0.006615445	-0.04789	0.24029	-0.452161315	0.009863	0.052886	0.695847	-1.3916946	-1.931518748				
	z4	3.743294	-5.43093	0.4186779	-3.03108	-46.6788	87.8371812	-0.11453	-0.61411	42.93555	-85.8711	-7.110050988				

FIGURA 3.98: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1067m a 1078m.*

N°	Dist	Cota	Y'
1	1067.00	3817.292	
2	1067.50	3817.291	-2.00
3	1068.00	3817.290	-2.00
4	1068.50	3817.290	0.00
5	1069.00	3817.289	-2.00
6	1069.50	3817.289	0.00
7	1070.00	3817.288	-2.00
8	1070.50	3817.287	-2.00
9	1071.00	3817.286	-2.00
10	1071.50	3817.284	-4.00
11	1072.00	3817.281	-6.00
12	1072.50	3817.280	-2.00
13	1073.00	3817.278	-4.00
14	1073.50	3817.277	-2.00
15	1074.00	3817.275	-4.00
16	1074.50	3817.273	-4.00
17	1075.00	3817.271	-4.00
18	1075.50	3817.272	2.00
19	1076.00	3817.271	-2.00
20	1076.50	3817.270	-2.00
21	1077.00	3817.269	-2.00
22	1077.50	3817.268	-2.00
23	1078.00	3817.267	-2.00

IRI 1.4423

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.27272727
z2' = **z4'** = 0

$Y' = (Y_1 - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.24585	0.02128394	0	-0.02521	0.057293886	0.000992	0	0.037038	-0.07407694	-2.262630099	RS1 =	0.179679	IRI =	0.179679
	z2	-0.92852	2.110264	0.9001616	0	-3.39137	7.707656818	0.062802	0	4.319885	-8.63977	1.178150453				
	z3	0.063863	-0.14514	0.006615445	0	0.24029	-0.546112727	0.009863	0	0.695847	-1.3916946	-2.0829511				
	z4	3.743294	-8.50749	0.4186779	0	-46.6788	106.08825	-0.11453	0	42.93555	-85.8711	11.70966362				
2da Iteracion	z1	0.988173	-2.23587	0.02128394	0.025076	-0.02521	0.05250976	0.000992	0.01162	0.037038	-0.07407694	-2.220741098	RS2 =	0.307319	IRI =	0.243499
	z2	-0.92852	2.100888	0.9001616	1.060526	-3.39137	7.06405579	0.062802	0.735386	4.319885	-8.63977	2.321086268				
	z3	0.063863	-0.1445	0.006615445	0.007794	0.24029	-0.500511487	0.009863	0.115489	0.695847	-1.3916946	-1.913422366				
	z4	3.743294	-8.46969	0.4186779	0.493266	-46.6788	97.22972031	-0.11453	-1.34105	42.93555	-85.8711	2.041145816				
3ra Iteracion	z1	0.988173	-2.19448	0.02128394	0.049402	-0.02521	0.048236058	0.000992	0.002025	0.037038	0	-2.094812346	RS3 =	1.528699	IRI =	0.671899
	z2	-0.92852	2.061994	0.9001616	2.089353	-3.39137	6.489121296	0.062802	0.128187	4.319885	0	10.76865503				
	z3	0.063863	-0.14182	0.006615445	0.015355	0.24029	-0.459775495	0.009863	0.020131	0.695847	0	-0.566113075				
	z4	3.743294	-8.31289	0.4186779	0.971788	-46.6788	89.31631734	-0.11453	-0.23376	42.93555	0	81.74145561				
4ta Iteracion	z1	0.988173	-2.07004	0.02128394	0.229199	-0.02521	0.01427132	0.000992	0.081113	0.037038	-0.07407694	-1.819529189	RS4 =	1.035451	IRI =	0.762787
	z2	-0.92852	1.945067	0.9001616	9.69353	-3.39137	1.919898331	0.062802	5.1335	4.319885	-8.63977	10.05222477				
	z3	0.063863	-0.13378	0.006615445	0.071239	0.24029	-0.136031084	0.009863	0.80619	0.695847	-1.3916946	-0.784077966				
	z4	3.743294	-7.8415	0.4186779	4.508598	-46.6788	26.42549597	-0.11453	-9.36145	42.93555	-85.8711	-72.13995304				
5ta Iteracion	z1	0.988173	-1.79801	0.02128394	0.213951	-0.02521	0.019766064	0.000992	-0.07159	0.037038	0	-1.635877724	RS5 =	0.686278	IRI =	0.747485
	z2	-0.92852	1.689462	0.9001616	9.048627	-3.39137	2.659097706	0.062802	-4.53051	4.319885	0	8.866676882				
	z3	0.063863	-0.1162	0.006615445	0.0665	0.24029	-0.188405781	0.009863	-0.71149	0.695847	0	-0.949600178				
	z4	3.743294	-6.81103	0.4186779	4.208644	-46.6788	36.59984206	-0.11453	8.261835	42.93555	0	42.25928906				

FIGURA 3.99: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1078m a 1089m.*

N°	Dist	Cota	Y'
1	1078.00	3817.267	
2	1078.50	3817.265	-4.00
3	1079.00	3817.264	-2.00
4	1079.50	3817.263	-2.00
5	1080.00	3817.262	-2.00
6	1080.50	3817.263	2.00
7	1081.00	3817.263	0.00
8	1081.50	3817.262	-2.00
9	1082.00	3817.262	0.00
10	1082.50	3817.261	-2.00
11	1083.00	3817.261	0.00
12	1083.50	3817.262	2.00
13	1084.00	3817.261	-2.00
14	1084.50	3817.260	-2.00
15	1085.00	3817.260	0.00
16	1085.50	3817.259	-2.00
17	1086.00	3817.259	0.00
18	1086.50	3817.258	-2.00
19	1087.00	3817.258	0.00
20	1087.50	3817.257	-2.00
21	1088.00	3817.256	-2.00
22	1088.50	3817.256	0.00
23	1089.00	3817.256	0.00

IRI **0.9937**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.98817	0.02128394	0	-0.02521	0.02520931	0.000992	0	0.037038	-0.14815388	-1.111111727	RS1 =	1.976425	IRI =	1.976425
	z2	-0.92852	0.928516	0.9001616	0	-3.39137	3.391369	0.062802	0	4.319885	-17.27954	-12.959655				
	z3	0.063863	-0.06386	0.006615445	0	0.24029	-0.2402896	0.009863	0	0.695847	-2.7833892	-3.08754206				
	z4	3.743294	-3.74329	0.4186779	0	-46.6788	46.67883	-0.11453	0	42.93555	-171.7422	-128.806664				
2da Iteracion	z1	0.988173	-1.09798	0.02128394	-0.27583	-0.02521	0.077834805	0.000992	-0.12782	0.037038	-0.07407694	-1.497867385	RS2 =	2.062804	IRI =	2.019614
	z2	-0.92852	1.03169	0.9001616	-11.6658	-3.39137	10.47099443	0.062802	-8.08927	4.319885	-8.63977	-16.8921428				
	z3	0.063863	-0.07096	0.006615445	-0.08573	0.24029	-0.741904247	0.009863	-1.27038	0.695847	-1.3916946	-3.560671212				
	z4	3.743294	-4.15924	0.4186779	-5.42592	-46.6788	144.1228509	-0.11453	14.7516	42.93555	-85.8711	63.41818724				
3ra Iteracion	z1	0.988173	-1.48015	0.02128394	-0.35953	-0.02521	0.089762064	0.000992	0.062931	0.037038	-0.07407694	-1.761066974	RS3 =	0.068154	IRI =	1.369128
	z2	-0.92852	1.390794	0.9001616	-15.2057	-3.39137	12.07554997	0.062802	3.982768	4.319885	-8.63977	-6.396316418				
	z3	0.063863	-0.09566	0.006615445	-0.11175	0.24029	-0.855592261	0.009863	0.625473	0.695847	-1.3916946	-1.82922131				
	z4	3.743294	-5.60696	0.4186779	-7.07237	-46.6788	166.2079662	-0.11453	-7.26297	42.93555	-85.8711	60.39456709				
4ta Iteracion	z1	0.988173	-1.74024	0.02128394	-0.13614	-0.02521	0.046113407	0.000992	0.059931	0.037038	-0.07407694	-1.844410129	RS4 =	0.454043	IRI =	1.140356
	z2	-0.92852	1.635179	0.9001616	-5.75772	-3.39137	6.203564444	0.062802	3.79288	4.319885	-8.63977	-2.765865444				
	z3	0.063863	-0.11247	0.006615445	-0.04231	0.24029	-0.439542857	0.009863	0.595652	0.695847	-1.3916946	-1.390367126				
	z4	3.743294	-6.59219	0.4186779	-2.678	-46.6788	85.38591055	-0.11453	-6.91669	42.93555	-85.8711	-16.67207107				
5ta Iteracion	z1	0.988173	-1.8226	0.02128394	-0.05887	-0.02521	0.035050196	0.000992	-0.01654	0.037038	0.07407694	-1.788881087	RS5 =	2.545966	IRI =	1.421478
	z2	-0.92852	1.712564	0.9001616	-2.48973	-3.39137	4.715247969	0.062802	-1.04703	4.319885	8.639770002	11.53082252				
	z3	0.063863	-0.11779	0.006615445	-0.0183	0.24029	-0.33409076	0.009863	-0.16443	0.695847	1.3916946	0.757085064				
	z4	3.743294	-6.90417	0.4186779	-1.15801	-46.6788	64.9007107	-0.11453	1.909371	42.93555	85.87110002	144.6190052				

FIGURA 3.100: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1089m a 1100m.*

N°	Dist	Cota	Y'
1	1089.00	3817.256	
2	1089.50	3817.255	-2.00
3	1090.00	3817.255	0.00
4	1090.50	3817.252	-6.00
5	1091.00	3817.250	-4.00
6	1091.50	3817.249	-2.00
7	1092.00	3817.248	-2.40
8	1092.50	3817.248	0.40
9	1093.00	3817.248	0.00
10	1093.50	3817.247	-2.00
11	1094.00	3817.247	0.00
12	1094.50	3817.246	-2.00
13	1095.00	3817.245	-2.00
14	1095.50	3817.244	-2.00
15	1096.00	3817.242	-4.00
16	1096.50	3817.240	-4.00
17	1097.00	3817.237	-6.00
18	1097.50	3817.236	-2.00
19	1098.00	3817.233	-6.00
20	1098.50	3817.231	-4.00
21	1099.00	3817.229	-4.00
22	1099.50	3817.228	-2.00
23	1100.00	3817.227	-2.00

IRI **1.5896**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -2.63636364
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.60518	0.02128394	0	-0.02521	0.066460908	0.000992	0	0.037038	-0.07407694	-2.612798605	RS1 =	0.419246	IRI =	0.419246
	z2	-0.92852	2.447906	0.9001616	0	-3.39137	8.940881909	0.062802	0	4.319885	-8.63977	2.749017729				
	z3	0.063863	-0.16837	0.006615445	0	0.24029	-0.633490764	0.009863	0	0.695847	-1.3916946	-2.19355214				
	z4	3.743294	-9.86868	0.4186779	0	-46.6788	123.06237	-0.11453	0	42.93555	-85.8711	27.32258584				
2da Iteracion	z1	0.988173	-2.5819	0.02128394	0.05851	-0.02521	0.055297936	0.000992	0.027113	0.037038	0	-2.440975735	RS2 =	2.034686	IRI =	1.226966
	z2	-0.92852	2.426025	0.9001616	2.47456	-3.39137	7.439144726	0.062802	1.715904	4.319885	0	14.05563425				
	z3	0.063863	-0.16686	0.006615445	0.018186	0.24029	-0.527087766	0.009863	0.269474	0.695847	0	-0.406289706				
	z4	3.743294	-9.78047	0.4186779	1.150953	-46.6788	102.3924474	-0.11453	-3.12912	42.93555	0	90.63380518				
3ra Iteracion	z1	0.988173	-2.41211	0.02128394	0.299159	-0.02521	0.010242283	0.000992	0.089937	0.037038	-0.22223082	-2.234997423	RS3 =	1.206726	IRI =	1.220219
	z2	-0.92852	2.266485	0.9001616	12.65234	-3.39137	1.377878315	0.062802	5.691954	4.319885	-25.91931	-3.93065012				
	z3	0.063863	-0.15589	0.006615445	0.092984	0.24029	-0.097627191	0.009863	0.893892	0.695847	-4.1750838	-3.441723166				
	z4	3.743294	-9.13729	0.4186779	5.884783	-46.6788	18.96512813	-0.11453	-10.3798	42.93555	-257.6133	-252.2805239				
4ta Iteracion	z1	0.988173	-2.20856	0.02128394	-0.08366	-0.02521	0.086763466	0.000992	-0.25034	0.037038	-0.14815388	-2.603955699	RS4 =	3.663343	IRI =	1.831
	z2	-0.92852	2.075231	0.9001616	-3.53822	-3.39137	11.67215325	0.062802	-15.8436	4.319885	-17.27954	-22.91401439				
	z3	0.063863	-0.14273	0.006615445	-0.026	0.24029	-0.827010283	0.009863	-2.48816	0.695847	-2.7833892	-6.267296781				
	z4	3.743294	-8.36625	0.4186779	-1.64568	-46.6788	160.6556106	-0.11453	28.89245	42.93555	-171.7422	7.793934032				
5ta Iteracion	z1	0.988173	-2.57316	0.02128394	-0.4877	-0.02521	0.157994278	0.000992	0.007734	0.037038	-0.07407694	-2.969207054	RS5 =	0.169469	IRI =	1.498694
	z2	-0.92852	2.417815	0.9001616	-20.6263	-3.39137	21.2547228	0.062802	0.489472	4.319885	-8.63977	-5.104076453				
	z3	0.063863	-0.1663	0.006615445	-0.15159	0.24029	-1.505966717	0.009863	0.076869	0.695847	-1.3916946	-3.138675742				
	z4	3.743294	-9.74737	0.4186779	-9.59359	-46.6788	292.5501744	-0.11453	-0.8926	42.93555	-85.8711	186.4455101				

FIGURA 3.101: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1100m a 1111m.*

N°	Dist	Cota	Y'
1	1100.00	3817.227	
2	1100.50	3817.227	0.00
3	1101.00	3817.226	-2.00
4	1101.50	3817.225	-2.00
5	1102.00	3817.228	6.00
6	1102.50	3817.229	2.00
7	1103.00	3817.230	2.00
8	1103.50	3817.228	-4.00
9	1104.00	3817.225	-6.00
10	1104.50	3817.220	-10.00
11	1105.00	3817.217	-6.00
12	1105.50	3817.216	-2.00
13	1106.00	3817.215	-2.00
14	1106.50	3817.214	-2.00
15	1107.00	3817.213	-2.00
16	1107.50	3817.212	-2.00
17	1108.00	3817.211	-2.00
18	1108.50	3817.210	-2.00
19	1109.00	3817.209	-2.00
20	1109.50	3817.208	-2.00
21	1110.00	3817.207	-2.00
22	1110.50	3817.207	0.00
23	1111.00	3817.206	-2.00

IRI | **2.6471**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.90909091
z2' = **z4'** = 0

$Y' = (Y_1 - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.88651	0.02128394	0	-0.02521	0.048126865	0.000992	0	0.037038	0	-1.838384654	RS1 =	1.257729	IRI =	1.257729
	z2	-0.92852	1.772621	0.9001616	0	-3.39137	6.474431727	0.062802	0	4.319885	0	8.247053182				
	z3	0.063863	-0.12192	0.006615445	0	0.24029	-0.458734691	0.009863	0	0.695847	0	-0.58065546				
	z4	3.743294	-7.14629	0.4186779	0	-46.6788	89.11413	-0.11453	0	42.93555	0	81.96784146				
2da Iteracion	z1	0.988173	-1.81664	0.02128394	0.17553	-0.02521	0.014637923	0.000992	0.081338	0.037038	-0.07407694	-1.619212717	RS2 =	0.833568	IRI =	1.045649
	z2	-0.92852	1.70697	0.9001616	7.423681	-3.39137	1.969216927	0.062802	5.147717	4.319885	-8.63977	7.607814407				
	z3	0.063863	-0.11741	0.006615445	0.054558	0.24029	-0.139525468	0.009863	0.808423	0.695847	-1.3916946	-0.785644788				
	z4	3.743294	-6.88161	0.4186779	3.452859	-46.6788	27.10431751	-0.11453	-9.38738	42.93555	-85.8711	-71.58291309				
3ra Iteracion	z1	0.988173	-1.60006	0.02128394	0.161924	-0.02521	0.019805563	0.000992	-0.07103	0.037038	-0.07407694	-1.56344182	RS3 =	0.776114	IRI =	0.955804
	z2	-0.92852	1.503465	0.9001616	6.848262	-3.39137	2.66441138	0.062802	-4.49553	4.319885	-8.63977	-2.119157799				
	z3	0.063863	-0.10341	0.006615445	0.050329	0.24029	-0.188782272	0.009863	-0.706	0.695847	-1.3916946	-2.339555362				
	z4	3.743294	-6.06119	0.4186779	3.185224	-46.6788	36.67297951	-0.11453	8.19804	42.93555	-85.8711	-43.87604567				
4ta Iteracion	z1	0.988173	-1.54495	0.02128394	-0.0451	-0.02521	0.058978576	0.000992	-0.04354	0.037038	0.22223082	-1.352384079	RS4 =	4.418696	IRI =	1.821527
	z2	-0.92852	1.451681	0.9001616	-1.90758	-3.39137	7.934295528	0.062802	-2.75549	4.319885	25.91931	30.64221285				
	z3	0.063863	-0.09985	0.006615445	-0.01402	0.24029	-0.562170822	0.009863	-0.43274	0.695847	4.1750838	3.066311916				
	z4	3.743294	-5.85242	0.4186779	-0.88724	-46.6788	109.207707	-0.11453	5.024909	42.93555	257.6133	365.1062486				
5ta Iteracion	z1	0.988173	-1.33639	0.02128394	0.652187	-0.02521	-0.077299608	0.000992	0.362301	0.037038	0.07407694	-0.32512372	RS5 =	6.170891	IRI =	2.6914
	z2	-0.92852	1.25571	0.9001616	27.58294	-3.39137	-10.39899518	0.062802	22.92328	4.319885	8.639770002	50.00871057				
	z3	0.063863	-0.08637	0.006615445	0.202712	0.24029	0.736802864	0.009863	3.600926	0.695847	1.3916946	5.845767778				
	z4	3.743294	-5.06237	0.4186779	12.82922	-46.6788	-143.1318527	-0.11453	-41.8138	42.93555	85.87110002	-91.30773615				

FIGURA 3.102: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1111m a 1122m.*

N°	Dist	Cota	Y'
1	1111.00	3817.206	
2	1111.50	3817.206	0.00
3	1112.00	3817.207	2.00
4	1112.50	3817.206	-2.00
5	1113.00	3817.205	-2.00
6	1113.50	3817.206	2.00
7	1114.00	3817.205	-2.00
8	1114.50	3817.205	0.00
9	1115.00	3817.204	-2.00
10	1115.50	3817.205	2.00
11	1116.00	3817.204	-2.00
12	1116.50	3817.204	0.00
13	1117.00	3817.205	2.00
14	1117.50	3817.205	0.00
15	1118.00	3817.206	2.00
16	1118.50	3817.205	-2.00
17	1119.00	3817.204	-2.00
18	1119.50	3817.204	0.00
19	1120.00	3817.203	-2.00
20	1120.50	3817.203	0.00
21	1121.00	3817.203	0.00
22	1121.50	3817.204	2.00
23	1122.00	3817.204	0.00

IRI	1.0228

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.18181818
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.17967	0.02128394	0	-0.02521	0.004583511	0.000932	0	0.037038	0	-0.175084253	RS1 =	0.119784	IRI =	0.119784
	z2	-0.92852	0.168821	0.9001616	0	-3.39137	0.616612545	0.062802	0	4.319885	0	0.785433636				
	z3	0.063863	-0.01161	0.006615445	0	0.24029	-0.043689018	0.009863	0	0.695847	0	-0.05530052				
	z4	3.743294	-0.6806	0.4186779	0	-46.6788	8.48706	-0.11453	0	42.93555	0	7.806461091				
2da Iteracion	z1	0.988173	-0.17301	0.02128394	0.016717	-0.02521	0.001394088	0.000932	0.007746	0.037038	0.07407694	-0.073078848	RS2 =	1.522492	IRI =	0.821138
	z2	-0.92852	0.162569	0.9001616	0.707017	-3.39137	0.187544469	0.062802	0.490259	4.319885	8.639770002	10.18715899				
	z3	0.063863	-0.01118	0.006615445	0.005196	0.24029	-0.01328814	0.009863	0.076993	0.695847	1.3916946	1.44941363				
	z4	3.743294	-0.65539	0.4186779	0.328844	-46.6788	2.581363572	-0.11453	-0.89404	42.93555	85.87110002	87.23187973				
3ra Iteracion	z1	0.988173	-0.07221	0.02128394	0.216823	-0.02521	-0.036538718	0.000932	0.086562	0.037038	-0.07407694	0.120554334	RS3 =	0.240904	IRI =	0.627727
	z2	-0.92852	0.067855	0.9001616	9.170089	-3.39137	-4.915496453	0.062802	5.478308	4.319885	-8.63977	1.160985488				
	z3	0.063863	-0.00467	0.006615445	0.067393	0.24029	0.348279021	0.009863	0.86034	0.695847	-1.3916946	-0.120349927				
	z4	3.743294	-0.27356	0.4186779	4.265138	-46.6788	-67.65693243	-0.11453	-9.99024	42.93555	-85.8711	-159.5266895				
4ta Iteracion	z1	0.988173	0.119129	0.02128394	0.02471	-0.02521	0.003033939	0.000932	-0.1583	0.037038	-0.07407694	-0.08550512	RS4 =	2.89309	IRI =	1.194068
	z2	-0.92852	-0.11194	0.9001616	1.045075	-3.39137	0.408151011	0.062802	-10.0185	4.319885	-8.63977	-17.31702357				
	z3	0.063863	0.007699	0.006615445	0.00768	0.24029	-0.028918836	0.009863	-1.57336	0.695847	-1.3916946	-2.978594697				
	z4	3.743294	0.45127	0.4186779	0.486079	-46.6788	5.617793775	-0.11453	18.26981	42.93555	-85.8711	-61.04614686				
5ta Iteracion	z1	0.988173	-0.08449	0.02128394	-0.36857	-0.02521	0.075088317	0.000932	-0.06058	0.037038	0.07407694	-0.364480158	RS5 =	0.31835	IRI =	1.018924
	z2	-0.92852	0.079393	0.9001616	-15.5881	-3.39137	10.10151372	0.062802	-3.8338	4.319885	8.639769998	-0.601243025				
	z3	0.063863	-0.00546	0.006615445	-0.11456	0.24029	-0.715725328	0.009863	-0.60208	0.695847	1.3916946	-0.046129793				
	z4	3.743294	-0.32007	0.4186779	-7.25026	-46.6788	139.0373155	-0.11453	6.991316	42.93555	85.87109998	224.3294057				

FIGURA 3.103: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1122m a 1133m.*

N°	Dist	Cota	Y'
1	1122.00	3817.204	
2	1122.50	3817.204	0.00
3	1123.00	3817.205	2.00
4	1123.50	3817.204	-2.00
5	1124.00	3817.205	2.00
6	1124.50	3817.205	0.00
7	1125.00	3817.205	0.00
8	1125.50	3817.205	0.00
9	1126.00	3817.204	-2.00
10	1126.50	3817.204	0.00
11	1127.00	3817.203	-2.00
12	1127.50	3817.203	0.00
13	1128.00	3817.202	-2.00
14	1128.50	3817.202	0.00
15	1129.00	3817.201	-2.00
16	1129.50	3817.201	0.00
17	1130.00	3817.200	-2.00
18	1130.50	3817.199	-2.00
19	1131.00	3817.198	-2.00
20	1131.50	3817.197	-2.00
21	1132.00	3817.196	-2.00
22	1132.50	3817.195	-2.00
23	1133.00	3817.194	-2.00

IRI	0.7145

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.90909091
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.89834	0.02128394	0	-0.02521	0.022917555	0.000992	0	0.037038	0	-0.875421264	RS1 =	0.598919	IRI =	0.598919
	z2	-0.92852	0.844105	0.9001616	0	-3.39137	3.083062727	0.062802	0	4.319885	0	3.927168182				
	z3	0.063863	-0.05806	0.006615445	0	0.24029	-0.218445091	0.003863	0	0.695847	0	-0.2765026				
	z4	3.743294	-3.40299	0.4186779	0	-46.6788	42.4353	-0.11453	0	42.93555	0	39.03230545				
2da Iteracion	z1	0.988173	-0.86507	0.02128394	0.083586	-0.02521	0.00697044	0.000992	0.038732	0.037038	0.07407694	-0.661702001	RS2 =	2.341992	IRI =	1.470455
	z2	-0.92852	0.812843	0.9001616	3.535086	-3.39137	0.937722346	0.062802	2.451294	4.319885	8.639770002	16.37671496				
	z3	0.063863	-0.05591	0.006615445	0.02598	0.24029	-0.066440699	0.003863	0.384963	0.695847	1.3916946	1.680289749				
	z4	3.743294	-3.27696	0.4186779	1.644219	-46.6788	12.90681786	-0.11453	-4.47018	42.93555	85.87110002	92.67499856				
3ra Iteracion	z1	0.988173	-0.65388	0.02128394	0.348561	-0.02521	-0.042358945	0.000992	0.091963	0.037038	-0.07407694	-0.32978779	RS3 =	0.321954	IRI =	1.087621
	z2	-0.92852	0.614401	0.9001616	14.74169	-3.39137	-5.698482565	0.062802	5.820145	4.319885	-8.63977	6.837982944				
	z3	0.063863	-0.04226	0.006615445	0.108339	0.24029	0.403756152	0.003863	0.914024	0.695847	-1.3916946	-0.007833784				
	z4	3.743294	-2.47695	0.4186779	6.856569	-46.6788	-78.43395954	-0.11453	-10.6136	42.93555	-85.8711	-170.5390495				
4ta Iteracion	z1	0.988173	-0.32589	0.02128394	0.145539	-0.02521	0.000197484	0.000992	-0.16923	0.037038	0.07407694	-0.27530236	RS4 =	0.007317	IRI =	0.817545
	z2	-0.92852	0.306213	0.9001616	6.15529	-3.39137	0.026567251	0.062802	-10.7101	4.319885	8.639770002	4.417703049				
	z3	0.063863	-0.02106	0.006615445	0.045236	0.24029	-0.001882377	0.003863	-1.68197	0.695847	1.3916946	-0.267984873				
	z4	3.743294	-1.23449	0.4186779	2.862912	-46.6788	0.36567186	-0.11453	19.531	42.93555	85.87110002	107.3961933				
5ta Iteracion	z1	0.988173	-0.27205	0.02128394	0.094026	-0.02521	0.006755714	0.000992	0.106571	0.037038	0	-0.064693422	RS5 =	1.071157	IRI =	0.868268
	z2	-0.92852	0.255623	0.9001616	3.976647	-3.39137	0.90883559	0.062802	6.74466	4.319885	0	11.88576517				
	z3	0.063863	-0.01758	0.006615445	0.029225	0.24029	-0.064393978	0.003863	1.059214	0.695847	0	1.006463675				
	z4	3.743294	-1.03054	0.4186779	1.849595	-46.6788	12.50922032	-0.11453	-12.2996	42.93555	0	1.02871751				

FIGURA 3.104: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1133m a 1144m.*

N°	Dist	Cota	Y'
1	1133.00	3817.194	
2	1133.50	3817.193	-2.00
3	1134.00	3817.192	-2.00
4	1134.50	3817.191	-2.00
5	1135.00	3817.190	-2.00
6	1135.50	3817.189	-2.00
7	1136.00	3817.188	-2.00
8	1136.50	3817.187	-2.00
9	1137.00	3817.186	-2.00
10	1137.50	3817.185	-2.00
11	1138.00	3817.184	-2.00
12	1138.50	3817.183	-2.00
13	1139.00	3817.182	-2.00
14	1139.50	3817.180	-4.00
15	1140.00	3817.178	-4.00
16	1140.50	3817.178	0.00
17	1141.00	3817.179	2.00
18	1141.50	3817.180	2.00
19	1142.00	3817.181	2.00
20	1142.50	3817.181	0.00
21	1143.00	3817.182	2.00
22	1143.50	3817.182	0.00
23	1144.00	3817.182	0.00

IRI 1.1483

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -1.09090909
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.07801	0.02128394	0	-0.02521	0.027501065	0.000992	0	0.037038	-0.07407694	-1.124582456	RS1 =	0.598915	IRI =	0.598915
	z2	-0.92852	1.012927	0.9001616	0	-3.39137	3.699675273	0.062802	0	4.319885	-8.63977	-3.927168184				
	z3	0.063863	-0.06967	0.006615445	0	0.24029	-0.262134109	0.009863	0	0.695847	-1.3916946	-1.72349772				
	z4	3.743294	-4.08359	0.4186779	0	-46.6788	50.92236	-0.11453	0	42.93555	-85.8711	-39.03233347				
2da Iteracion	z1	0.988173	-1.11128	0.02128394	-0.08359	-0.02521	0.043448188	0.000992	-0.03873	0.037038	-0.07407694	-1.264228474	RS2 =	1.024368	IRI =	0.811641
	z2	-0.92852	1.044193	0.9001616	-3.53509	-3.39137	5.84501674	0.062802	-2.4513	4.319885	-8.63977	-7.736942175				
	z3	0.063863	-0.07182	0.006615445	-0.02598	0.24029	-0.414138578	0.009863	-0.38496	0.695847	-1.3916946	-2.288596059				
	z4	3.743294	-4.20964	0.4186779	-1.64422	-46.6788	80.45085709	-0.11453	4.470182	42.93555	-85.8711	-6.803922283				
3ra Iteracion	z1	0.988173	-1.24928	0.02128394	-0.16467	-0.02521	0.057693928	0.000992	-0.00675	0.037038	-0.07407694	-1.437083335	RS3 =	0.703563	IRI =	0.775615
	z2	-0.92852	1.173856	0.9001616	-6.9645	-3.39137	7.761473728	0.062802	-0.4273	4.319885	-8.63977	-7.096235837				
	z3	0.063863	-0.08074	0.006615445	-0.05118	0.24029	-0.549325832	0.009863	-0.0671	0.695847	-1.3916946	-2.140646407				
	z4	3.743294	-4.73238	0.4186779	-3.23929	-46.6788	106.8289864	-0.11453	0.77922	42.93555	-85.8711	13.76544068				
4ta Iteracion	z1	0.988173	-1.42009	0.02128394	-0.15104	-0.02521	0.053964219	0.000992	0.01366	0.037038	-0.07407694	-1.577575424	RS4 =	0.331452	IRI =	0.664574
	z2	-0.92852	1.334355	0.9001616	-6.38776	-3.39137	7.259721866	0.062802	0.864493	4.319885	-8.63977	-5.568959608				
	z3	0.063863	-0.09178	0.006615445	-0.04694	0.24029	-0.514375069	0.009863	0.135764	0.695847	-1.3916946	-1.909027117				
	z4	3.743294	-5.37943	0.4186779	-2.97104	-46.6788	99.92286974	-0.11453	-1.57649	42.93555	-85.8711	4.124818706				
5ta Iteracion	z1	0.988173	-1.55892	0.02128394	-0.11853	-0.02521	0.048125256	0.000992	0.004093	0.037038	-0.07407694	-1.699304926	RS5 =	0.248018	IRI =	0.581263
	z2	-0.92852	1.464804	0.9001616	-5.01296	-3.39137	6.474215386	0.062802	0.259046	4.319885	-8.63977	-5.454668677				
	z3	0.063863	-0.10075	0.006615445	-0.03684	0.24029	-0.458719362	0.009863	0.040682	0.695847	-1.3916946	-1.947322451				
	z4	3.743294	-5.90533	0.4186779	-2.3316	-46.6788	89.11115228	-0.11453	-0.4724	42.93555	-85.8711	-5.469271912				

FIGURA 3.105: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1144m a 1155m.*

N°	Dist	Cota	Y'
1	1144.00	3817.182	
2	1144.50	3817.183	2.00
3	1145.00	3817.183	0.00
4	1145.50	3817.183	0.00
5	1146.00	3817.184	2.00
6	1146.50	3817.184	0.00
7	1147.00	3817.184	0.00
8	1147.50	3817.185	2.00
9	1148.00	3817.185	0.00
10	1148.50	3817.184	-2.00
11	1149.00	3817.184	0.00
12	1149.50	3817.185	2.00
13	1150.00	3817.185	0.00
14	1150.50	3817.184	-2.00
15	1151.00	3817.184	0.00
16	1151.50	3817.183	-2.00
17	1152.00	3817.182	-2.00
18	1152.50	3817.181	-2.00
19	1153.00	3817.180	-2.00
20	1153.50	3817.179	-2.00
21	1154.00	3817.178	-2.00
22	1154.50	3817.177	-2.00
23	1155.00	3817.176	-2.00

IRI	1.0701

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.54545455
z2' = **z4'** = 0

$Y' = (Y_1 - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.539	0.02128394	0	-0.02521	0.013750533	0.000992	0	0.037038	0.07407694	-0.451175818	RS1 =	1.676969	IRI =	1.676969
	z2	-0.92852	0.506463	0.9001616	0	-3.39137	1.849837636	0.062802	0	4.319885	8.639770002	10.99607091				
	z3	0.063863	-0.03483	0.006615445	0	0.24029	-0.131067055	0.009863	0	0.695847	1.3916946	1.22579304				
	z4	3.743294	-2.0418	0.4186779	0	-46.6788	25.46118	-0.11453	0	42.93555	85.87110002	109.2904833				
2da Iteracion	z1	0.988173	-0.44584	0.02128394	0.23404	-0.02521	-0.030901397	0.000992	0.108451	0.037038	0	-0.13425056	RS2 =	1.550623	IRI =	1.613796
	z2	-0.92852	0.418924	0.9001616	9.898241	-3.39137	-4.157116517	0.062802	6.863625	4.319885	0	13.0236731				
	z3	0.063863	-0.02881	0.006615445	0.072744	0.24029	0.294545319	0.009863	1.077897	0.695847	0	1.416372727				
	z4	3.743294	-1.68888	0.4186779	4.603812	-46.6788	-57.21858494	-0.11453	-12.5165	42.93555	0	-66.82016033				
3ra Iteracion	z1	0.988173	-0.13266	0.02128394	0.277195	-0.02521	-0.035705779	0.000992	-0.06631	0.037038	0	0.042519812	RS3 =	0.283622	IRI =	1.170405
	z2	-0.92852	0.124654	0.9001616	11.72341	-3.39137	-4.803442558	0.062802	-4.19642	4.319885	0	2.848203991				
	z3	0.063863	-0.00857	0.006615445	0.086157	0.24029	0.340339636	0.009863	-0.65903	0.695847	0	-0.241102508				
	z4	3.743294	-0.50254	0.4186779	5.452724	-46.6788	-66.11462173	-0.11453	7.652586	42.93555	0	-53.5118514				
4ta Iteracion	z1	0.988173	0.042017	0.02128394	0.060621	-0.02521	0.006078028	0.000992	-0.0531	0.037038	0.07407694	0.129692195	RS4 =	0.697855	IRI =	1.052267
	z2	-0.92852	-0.03948	0.9001616	2.563844	-3.39137	0.817667572	0.062802	-3.36063	4.319885	8.639769998	8.621167474				
	z3	0.063863	0.002715	0.006615445	0.018842	0.24029	-0.057934425	0.009863	-0.52777	0.695847	1.3916946	0.827547498				
	z4	3.743294	0.159164	0.4186779	1.19248	-46.6788	11.25438299	-0.11453	6.12845	42.93555	85.87109998	104.6055773				
5ta Iteracion	z1	0.988173	0.128158	0.02128394	0.183492	-0.02521	-0.020861901	0.000992	0.103802	0.037038	0	0.394590637	RS5 =	0.901267	IRI =	1.022067
	z2	-0.92852	-0.12042	0.9001616	7.760444	-3.39137	-2.806518932	0.062802	6.569405	4.319885	0	11.40290864				
	z3	0.063863	0.008283	0.006615445	0.057033	0.24029	0.198851057	0.009863	1.031691	0.695847	0	1.295857818				
	z4	3.743294	0.485476	0.4186779	3.609432	-46.6788	-38.628949	-0.11453	-11.98	42.93555	0	-46.51394489				

FIGURA 3.106: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1155m a 1166m.*

N°	Dist	Cota	Y'
1	1155.00	3817.176	
2	1155.50	3817.176	0.00
3	1156.00	3817.175	-2.00
4	1156.50	3817.174	-2.00
5	1157.00	3817.174	0.00
6	1157.50	3817.173	-2.00
7	1158.00	3817.172	-2.00
8	1158.50	3817.171	-2.00
9	1159.00	3817.171	0.00
10	1159.50	3817.170	-2.00
11	1160.00	3817.170	0.00
12	1160.50	3817.169	-2.00
13	1161.00	3817.169	0.00
14	1161.50	3817.169	0.00
15	1162.00	3817.168	-2.00
16	1162.50	3817.167	-2.00
17	1163.00	3817.168	2.00
18	1163.50	3817.168	0.00
19	1164.00	3817.167	-2.00
20	1164.50	3817.167	0.00
21	1165.00	3817.167	0.00
22	1165.50	3817.165	-4.00
23	1166.00	3817.164	-2.00

IRI **1.0947**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.09090909
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.07801	0.02128394	0	-0.02521	0.027501065	0.000992	0	0.037038	0	-1.050505516	RS1 =	0.718702	IRI =	0.718702
	z2	-0.92852	1.012927	0.9001616	0	-3.39137	3.699675273	0.062802	0	4.319885	0	4.712601818				
	z3	0.063863	-0.06967	0.006615445	0	0.24029	-0.262134109	0.009863	0	0.695847	0	-0.33180312				
	z4	3.743294	-4.08359	0.4186779	0	-46.6788	50.92236	-0.11453	0	42.93555	0	46.83876655				
2da Iteracion	z1	0.988173	-1.03808	0.02128394	0.100303	-0.02521	0.008364528	0.000992	0.046479	0.037038	-0.07407694	-0.95701167	RS2 =	0.088369	IRI =	0.403536
	z2	-0.92852	0.975411	0.9001616	4.242103	-3.39137	1.125266815	0.062802	2.941553	4.319885	-8.63977	0.644563946				
	z3	0.063863	-0.06709	0.006615445	0.031176	0.24029	-0.079728839	0.009863	0.461956	0.695847	-1.3916946	-1.045380422				
	z4	3.743294	-3.93235	0.4186779	1.973062	-46.6788	15.48818143	-0.11453	-5.36421	42.93555	-85.8711	-77.70642177				
3ra Iteracion	z1	0.988173	-0.94569	0.02128394	0.013719	-0.02521	0.026353319	0.000992	-0.07711	0.037038	-0.07407694	-1.05680693	RS3 =	1.409329	IRI =	0.7388
	z2	-0.92852	0.888601	0.9001616	0.580212	-3.39137	3.545270756	0.062802	-4.88009	4.319885	-8.63977	-8.505779938				
	z3	0.063863	-0.06112	0.006615445	0.004264	0.24029	-0.251194043	0.009863	-0.76639	0.695847	-1.3916946	-2.466136023				
	z4	3.743294	-3.58238	0.4186779	0.269865	-46.6788	48.797135	-0.11453	8.899336	42.93555	-85.8711	-31.48714061				
4ta Iteracion	z1	0.988173	-1.04431	0.02128394	-0.18104	-0.02521	0.062169587	0.000992	-0.03125	0.037038	0	-1.194419889	RS4 =	0.167525	IRI =	0.595981
	z2	-0.92852	0.981262	0.9001616	-7.65658	-3.39137	8.363577257	0.062802	-1.97745	4.319885	0	-0.289182091				
	z3	0.063863	-0.06749	0.006615445	-0.05627	0.24029	-0.592586838	0.009863	-0.31055	0.695847	0	-1.026895086				
	z4	3.743294	-3.95594	0.4186779	-3.56118	-46.6788	115.1163442	-0.11453	3.606068	42.93555	0	111.205291				
5ta Iteracion	z1	0.988173	-1.18029	0.02128394	-0.00615	-0.02521	0.025887317	0.000992	0.110351	0.037038	-0.07407694	-1.12428684	RS5 =	0.50443	IRI =	0.577671
	z2	-0.92852	1.109038	0.9001616	-0.26031	-3.39137	3.482580159	0.062802	6.983878	4.319885	-8.63977	2.675415507				
	z3	0.063863	-0.07628	0.006615445	-0.00191	0.24029	-0.246752209	0.009863	1.096782	0.695847	-1.3916946	-0.619857227				
	z4	3.743294	-4.47106	0.4186779	-0.12107	-46.6788	47.93426113	-0.11453	-12.7358	42.93555	-85.8711	-55.26477492				

FIGURA 3.107: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1166m a 1177m.*

N°	Dist	Cota	Y'
1	1166.00	3817.164	
2	1166.50	3817.163	-2.00
3	1167.00	3817.160	-6.00
4	1167.50	3817.159	-2.00
5	1168.00	3817.157	-4.00
6	1168.50	3817.156	-2.00
7	1169.00	3817.155	-2.00
8	1169.50	3817.153	-4.00
9	1170.00	3817.150	-6.00
10	1170.50	3817.148	-4.00
11	1171.00	3817.144	-8.00
12	1171.50	3817.141	-6.00
13	1172.00	3817.139	-4.00
14	1172.50	3817.137	-4.00
15	1173.00	3817.135	-4.00
16	1173.50	3817.134	-2.00
17	1174.00	3817.132	-4.00
18	1174.50	3817.131	-2.00
19	1175.00	3817.130	-2.00
20	1175.50	3817.128	-4.00
21	1176.00	3817.126	-4.00
22	1176.50	3817.124	-4.00
23	1177.00	3817.122	-4.00

IRI	1.3518

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -3.81818182
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-3.77302	0.02128394	0	-0.02521	0.096253729	0.000992	0	0.037038	-0.07407694	-3.750846247	RS1 =	1.197841	IRI =	1.197841
	z2	-0.92852	3.545243	0.9001616	0	-3.39137	12.94886345	0.062802	0	4.319885	-8.63977	7.854336366				
	z3	0.063863	-0.24384	0.006615445	0	0.24029	-0.917469382	0.009863	0	0.695847	-1.3916946	-2.55300552				
	z4	3.743294	-14.2926	0.4186779	0	-46.6788	178.22826	-0.11453	0	42.93555	-85.8711	78.06458293				
2da Iteracion	z1	0.988173	-3.70648	0.02128394	0.167171	-0.02521	0.064359508	0.000992	0.077465	0.037038	-0.22223082	-3.619719178	RS2 =	0.586481	IRI =	0.892161
	z2	-0.92852	3.482721	0.9001616	7.070172	-3.39137	8.658183776	0.062802	4.902586	4.319885	-25.91931	-1.805647305				
	z3	0.063863	-0.23954	0.006615445	0.05196	0.24029	-0.613460675	0.009863	0.769326	0.695847	-4.1750838	-4.206199813				
	z4	3.743294	-14.0405	0.4186779	3.288437	-46.6788	119.1713106	-0.11453	-8.94035	42.93555	-257.6133	-158.1344267				
3ra Iteracion	z1	0.988173	-3.57691	0.02128394	-0.03843	-0.02521	0.106035395	0.000992	-0.15692	0.037038	-0.07407694	-3.740299908	RS3 =	0.464842	IRI =	0.749721
	z2	-0.92852	3.360967	0.9001616	-1.62537	-3.39137	14.26477566	0.062802	-9.93111	4.319885	-8.63977	-2.570507625				
	z3	0.063863	-0.23117	0.006615445	-0.01195	0.24029	-1.010706071	0.009863	-1.55963	0.695847	-1.3916946	-4.205142146				
	z4	3.743294	-13.5497	0.4186779	-0.75598	-46.6788	196.340486	-0.11453	18.11036	42.93555	-85.8711	114.2740894				
4ta Iteracion	z1	0.988173	-3.69606	0.02128394	-0.05471	-0.02521	0.106008732	0.000992	0.113396	0.037038	-0.14815388	-3.679521873	RS4 =	0.756857	IRI =	0.751505
	z2	-0.92852	3.472928	0.9001616	-2.31387	-3.39137	14.26118872	0.062802	7.176604	4.319885	-17.27954	5.317308418				
	z3	0.063863	-0.23887	0.006615445	-0.01701	0.24029	-1.010451924	0.009863	1.127049	0.695847	-2.7833892	-2.922665146				
	z4	3.743294	-14.001	0.4186779	-1.07621	-46.6788	196.2911154	-0.11453	-13.0873	42.93555	-171.7422	-3.615593073				
5ta Iteracion	z1	0.988173	-3.636	0.02128394	0.113173	-0.02521	0.073678372	0.000992	-0.00359	0.037038	-0.07407694	-3.526816172	RS5 =	1.197366	IRI =	0.840677
	z2	-0.92852	3.416495	0.9001616	4.786437	-3.39137	9.911835973	0.062802	-0.22707	4.319885	-8.63977	9.247932477				
	z3	0.063863	-0.23493	0.006615445	0.035176	0.24029	-0.702286039	0.009863	-0.03566	0.695847	-1.3916946	-2.329449977				
	z4	3.743294	-13.7735	0.4186779	2.22624	-46.6788	136.4265895	-0.11453	0.414076	42.93555	-85.8711	39.42227305				

FIGURA 3.108: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1177m a 1188m.*

N°	Dist	Cota	Y'
1	1177.00	3817.122	
2	1177.50	3817.119	-6.00
3	1178.00	3817.116	-6.00
4	1178.50	3817.115	-2.00
5	1179.00	3817.112	-6.00
6	1179.50	3817.109	-6.00
7	1180.00	3817.107	-4.00
8	1180.50	3817.109	4.00
9	1181.00	3817.108	-2.00
10	1181.50	3817.108	0.00
11	1182.00	3817.108	0.00
12	1182.50	3817.108	0.00
13	1183.00	3817.109	2.00
14	1183.50	3817.109	0.00
15	1184.00	3817.109	0.00
16	1184.50	3817.110	2.00
17	1185.00	3817.110	0.00
18	1185.50	3817.109	-2.00
19	1186.00	3817.107	-4.00
20	1186.50	3817.105	-4.00
21	1187.00	3817.104	-2.00
22	1187.50	3817.103	-2.00
23	1188.00	3817.102	-2.00

IRI 2.5506

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.81818182
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.79668	0.02128394	0	-0.02521	0.045835109	0.000992	0	0.037038	-0.22223082	-1.973073347	**RS1** =	2.755016	**IRI** =	2.755016
	z2	-0.92852	1.688211	0.9001616	0	-3.39137	6.166125455	0.062802	0	4.319885	-25.91931	-18.06497364				
	z3	0.063863	-0.11612	0.006615445	0	0.24029	-0.436890182	0.009863	0	0.695847	-4.1750838	-4.728089				
	z4	3.743294	-6.80599	0.4186779	0	-46.6788	84.8706	-0.11453	0	42.93555	-257.6133	-179.5486891				
2da Iteracion	z1	0.988173	-1.94974	0.02128394	-0.38449	-0.02521	0.119191861	0.000992	-0.17817	0.037038	-0.22223082	-2.615439117	**RS2** =	4.712101	**IRI** =	3.733558
	z2	-0.92852	1.83203	0.9001616	-16.2614	-3.39137	16.03469446	0.062802	-11.276	4.319885	-25.91931	-35.58933846				
	z3	0.063863	-0.12601	0.006615445	-0.11951	0.24029	-1.136110615	0.009863	-1.77083	0.695847	-4.1750838	-7.327540415				
	z4	3.743294	-7.38579	0.4186779	-7.56341	-46.6788	220.7016627	-0.11453	20.56283	42.93555	-257.6133	-31.29800458				
3ra Iteracion	z1	0.988173	-2.58451	0.02128394	-0.75749	-0.02521	0.184722238	0.000992	-0.03106	0.037038	-0.07407694	-3.262411877	**RS3** =	0.60117	**IRI** =	2.689429
	z2	-0.92852	2.428477	0.9001616	-32.0367	-3.39137	24.85039341	0.062802	-1.96557	4.319885	-8.63977	-15.36316243				
	z3	0.063863	-0.16703	0.006615445	-0.23544	0.24029	-1.760731755	0.009863	-0.30868	0.695847	-1.3916946	-3.863582308				
	z4	3.743294	-9.79036	0.4186779	-14.9007	-46.6788	342.0410133	-0.11453	3.584407	42.93555	-85.8711	235.0632422				
4ta Iteracion	z1	0.988173	-3.22383	0.02128394	-0.32699	-0.02521	0.097398244	0.000992	0.233257	0.037038	-0.22223082	-3.442390423	**RS4** =	0.347299	**IRI** =	2.103897
	z2	-0.92852	3.029202	0.9001616	-13.8293	-3.39137	13.10283327	0.062802	14.76236	4.319885	-25.91931	-8.85423981				
	z3	0.063863	-0.20835	0.006615445	-0.10163	0.24029	-0.928378647	0.009863	2.318354	0.695847	-4.1750838	-3.095091324				
	z4	3.743294	-12.2122	0.4186779	-6.43222	-46.6788	180.3475018	-0.11453	-26.9206	42.93555	-257.6133	-122.830823				
5ta Iteracion	z1	0.988173	-3.40168	0.02128394	-0.18845	-0.02521	0.078025117	0.000992	-0.12189	0.037038	-0.22223082	-3.856222103	**RS5** =	2.552438	**IRI** =	2.193605
	z2	-0.92852	3.196315	0.9001616	-7.97025	-3.39137	10.49659677	0.062802	-7.71398	4.319885	-25.91931	-27.31062613				
	z3	0.063863	-0.21984	0.006615445	-0.05857	0.24029	-0.743718256	0.009863	-1.21144	0.695847	-4.1750838	-6.408660168				
	z4	3.743294	-12.8859	0.4186779	-3.70707	-46.6788	144.4752418	-0.11453	14.06721	42.93555	-257.6133	-115.6637999				

FIGURA 3.109: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1188m a 1199m.*

N°	Dist	Cota	Y'
1	1188.00	3817.102	
2	1188.50	3817.101	-2.00
3	1189.00	3817.100	-2.00
4	1189.50	3817.101	2.00
5	1190.00	3817.100	-2.00
6	1190.50	3817.099	-2.00
7	1191.00	3817.098	-2.00
8	1191.50	3817.096	-4.00
9	1192.00	3817.095	-2.00
10	1192.50	3817.094	-2.00
11	1193.00	3817.093	-2.00
12	1193.50	3817.092	-2.00
13	1194.00	3817.091	-2.00
14	1194.50	3817.091	0.00
15	1195.00	3817.090	-2.00
16	1195.50	3817.088	-4.00
17	1196.00	3817.086	-4.00
18	1196.50	3817.084	-4.00
19	1197.00	3817.082	-4.00
20	1197.50	3817.080	-4.00
21	1198.00	3817.078	-4.00
22	1198.50	3817.076	-4.00
23	1199.00	3817.075	-2.00

IRI	1.1476

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -2.45454545
z2' = z4' = 0

$$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.42551	0.02128394	0	-0.02521	0.061877397	0.000992	0	0.037038	-0.07407694	-2.437714352	RS1 =	0.299463	IRI =	0.299463
	z2	-0.92852	2.279085	0.9001616	0	-3.39137	8.324269364	0.062802	0	4.319885	-8.63977	1.963584089				
	z3	0.063863	-0.15676	0.006615445	0	0.24029	-0.589801745	0.009863	0	0.695847	-1.3916946	-2.13825162				
	z4	3.743294	-9.18809	0.4186779	0	-46.6788	114.57531	-0.11453	0	42.93555	-85.8711	19.51612471				
2da Iteracion	z1	0.988173	-2.40888	0.02128394	0.041793	-0.02521	0.053903848	0.000992	0.019366	0.037038	-0.07407694	-2.367896886	RS2 =	0.512194	IRI =	0.405828
	z2	-0.92852	2.263457	0.9001616	1.767543	-3.39137	7.251600259	0.062802	1.225645	4.319885	-8.63977	3.86847526				
	z3	0.063863	-0.15568	0.006615445	0.01299	0.24029	-0.513799627	0.009863	0.192481	0.695847	-1.3916946	-1.855703336				
	z4	3.743294	-9.12508	0.4186779	0.822109	-46.6788	99.81108388	-0.11453	-2.23509	42.93555	-85.8711	3.401925524				
3ra Iteracion	z1	0.988173	-2.33989	0.02128394	0.082336	-0.02521	0.046781001	0.000992	0.003376	0.037038	0.07407694	-2.133320937	RS3 =	2.987031	IRI =	1.266229
	z2	-0.92852	2.19863	0.9001616	3.482253	-3.39137	6.293374768	0.062802	0.213647	4.319885	8.639769998	20.82767439				
	z3	0.063863	-0.15122	0.006615445	0.025592	0.24029	-0.445906212	0.009863	0.033552	0.695847	1.3916946	0.853710561				
	z4	3.743294	-8.86373	0.4186779	1.619645	-46.6788	86.62206056	-0.11453	-0.38961	42.93555	85.87109998	164.8594656				
4ta Iteracion	z1	0.988173	-2.10809	0.02128394	0.443295	-0.02521	-0.021521454	0.000992	0.163593	0.037038	-0.07407694	-1.596800164	RS4 =	2.037743	IRI =	1.459108
	z2	-0.92852	1.980823	0.9001616	18.74827	-3.39137	-2.895247531	0.062802	10.35345	4.319885	-8.63977	19.54752755				
	z3	0.063863	-0.13624	0.006615445	0.137784	0.24029	0.205137769	0.009863	1.625956	0.695847	-1.3916946	0.440942828				
	z4	3.743294	-7.98565	0.4186779	8.720087	-46.6788	-39.85021014	-0.11453	-18.8805	42.93555	-85.8711	-143.8674174				
5ta Iteracion	z1	0.988173	-1.57791	0.02128394	0.416048	-0.02521	-0.011115864	0.000992	-0.14276	0.037038	-0.07407694	-1.389820743	RS5 =	1.287499	IRI =	1.424786
	z2	-0.92852	1.482655	0.9001616	17.59593	-3.39137	-1.495399838	0.062802	-9.03511	4.319885	-8.63977	-0.09169573				
	z3	0.063863	-0.10198	0.006615445	0.129316	0.24029	0.105953976	0.009863	-1.41892	0.695847	-1.3916946	-2.677320195				
	z4	3.743294	-5.97729	0.4186779	8.184118	-46.6788	-20.58269532	-0.11453	16.47643	42.93555	-85.8711	-87.77053966				

FIGURA 3.110: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1199m a 1210m.*

N°	Dist	Cota	Y'
1	1199.00	3817.075	
2	1199.50	3817.072	-6.00
3	1200.00	3817.070	-4.00
4	1200.50	3817.070	0.00
5	1201.00	3817.069	-2.00
6	1201.50	3817.070	2.00
7	1202.00	3817.070	0.00
8	1202.50	3817.069	-2.00
9	1203.00	3817.068	-2.00
10	1203.50	3817.065	-6.00
11	1204.00	3817.065	0.00
12	1204.50	3817.064	-2.00
13	1205.00	3817.063	-2.00
14	1205.50	3817.067	8.00
15	1206.00	3817.066	-2.00
16	1206.50	3817.064	-4.00
17	1207.00	3817.060	-8.00
18	1207.50	3817.060	0.00
19	1208.00	3817.059	-2.00
20	1208.50	3817.059	0.00
21	1209.00	3817.058	-2.00
22	1209.50	3817.057	-2.00
23	1210.00	3817.057	0.00

IRI **2.7876**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.63636364
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.61701	0.02128394	0	-0.02521	0.041251598	0.000992	0	0.037038	-0.22223082	-1.797989095	**RS1** =	2.874799	**IRI** =	2.874799
	z2	-0.92852	1.51939	0.9001616	0	-3.39137	5.549512909	0.062802	0	4.319885	-25.91931	-18.85040727				
	z3	0.063863	-0.1045	0.006615445	0	0.24029	-0.393201164	0.009863	0	0.695847	-4.1750838	-4.67278848				
	z4	3.743294	-6.12539	0.4186779	0	-46.6788	76.38354	-0.11453	0	42.93555	-257.6133	-187.3551502				
2da Iteracion	z1	0.988173	-1.77672	0.02128394	-0.40121	-0.02521	0.117797773	0.000992	-0.18592	0.037038	-0.14815388	-2.394206389	**RS2** =	3.599358	**IRI** =	3.237079
	z2	-0.92852	1.669462	0.9001616	-16.9684	-3.39137	15.84715	0.062802	-11.7662	4.319885	-17.27954	-28.49755745				
	z3	0.063863	-0.11483	0.006615445	-0.1247	0.24029	-1.122822475	0.009863	-1.84782	0.695847	-2.7833892	-5.993564845				
	z4	3.743294	-6.7304	0.4186779	-7.89225	-46.6788	218.1202991	-0.11453	21.45687	42.93555	-171.7422	53.21231569				
3ra Iteracion	z1	0.988173	-2.36589	0.02128394	-0.60654	-0.02521	0.151093634	0.000992	0.052803	0.037038	0	-2.768532602	**RS3** =	1.511731	**IRI** =	2.661963
	z2	-0.92852	2.223059	0.9001616	-25.6524	-3.39137	20.32639001	0.062802	3.341822	4.319885	0	0.238864334				
	z3	0.063863	-0.1529	0.006615445	-0.18852	0.24029	-1.440191299	0.009863	0.524816	0.695847	0	-1.256801107				
	z4	3.743294	-8.96222	0.4186779	-11.9313	-46.6788	279.7725945	-0.11453	-6.09415	42.93555	0	252.7849328				
4ta Iteracion	z1	0.988173	-2.73579	0.02128394	0.005084	-0.02521	0.031683089	0.000992	0.250843	0.037038	-0.07407694	-2.522255553	**RS4** =	3.146474	**IRI** =	2.783091
	z2	-0.92852	2.570627	0.9001616	0.215017	-3.39137	4.262276312	0.062802	15.87532	4.319885	-8.63977	14.28346556				
	z3	0.063863	-0.17681	0.006615445	0.00158	0.24029	-0.301996235	0.009863	2.493137	0.695847	-1.3916946	0.624218743				
	z4	3.743294	-10.3634	0.4186779	0.100007	-46.6788	58.6660052	-0.11453	-28.9502	42.93555	-85.8711	-66.41873875				
5ta Iteracion	z1	0.988173	-2.49242	0.02128394	0.304008	-0.02521	-0.015736124	0.000992	-0.06591	0.037038	0.07407694	-2.19598325	**RS5** =	3.016016	**IRI** =	2.829676
	z2	-0.92852	2.341955	0.9001616	12.85743	-3.39137	-2.116956093	0.062802	-4.17121	4.319885	8.639769998	17.55098804				
	z3	0.063863	-0.16108	0.006615445	0.094491	0.24029	0.149993272	0.009863	-0.65507	0.695847	1.3916946	0.820033124				
	z4	3.743294	-9.44154	0.4186779	5.980171	-46.6788	-29.13780057	-0.11453	7.606613	42.93555	85.87109998	60.87853939				

FIGURA 3.111: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1210m a 1221m.*

N°	Dist	Cota	Y'
1	1210.00	3817.057	
2	1210.50	3817.056	-2.00
3	1211.00	3817.056	0.00
4	1211.50	3817.055	-2.00
5	1212.00	3817.054	-2.00
6	1212.50	3817.056	4.00
7	1213.00	3817.052	-8.00
8	1213.50	3817.055	6.00
9	1214.00	3817.053	-4.00
10	1214.50	3817.052	-2.00
11	1215.00	3817.053	2.00
12	1215.50	3817.048	-10.00
13	1216.00	3817.047	-2.00
14	1216.50	3817.047	0.00
15	1217.00	3817.046	-2.00
16	1217.50	3817.046	0.00
17	1218.00	3817.045	-2.00
18	1218.50	3817.045	0.00
19	1219.00	3817.044	-2.00
20	1219.50	3817.044	0.00
21	1220.00	3817.043	-2.00
22	1220.50	3817.044	2.00
23	1221.00	3817.043	-2.00

IRI	1.1006

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.27272727
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.25767	0.02128394	0	-0.02521	0.032084576	0.000992	0	0.037038	-0.07407694	-1.299666709	RS1 =	0.479132	IRI =	0.479132
	z2	-0.92852	1.181748	0.9001616	0	-3.39137	4.316287818	0.062802	0	4.319885	-8.63977	-3.141734543				
	z3	0.063863	-0.08128	0.006615445	0	0.24029	-0.305823127	0.009863	0	0.695847	-1.3916946	-1.77879824				
	z4	3.743294	-4.76419	0.4186779	0	-46.6788	59.40942	-0.11453	0	42.93555	-85.8711	-31.22587234				
2da Iteracion	z1	0.988173	-1.2843	0.02128394	-0.06687	-0.02521	0.044842276	0.000992	-0.03099	0.037038	0	-1.337307323	RS2 =	0.498125	IRI =	0.488628
	z2	-0.92852	1.206761	0.9001616	-2.82807	-3.39137	6.032561207	0.062802	-1.96104	4.319885	0	2.450216818				
	z3	0.063863	-0.083	0.006615445	-0.02078	0.24029	-0.427426717	0.009863	-0.30797	0.695847	0	-0.839182429				
	z4	3.743294	-4.86503	0.4186779	-1.31537	-46.6788	83.03222063	-0.11453	3.576146	42.93555	0	80.42795737				
3ra Iteracion	z1	0.988173	-1.32149	0.02128394	0.05215	-0.02521	0.02115521	0.000992	0.07981	0.037038	-0.07407694	-1.242452061	RS3 =	0.37315	IRI =	0.450136
	z2	-0.92852	1.241711	0.9001616	2.205591	-3.39137	2.845977276	0.062802	5.05101	4.319885	-8.63977	2.704519648				
	z3	0.063863	-0.0854	0.006615445	0.016209	0.24029	-0.20164681	0.009863	0.793235	0.695847	-1.3916946	-0.869301735				
	z4	3.743294	-5.00593	0.4186779	1.025852	-46.6788	39.17205395	-0.11453	-9.21102	42.93555	-85.8711	-59.89014877				
4ta Iteracion	z1	0.988173	-1.22776	0.02128394	0.057563	-0.02521	0.021914497	0.000992	-0.05943	0.037038	-0.07407694	-1.2817868	RS4 =	0.970925	IRI =	0.580333
	z2	-0.92852	1.153637	0.9001616	2.434505	-3.39137	2.948122954	0.062802	-3.7612	4.319885	-8.63977	-5.864707052				
	z3	0.063863	-0.07935	0.006615445	0.017892	0.24029	-0.208884166	0.009863	-0.59068	0.695847	-1.3916946	-2.252711576				
	z4	3.743294	-4.65086	0.4186779	1.132323	-46.6788	40.57798789	-0.11453	6.858925	42.93555	-85.8711	-41.95272755				
5ta Iteracion	z1	0.988173	-1.26663	0.02128394	-0.12482	-0.02521	0.056789304	0.000992	-0.04163	0.037038	0.14815388	-1.228137995	RS5 =	2.935801	IRI =	1.051427
	z2	-0.92852	1.19016	0.9001616	-5.27918	-3.39137	7.639776206	0.062802	-2.6347	4.319885	17.27954	18.19559032				
	z3	0.063863	-0.08186	0.006615445	-0.0388	0.24029	-0.541303164	0.009863	-0.41377	0.695847	2.7833892	1.707662979				
	z4	3.743294	-4.7981	0.4186779	-2.45542	-46.6788	105.1539407	-0.11453	4.80464	42.93555	171.7422	274.447253				

FIGURA 3.112: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1221m a 1232m.*

N°	Dist	Cota	Y'
1	1221.00	3817.043	
2	1221.50	3817.043	0.00
3	1222.00	3817.042	-2.00
4	1222.50	3817.042	0.00
5	1223.00	3817.043	2.00
6	1223.50	3817.043	0.00
7	1224.00	3817.042	-2.00
8	1224.50	3817.041	-2.00
9	1225.00	3817.042	2.00
10	1225.50	3817.043	2.00
11	1226.00	3817.044	2.00
12	1226.50	3817.045	2.00
13	1227.00	3817.046	2.00
14	1227.50	3817.043	-6.00
15	1228.00	3817.041	-4.00
16	1228.50	3817.040	-2.00
17	1229.00	3817.040	0.00
18	1229.50	3817.040	0.00
19	1230.00	3817.040	0.00
20	1230.50	3817.039	-2.00
21	1231.00	3817.038	-2.00
22	1231.50	3817.037	-2.00
23	1232.00	3817.036	-2.00

IRI	1.8613

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.63636364
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.62884	0.02128394	0	-0.02521	0.016042288	0.000992	0	0.037038	0	-0.612794885	RS1 =	0.419243	IRI =	0.419243
	z2	-0.92852	0.590874	0.9001616	0	-3.39137	2.158143909	0.062802	0	4.319885	0	2.749017727				
	z3	0.063863	-0.04064	0.006615445	0	0.24029	-0.152911564	0.009863	0	0.695847	0	-0.19355182				
	z4	3.743294	-2.3821	0.4186779	0	-46.6788	29.70471	-0.11453	0	42.93555	0	27.32261382				
2da Iteracion	z1	0.988173	-0.60555	0.02128394	0.05851	-0.02521	0.004879308	0.000992	0.027113	0.037038	-0.07407694	-0.589122199	RS2 =	0.600556	IRI =	0.509899
	z2	-0.92852	0.56899	0.9001616	2.47456	-3.39137	0.656405642	0.062802	1.715906	4.319885	-8.63977	-3.223908529				
	z3	0.063863	-0.03914	0.006615445	0.018186	0.24029	-0.046508489	0.009863	0.269474	0.695847	-1.3916946	-1.189677996				
	z4	3.743294	-2.29387	0.4186779	1.150953	-46.6788	9.034772501	-0.11453	-3.12913	42.93555	-85.8711	-81.108371				
3ra Iteracion	z1	0.988173	-0.58215	0.02128394	-0.06862	-0.02521	0.029990961	0.000992	-0.08049	0.037038	0	-0.701266163	RS3 =	0.443498	IRI =	0.487766
	z2	-0.92852	0.547009	0.9001616	-2.90204	-3.39137	4.034637075	0.062802	-5.09374	4.319885	0	-3.414133347				
	z3	0.063863	-0.03762	0.006615445	-0.02133	0.24029	-0.28586725	0.009863	-0.79395	0.695847	0	-1.144764012				
	z4	3.743294	-2.20526	0.4186779	-1.34978	-46.6788	55.53277691	-0.11453	9.288944	42.93555	0	61.26668437				
4ta Iteracion	z1	0.988173	-0.69297	0.02128394	-0.07267	-0.02521	0.028858711	0.000992	0.060796	0.037038	0.07407694	-0.601906694	RS4 =	2.255409	IRI =	0.929676
	z2	-0.92852	0.651137	0.9001616	-3.07327	-3.39137	3.882317182	0.062802	3.84765	4.319885	8.639769998	13.94760239				
	z3	0.063863	-0.04479	0.006615445	-0.02259	0.24029	-0.275074887	0.009863	0.604254	0.695847	1.3916946	1.653502261				
	z4	3.743294	-2.62505	0.4186779	-1.42942	-46.6788	53.4362447	-0.11453	-7.01657	42.93555	85.87109998	128.2363039				
5ta Iteracion	z1	0.988173	-0.59479	0.02128394	0.29686	-0.02521	-0.041683651	0.000992	0.127251	0.037038	0	-0.212360482	RS5 =	1.928263	IRI =	1.129394
	z2	-0.92852	0.55888	0.9001616	12.5551	-3.39137	-5.60763631	0.062802	8.053454	4.319885	0	15.55979381				
	z3	0.063863	-0.03844	0.006615445	0.09227	0.24029	0.397319397	0.009863	1.264754	0.695847	0	1.7159029				
	z4	3.743294	-2.25311	0.4186779	5.839553	-46.6788	-77.18355095	-0.11453	-14.6863	42.93555	0	-88.28338732				

FIGURA 3.113: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1232m a 1243m.*

N°	Dist	Cota	Y'
1	1232.00	3817.036	
2	1232.50	3817.035	-2.00
3	1233.00	3817.035	0.00
4	1233.50	3817.036	2.00
5	1234.00	3817.037	2.00
6	1234.50	3817.038	2.00
7	1235.00	3817.039	2.00
8	1235.50	3817.040	2.00
9	1236.00	3817.038	-4.00
10	1236.50	3817.036	-4.00
11	1237.00	3817.033	-6.00
12	1237.50	3817.031	-4.00
13	1238.00	3817.028	-6.00
14	1238.50	3817.027	-2.00
15	1239.00	3817.026	-2.00
16	1239.50	3817.025	-2.00
17	1240.00	3817.024	-2.00
18	1240.50	3817.024	0.00
19	1241.00	3817.024	0.00
20	1241.50	3817.023	-2.00
21	1242.00	3817.023	0.00
22	1242.50	3817.023	0.00
23	1243.00	3817.022	-2.00

IRI **2.3404**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.27272727
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.25767	0.02128394	0	-0.02521	0.032084576	0.000992	0	0.037038	-0.07407694	-1.299666709	RS1 =	0.479132	IRI =	0.479132
	z2	-0.92852	1.181748	0.9001616	0	-3.39137	4.316287818	0.062802	0	4.319885	-8.63977	-3.141734547				
	z3	0.063863	-0.08128	0.006615445	0	0.24029	-0.305823127	0.009863	0	0.695847	-1.3916946	-1.77879824				
	z4	3.743294	-4.76419	0.4186779	0	-46.6788	59.40942	-0.11453	0	42.93555	-85.8711	-31.22587238				
2da Iteracion	z1	0.988173	-1.2843	0.02128394	-0.06687	-0.02521	0.044842276	0.000992	-0.03099	0.037038	0	-1.337307323	RS2 =	0.498125	IRI =	0.488628
	z2	-0.92852	1.206761	0.9001616	-2.82807	-3.39137	6.032561209	0.062802	-1.96104	4.319885	0	2.450216814				
	z3	0.063863	-0.083	0.006615445	-0.02078	0.24029	-0.427426718	0.009863	-0.30797	0.695847	0	-0.83918243				
	z4	3.743294	-4.86503	0.4186779	-1.31537	-46.6788	83.03222066	-0.11453	3.576146	42.93555	0	80.4279574				
3ra Iteracion	z1	0.988173	-1.32149	0.02128394	0.05215	-0.02521	0.02115521	0.000992	0.07981	0.037038	0.07407694	-1.094298181	RS3 =	3.008386	IRI =	1.328547
	z2	-0.92852	1.241711	0.9001616	2.205591	-3.39137	2.845977277	0.062802	5.05101	4.319885	8.639770002	19.98405965				
	z3	0.063863	-0.0854	0.006615445	0.016209	0.24029	-0.20164681	0.009863	0.793235	0.695847	1.3916946	1.914087466				
	z4	3.743294	-5.00593	0.4186779	1.025852	-46.6788	39.17205398	-0.11453	-9.21102	42.93555	85.87110002	111.8520513				
4ta Iteracion	z1	0.988173	-1.08136	0.02128394	0.42534	-0.02521	-0.048252824	0.000992	0.110993	0.037038	0.07407694	-0.51919931	RS4 =	3.536308	IRI =	1.880488
	z2	-0.92852	1.016073	0.9001616	17.98888	-3.39137	-6.491376896	0.062802	7.024496	4.319885	8.639769998	28.1778452				
	z3	0.063863	-0.06989	0.006615445	0.132203	0.24029	0.459935312	0.009863	1.103161	0.695847	1.3916946	3.017108899				
	z4	3.743294	-4.09628	0.4186779	8.366884	-46.6788	-89.34736344	-0.11453	-12.8099	42.93555	85.87109998	-12.0155265				
5ta Iteracion	z1	0.988173	-0.51306	0.02128394	0.599736	-0.02521	-0.076059234	0.000992	-0.01192	0.037038	0.07407694	0.072771484	RS5 =	2.078649	IRI =	1.92012
	z2	-0.92852	0.482085	0.9001616	25.36461	-3.39137	-10.23212959	0.062802	-0.7546	4.319885	8.639770002	23.49974437				
	z3	0.063863	-0.03316	0.006615445	0.186409	0.24029	0.72497983	0.009863	-0.11851	0.695847	1.3916946	2.151420422				
	z4	3.743294	-1.94352	0.4186779	11.79744	-46.6788	-140.8351134	-0.11453	1.376079	42.93555	85.87110002	-43.73400859				

FIGURA 3.114: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1243m a 1254m.*

N°	Dist	Cota	Y'
1	1243.00	3817.022	
2	1243.50	3817.022	0.00
3	1244.00	3817.022	0.00
4	1244.50	3817.021	-2.00
5	1245.00	3817.022	2.00
6	1245.50	3817.021	-2.00
7	1246.00	3817.021	0.00
8	1246.50	3817.020	-2.00
9	1247.00	3817.021	2.00
10	1247.50	3817.020	-2.00
11	1248.00	3817.020	0.00
12	1248.50	3817.020	0.00
13	1249.00	3817.021	2.00
14	1249.50	3817.020	-2.00
15	1250.00	3817.019	-2.00
16	1250.50	3817.018	-2.00
17	1251.00	3817.016	-4.00
18	1251.50	3817.014	-4.00
19	1252.00	3817.012	-4.00
20	1252.50	3817.010	-4.00
21	1253.00	3817.008	-4.00
22	1253.50	3817.006	-4.00
23	1254.00	3817.004	-4.00

IRI	1.3218

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -1.63636364
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.61701	0.02128394	0	-0.02521	0.041251538	0.000992	0	0.037038	0	-1.575758275	RS1 =	1.078054	IRI =	1.078054
	z2	-0.92852	1.51939	0.9001616	0	-3.39137	5.549512909	0.062802	0	4.319885	0	7.068902727				
	z3	0.063863	-0.1045	0.006615445	0	0.24029	-0.393201164	0.009863	0	0.695847	0	-0.49770468				
	z4	3.743294	-6.12539	0.4186779	0	-46.6788	76.38354	-0.11453	0	42.93555	0	70.25814982				
2da Iteracion	z1	0.988173	-1.55712	0.02128394	0.150454	-0.02521	0.012546792	0.000992	0.069718	0.037038	0	-1.324402094	RS2 =	1.843873	IRI =	1.460963
	z2	-0.92852	1.463117	0.9001616	6.363155	-3.39137	1.687900223	0.062802	4.412329	4.319885	0	13.92650092				
	z3	0.063863	-0.10063	0.006615445	0.046764	0.24029	-0.119593258	0.009863	0.692934	0.695847	0	0.519471267				
	z4	3.743294	-5.89853	0.4186779	2.959593	-46.6788	23.23227215	-0.11453	-8.04632	42.93555	0	12.24701737				
3ra Iteracion	z1	0.988173	-1.30874	0.02128394	0.296411	-0.02521	-0.013095512	0.000992	0.012153	0.037038	-0.07407694	-1.087346718	RS3 =	0.051187	IRI =	0.991038
	z2	-0.92852	1.229729	0.9001616	12.5361	-3.39137	-1.761718753	0.062802	0.769133	4.319885	-8.63977	4.133474276				
	z3	0.063863	-0.08458	0.006615445	0.09213	0.24029	0.124823543	0.009863	0.120788	0.695847	-1.3916946	-1.138533278				
	z4	3.743294	-4.95763	0.4186779	5.830718	-46.6788	-24.24831098	-0.11453	-1.40259	42.93555	-85.8711	-110.6489101				
4ta Iteracion	z1	0.988173	-1.07449	0.02128394	0.087977	-0.02521	0.028701638	0.000992	-0.1098	0.037038	0.07407694	-0.993529885	RS4 =	0.978255	IRI =	0.987842
	z2	-0.92852	1.009619	0.9001616	3.720795	-3.39137	3.861186466	0.062802	-6.94894	4.319885	8.639770002	10.28243377				
	z3	0.063863	-0.06944	0.006615445	0.027345	0.24029	-0.273577706	0.009863	-1.09129	0.695847	1.3916946	-0.015274633				
	z4	3.743294	-4.07026	0.4186779	1.730594	-46.6788	53.14540135	-0.11453	12.67208	42.93555	85.87110002	149.3489147				
5ta Iteracion	z1	0.988173	-0.98178	0.02128394	0.218851	-0.02521	0.000385063	0.000992	0.148201	0.037038	-0.07407694	-0.68841889	RS5 =	0.770607	IRI =	0.944395
	z2	-0.92852	0.922508	0.9001616	9.255852	-3.39137	0.051801918	0.062802	9.379361	4.319885	-8.63977	10.9697536				
	z3	0.063863	-0.06345	0.006615445	0.068023	0.24029	-0.003670336	0.009863	1.472981	0.695847	-1.3916946	0.082188436				
	z4	3.743294	-3.71907	0.4186779	4.305028	-46.6788	0.713002009	-0.11453	-17.1042	42.93555	-85.8711	-101.6763441				

FIGURA 3.115: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1254m a 1265m.*

N°	Dist	Cota	Y'
1	1254.00	3817.004	
2	1254.50	3817.002	-4.00
3	1255.00	3817.001	-2.00
4	1255.50	3817.000	-2.00
5	1256.00	3816.999	-2.00
6	1256.50	3816.998	-2.00
7	1257.00	3817.000	4.00
8	1257.50	3816.997	-6.00
9	1258.00	3816.996	-2.00
10	1258.50	3816.995	-2.00
11	1259.00	3816.996	2.00
12	1259.50	3816.993	-6.00
13	1260.00	3816.993	0.00
14	1260.50	3816.992	-2.00
15	1261.00	3816.991	-2.00
16	1261.50	3816.990	-2.00
17	1262.00	3816.990	0.00
18	1262.50	3816.988	-4.00
19	1263.00	3816.987	-2.00
20	1263.50	3816.987	0.00
21	1264.00	3816.986	-2.00
22	1264.50	3816.986	0.00
23	1265.00	3816.985	-2.00

IRI	1.4519

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.72727273
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.70684	0.02128394	0	-0.02521	0.043543354	0.000992	0	0.037038	-0.14815388	-1.811454281	RS1 =	1.49729	IRI =	1.49729
	z2	-0.92852	1.6038	0.9001616	0	-3.39137	5.857819182	0.062802	0	4.319885	-17.27954	-9.817920454				
	z3	0.063863	-0.11031	0.006615445	0	0.24029	-0.415045673	0.009863	0	0.695847	-2.7833892	-3.30874414				
	z4	3.743294	-6.46569	0.4186779	0	-46.6788	80.62707	-0.11453	0	42.93555	-171.7422	-97.58081963				
2da Iteracion	z1	0.988173	-1.79003	0.02128394	-0.20896	-0.02521	0.083411157	0.000992	-0.09683	0.037038	-0.07407694	-2.086490538	RS2 =	1.243305	IRI =	1.370297
	z2	-0.92852	1.681964	0.9001616	-8.83771	-3.39137	11.22117231	0.062802	-6.12824	4.319885	-8.63977	-10.70258683				
	z3	0.063863	-0.11569	0.006615445	-0.06495	0.24029	-0.795056806	0.009863	-0.96241	0.695847	-1.3916946	-3.329795093				
	z4	3.743294	-6.78081	0.4186779	-4.11055	-46.6788	154.4483052	-0.11453	11.17545	42.93555	-85.8711	68.86130607				
3ra Iteracion	z1	0.988173	-2.06181	0.02128394	-0.22779	-0.02521	0.083941837	0.000992	0.068332	0.037038	-0.07407694	-2.211409098	RS3 =	0.494704	IRI =	1.078433
	z2	-0.92852	1.93734	0.9001616	-9.63406	-3.39137	11.29256385	0.062802	4.324605	4.319885	-8.63977	-0.719318961				
	z3	0.063863	-0.13325	0.006615445	-0.0708	0.24029	-0.800115131	0.009863	0.679157	0.695847	-1.3916946	-1.716705167				
	z4	3.743294	-7.81035	0.4186779	-4.48094	-46.6788	155.4309391	-0.11453	-7.88635	42.93555	-85.8711	49.38220704				
4ta Iteracion	z1	0.988173	-2.18525	0.02128394	-0.01531	-0.02521	0.043276953	0.000992	0.049003	0.037038	-0.07407694	-2.182361249	RS4 =	0.719215	IRI =	0.988628
	z2	-0.92852	2.053329	0.9001616	-0.6475	-3.39137	5.821980684	0.062802	3.101285	4.319885	-8.63977	1.689321176				
	z3	0.063863	-0.14123	0.006615445	-0.00476	0.24029	-0.412506398	0.009863	0.487041	0.695847	-1.3916946	-1.463146502				
	z4	3.743294	-8.27795	0.4186779	-0.30116	-46.6788	80.13378864	-0.11453	-5.6555	42.93555	-85.8711	-19.97193094				
5ta Iteracion	z1	0.988173	-2.15655	0.02128394	0.035955	-0.02521	0.036884914	0.000992	-0.01982	0.037038	-0.07407694	-2.1776043	RS5 =	0.109158	IRI =	0.812734
	z2	-0.92852	2.026357	0.9001616	1.520662	-3.39137	4.962069688	0.062802	-1.25427	4.319885	-8.63977	-1.384951536				
	z3	0.063863	-0.13937	0.006615445	0.011176	0.24029	-0.351578888	0.009863	-0.19698	0.695847	-1.3916946	-2.068447344				
	z4	3.743294	-8.16922	0.4186779	0.707281	-46.6788	68.29796681	-0.11453	2.287287	42.93555	-85.8711	-22.7477841				

FIGURA 3.116: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1265m a 1276m.*

N°	Dist	Cota	Y'
1	1265.00	3816.985	
2	1265.50	3816.984	-2.00
3	1266.00	3816.984	0.00
4	1266.50	3816.983	-2.00
5	1267.00	3816.987	8.00
6	1267.50	3816.982	-10.00
7	1268.00	3816.982	0.00
8	1268.50	3816.981	-2.00
9	1269.00	3816.981	0.00
10	1269.50	3816.982	2.00
11	1270.00	3816.980	-4.00
12	1270.50	3816.978	-4.00
13	1271.00	3816.976	-4.00
14	1271.50	3816.975	-2.00
15	1272.00	3816.974	-2.00
16	1272.50	3816.973	-2.00
17	1273.00	3816.972	-2.00
18	1273.50	3816.971	-2.00
19	1274.00	3816.970	-2.00
20	1274.50	3816.969	-2.00
21	1275.00	3816.971	4.00
22	1275.50	3816.968	-6.00
23	1276.00	3816.967	-2.00

IRI	2.1204

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.63636364
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.61701	0.02128394	0	-0.02521	0.041251598	0.000992	0	0.037038	-0.07407694	-1.649835214	RS1 =	0.239564	IRI =	0.239564
	z2	-0.92852	1.51939	0.9001616	0	-3.39137	5.549512909	0.062802	0	4.319885	-8.63977	-1.570867271				
	z3	0.063863	-0.1045	0.006615445	0	0.24029	-0.393201164	0.009863	0	0.695847	-1.3916946	-1.88939928				
	z4	3.743294	-6.12539	0.4186779	0	-46.6788	76.38354	-0.11453	0	42.93555	-85.8711	-15.61295016				
2da Iteracion	z1	0.988173	-1.63032	0.02128394	-0.03343	-0.02521	0.047630452	0.000992	-0.01549	0.037038	0	-1.631618893	RS2 =	0.907875	IRI =	0.573719
	z2	-0.92852	1.531898	0.9001616	-1.41403	-3.39137	6.407650146	0.062802	-0.98052	4.319885	0	5.5449948				
	z3	0.063863	-0.10536	0.006615445	-0.01039	0.24029	-0.454002997	0.009863	-0.15399	0.695847	0	-0.72374437				
	z4	3.743294	-6.17582	0.4186779	-0.65769	-46.6788	88.19494778	-0.11453	1.788075	42.93555	0	83.14951679				
3ra Iteracion	z1	0.988173	-1.61232	0.02128394	0.118019	-0.02521	0.018245096	0.000992	0.082511	0.037038	-0.07407694	-1.467623123	RS3 =	0.654579	IRI =	0.600673
	z2	-0.92852	1.514984	0.9001616	4.991391	-3.39137	2.454484219	0.062802	5.221929	4.319885	-8.63977	5.543018376				
	z3	0.063863	-0.1042	0.006615445	0.036683	0.24029	-0.173908245	0.009863	0.820077	0.695847	-1.3916946	-0.813043663				
	z4	3.743294	-6.10763	0.4186779	2.321567	-46.6788	33.7835404	-0.11453	-9.52271	42.93555	-85.8711	-65.3963288				
4ta Iteracion	z1	0.988173	-1.45027	0.02128394	0.117977	-0.02521	0.02049627	0.000992	-0.06489	0.037038	0.29630776	-1.080377659	RS4 =	5.749749	IRI =	1.887942
	z2	-0.92852	1.362712	0.9001616	4.989612	-3.39137	2.757331074	0.062802	-4.107	4.319885	34.55908	39.56173626				
	z3	0.063863	-0.09373	0.006615445	0.03667	0.24029	-0.195365937	0.009863	-0.64498	0.695847	5.566778401	4.669371736				
	z4	3.743294	-5.49374	0.4186779	2.320739	-46.6788	37.95192693	-0.11453	7.489521	42.93555	343.4844	385.7528425				
5ta Iteracion	z1	0.988173	-1.0676	0.02128394	0.84203	-0.02521	-0.11771164	0.000992	0.382789	0.037038	-0.3703847	-0.330877517	RS5 =	1.508315	IRI =	1.812017
	z2	-0.92852	1.003148	0.9001616	35.61196	-3.39137	-15.83556255	0.062802	24.22592	4.319885	-43.19885	1.806613914				
	z3	0.063863	-0.069	0.006615445	0.261718	0.24029	1.122001467	0.009863	3.804557	0.695847	-6.958473	-1.839192638				
	z4	3.743294	-4.04417	0.4186779	16.56362	-46.6788	-217.9608095	-0.11453	-44.1784	42.93555	-429.3555	-678.9752389				

FIGURA 3.117: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1276m a 1287m.*

N°	Dist	Cota	Y'
1	1276.00	3816.967	
2	1276.50	3816.967	0.00
3	1277.00	3816.966	-2.00
4	1277.50	3816.966	0.00
5	1278.00	3816.965	-2.00
6	1278.50	3816.964	-2.00
7	1279.00	3816.964	0.00
8	1279.50	3816.967	6.00
9	1280.00	3816.966	-2.00
10	1280.50	3816.964	-4.00
11	1281.00	3816.964	0.00
12	1281.50	3816.965	2.00
13	1282.00	3816.966	2.00
14	1282.50	3816.965	-2.00
15	1283.00	3816.964	-2.00
16	1283.50	3816.964	0.00
17	1284.00	3816.963	-2.00
18	1284.50	3816.963	0.00
19	1285.00	3816.963	0.00
20	1285.50	3816.965	4.00
21	1286.00	3816.962	-6.00
22	1286.50	3816.962	0.00
23	1287.00	3816.961	-2.00

IRI **1.9849**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.54545455
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.539	0.02128394	0	-0.02521	0.013750533	0.000932	0	0.037038	0	-0.525252758	RS1 =	0.359351	IRI =	0.359351
	z2	-0.92852	0.506463	0.9001616	0	-3.39137	1.849837636	0.062802	0	4.319885	0	2.356300909				
	z3	0.063863	-0.03483	0.006615445	0	0.24029	-0.131067055	0.009863	0	0.695847	0	-0.16590156				
	z4	3.743294	-2.0418	0.4186779	0	-46.6788	25.46118	-0.11453	0	42.93555	0	23.41938327				
2da Iteracion	z1	0.988173	-0.51904	0.02128394	0.050151	-0.02521	0.004182264	0.000932	0.023239	0.037038	-0.07407694	-0.515544305	RS2 =	0.702993	IRI =	0.531172
	z2	-0.92852	0.487706	0.9001616	2.121052	-3.39137	0.562633408	0.062802	1.470776	4.319885	-8.63977	-3.997603028				
	z3	0.063863	-0.03354	0.006615445	0.015588	0.24029	-0.039864419	0.009863	0.230978	0.695847	-1.3916946	-1.218537511				
	z4	3.743294	-1.96618	0.4186779	0.986531	-46.6788	7.744090716	-0.11453	-2.68211	42.93555	-85.8711	-81.78876089				
3ra Iteracion	z1	0.988173	-0.50945	0.02128394	-0.08508	-0.02521	0.03071849	0.000932	-0.08116	0.037038	0	-0.644973398	RS3 =	0.513855	IRI =	0.5254
	z2	-0.92852	0.478691	0.9001616	-3.59849	-3.39137	4.132510341	0.062802	-5.13647	4.319885	0	-4.123758032				
	z3	0.063863	-0.03292	0.006615445	-0.02645	0.24029	-0.292801891	0.009863	-0.80666	0.695847	0	-1.15882853				
	z4	3.743294	-1.92983	0.4186779	-1.67371	-46.6788	56.87990533	-0.11453	9.366866	42.93555	0	62.64322941				
4ta Iteracion	z1	0.988173	-0.63735	0.02128394	-0.08777	-0.02521	0.029213268	0.000932	0.062162	0.037038	-0.07407694	-0.707816685	RS4 =	0.412973	IRI =	0.497293
	z2	-0.92852	0.598868	0.9001616	-3.71205	-3.39137	3.930015154	0.062802	3.934099	4.319885	-8.63977	-3.888835936				
	z3	0.063863	-0.04119	0.006615445	-0.02728	0.24029	-0.278454444	0.009863	0.61783	0.695847	-1.3916946	-1.120789517				
	z4	3.743294	-2.41433	0.4186779	-1.72653	-46.6788	54.09275997	-0.11453	-7.17422	42.93555	-85.8711	-43.09341356				
5ta Iteracion	z1	0.988173	-0.69945	0.02128394	-0.08277	-0.02521	0.02825433	0.000932	-0.04276	0.037038	-0.07407694	-0.87079979	RS5 =	1.286155	IRI =	0.655066
	z2	-0.92852	0.657219	0.9001616	-3.50058	-3.39137	3.801010823	0.062802	-2.70634	4.319885	-8.63977	-10.38845917				
	z3	0.063863	-0.0452	0.006615445	-0.02573	0.24029	-0.269314065	0.009863	-0.42502	0.695847	-1.3916946	-2.156955074				
	z4	3.743294	-2.64957	0.4186779	-1.62817	-46.6788	52.31714332	-0.11453	4.935277	42.93555	-85.8711	-32.89641477				

FIGURA 3.118: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1287m a 1298m.*

N°	Dist	Cota	Y'
1	1287.00	3816.961	
2	1287.50	3816.961	0.00
3	1288.00	3816.961	0.00
4	1288.50	3816.963	4.00
5	1289.00	3816.963	0.00
6	1289.50	3816.960	-6.00
7	1290.00	3816.960	0.00
8	1290.50	3816.963	6.00
9	1291.00	3816.961	-4.00
10	1291.50	3816.961	0.00
11	1292.00	3816.961	0.00
12	1292.50	3816.960	-2.00
13	1293.00	3816.960	0.00
14	1293.50	3816.960	0.00
15	1294.00	3816.959	-2.00
16	1294.50	3816.958	-2.00
17	1295.00	3816.957	-2.00
18	1295.50	3816.957	0.00
19	1296.00	3816.960	6.00
20	1296.50	3816.957	-6.00
21	1297.00	3816.957	0.00
22	1297.50	3816.957	0.00
23	1298.00	3816.956	-2.00

IRI 2.2814

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.45454545
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.44917	0.02128394	0	-0.02521	0.011458777	0.000932	0	0.037038	0	-0.437710632	RS1 =	0.299459	IRI =	0.299459
	z2	-0.92852	0.422053	0.9001616	0	-3.39137	1.541531364	0.062802	0	4.319885	0	1.963584091				
	z3	0.063863	-0.02903	0.006615445	0	0.24029	-0.109222545	0.009863	0	0.695847	0	-0.1382513				
	z4	3.743294	-1.7015	0.4186779	0	-46.6788	21.21765	-0.11453	0	42.93555	0	19.51615273				
2da Iteracion	z1	0.988173	-0.43253	0.02128394	0.041793	-0.02521	0.00348522	0.000932	0.019366	0.037038	0	-0.367889471	RS2 =	0.512187	IRI =	0.405823
	z2	-0.92852	0.406421	0.9001616	1.767543	-3.39137	0.468861173	0.062802	1.225647	4.319885	0	3.868472478				
	z3	0.063863	-0.02795	0.006615445	0.01239	0.24029	-0.03322035	0.009863	0.192482	0.695847	0	0.144297574				
	z4	3.743294	-1.63848	0.4186779	0.822109	-46.6788	6.45340893	-0.11453	-2.23509	42.93555	0	3.401949269				
3ra Iteracion	z1	0.988173	-0.36354	0.02128394	0.082336	-0.02521	-0.003637642	0.000932	0.003376	0.037038	0.14815388	-0.133309947	RS3 =	2.987022	IRI =	1.266223
	z2	-0.92852	0.341591	0.9001616	3.48225	-3.39137	-0.48936632	0.062802	0.213648	4.319885	17.27954	20.82766341				
	z3	0.063863	-0.02349	0.006615445	0.025592	0.24029	0.034673206	0.009863	0.033552	0.695847	2.7833892	2.853711789				
	z4	3.743294	-1.37712	0.4186779	1.619644	-46.6788	-6.735641939	-0.11453	-0.38961	42.93555	171.7422	164.859475				
4ta Iteracion	z1	0.988173	-0.13173	0.02128394	0.443295	-0.02521	-0.071940105	0.000932	0.163593	0.037038	0	0.40321416	RS4 =	2.03773	IRI =	1.4591
	z2	-0.92852	0.12378	0.9001616	18.74826	-3.39137	-9.677989697	0.062802	10.35345	4.319885	0	19.54750388				
	z3	0.063863	-0.00851	0.006615445	0.137784	0.24029	0.685717264	0.009863	1.625956	0.695847	0	2.440944165				
	z4	3.743294	-0.49902	0.4186779	8.720082	-46.6788	-133.2079275	-0.11453	-18.8805	42.93555	0	-143.8674113				
5ta Iteracion	z1	0.988173	0.398445	0.02128394	0.416048	-0.02521	-0.061534518	0.000932	-0.14276	0.037038	-0.22223082	0.387965781	RS5 =	5.240368	IRI =	2.215353
	z2	-0.92852	-0.37439	0.9001616	17.59591	-3.39137	-8.278142371	0.062802	-9.03511	4.319885	-25.91931	-26.01104448				
	z3	0.063863	0.025751	0.006615445	0.129315	0.24029	0.586533497	0.009863	-1.41892	0.695847	-4.1750838	-4.852402535				
	z4	3.743294	1.509349	0.4186779	8.184108	-46.6788	-113.9404177	-0.11453	16.47643	42.93555	-257.6133	-345.383831				

FIGURA 3.119: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1298m a 1309m.*

N°	Dist	Cota	Y'
1	1298.00	3816.956	
2	1298.50	3816.956	0.00
3	1299.00	3816.955	-2.00
4	1299.50	3816.955	0.00
5	1300.00	3816.955	0.00
6	1300.50	3816.956	2.00
7	1301.00	3816.959	6.00
8	1301.50	3816.963	8.00
9	1302.00	3816.968	10.00
10	1302.50	3816.974	12.00
11	1303.00	3816.980	12.00
12	1303.50	3816.986	12.00
13	1304.00	3816.993	14.00
14	1304.50	3816.997	8.00
15	1305.00	3817.004	14.00
16	1305.50	3817.008	8.00
17	1306.00	3817.013	10.00
18	1306.50	3817.016	6.00
19	1307.00	3817.018	4.00
20	1307.50	3817.020	4.00
21	1308.00	3817.022	4.00
22	1308.50	3817.025	6.00
23	1309.00	3817.029	8.00

IRI | **4.6877**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 6.636363636
z2' = **z4'** = 0

$$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	6.557873	0.02128394	0	-0.02521	-0.167298148	0.000932	0	0.037038	0	6.390575225	RS1 =	4.372106	IRI =	4.372106
	z2	-0.92852	-6.16197	0.9001616	0	-3.39137	-22.50635791	0.062802	0	4.319885	0	-28.66832773				
	z3	0.063863	0.42382	0.006615445	0	0.24029	1.594649164	0.009863	0	0.695847	0	2.01846898				
	z4	3.743294	24.84186	0.4186779	0	-46.6788	-309.77769	-0.11453	0	42.93555	0	-284.9358298				
2da Iteracion	z1	0.988173	6.314992	0.02128394	-0.61017	-0.02521	-0.05088421	0.000932	-0.28275	0.037038	-0.07407694	5.297109331	RS2 =	8.795549	IRI =	6.583827
	z2	-0.92852	-5.93375	0.9001616	-25.8061	-3.39137	-6.845373126	0.062802	-17.8944	4.319885	-8.63977	-65.11946818				
	z3	0.063863	0.408123	0.006615445	-0.18965	0.24029	0.485017104	0.009863	-2.81023	0.695847	-1.3916946	-3.498439184				
	z4	3.743294	23.9218	0.4186779	-12.0028	-46.6788	-94.21977038	-0.11453	32.6323	42.93555	-85.8711	-135.5395593				
3ra Iteracion	z1	0.988173	5.234459	0.02128394	-1.386	-0.02521	0.088193238	0.000932	-0.1345	0.037038	0	3.802155073	RS3 =	6.072081	IRI =	6.413245
	z2	-0.92852	-4.91845	0.9001616	-58.618	-3.39137	11.8644982	0.062802	-8.51211	4.319885	0	-60.18410792				
	z3	0.063863	0.338291	0.006615445	-0.43079	0.24029	-0.840638552	0.009863	-1.33678	0.695847	0	-2.269325443				
	z4	3.743294	19.82864	0.4186779	-27.2641	-46.6788	163.3030479	-0.11453	15.52268	42.93555	0	171.3902849				
4ta Iteracion	z1	0.988173	3.757186	0.02128394	-1.28095	-0.02521	0.057223254	0.000932	0.170073	0.037038	0	2.703527565	RS4 =	1.713926	IRI =	5.238415
	z2	-0.92852	-3.53036	0.9001616	-54.1754	-3.39137	7.698154779	0.062802	10.7636	4.319885	0	-39.2440338				
	z3	0.063863	0.242818	0.006615445	-0.39814	0.24029	-0.545439477	0.009863	1.690368	0.695847	0	0.989601421				
	z4	3.743294	14.23258	0.4186779	-25.1978	-46.6788	105.9574639	-0.11453	-19.6285	42.93555	0	75.36380269				
5ta Iteracion	z1	0.988173	2.671552	0.02128394	-0.83527	-0.02521	-0.024347169	0.000932	0.074785	0.037038	0.07407694	1.960198388	RS5 =	0.325615	IRI =	4.255855
	z2	-0.92852	-2.51027	0.9001616	-35.326	-3.39137	-3.356103581	0.062802	4.732973	4.319885	8.639770002	-27.81960177				
	z3	0.063863	0.172656	0.006615445	-0.25962	0.24029	0.23779093	0.009863	0.743289	0.695847	1.3916946	2.285813936				
	z4	3.743294	10.1201	0.4186779	-16.4306	-46.6788	-46.19343649	-0.11453	-8.63105	42.93555	85.87110002	24.73610534				

FIGURA 3.120: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1309m a 1320m.*

N°	Dist	Cota	Y'
1	1309.00	3817.029	
2	1309.50	3817.033	8.00
3	1310.00	3817.037	8.00
4	1310.50	3817.036	-2.00
5	1311.00	3817.033	-6.00
6	1311.50	3817.033	0.00
7	1312.00	3817.033	0.00
8	1312.50	3817.033	0.00
9	1313.00	3817.034	2.00
10	1313.50	3817.035	2.00
11	1314.00	3817.035	0.00
12	1314.50	3817.035	0.00
13	1315.00	3817.036	2.00
14	1315.50	3817.035	-2.00
15	1316.00	3817.035	0.00
16	1316.50	3817.035	0.00
17	1317.00	3817.034	-2.00
18	1317.50	3817.034	0.00
19	1318.00	3817.033	-2.00
20	1318.50	3817.033	0.00
21	1319.00	3817.033	0.00
22	1319.50	3817.033	0.00
23	1320.00	3817.033	0.00

IRI	2.1127

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = 0.363636364
z2' = z4' = 0

$$Y' = (Y_i - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.359336	0.02128394	0	-0.02521	-0.009167022	0.000992	0	0.037038	0.29630776	0.646476265	RS1 =	5.030903	IRI =	5.030903
	z2	-0.92852	-0.33764	0.9001616	0	-3.39137	-1.233225091	0.062802	0	4.319885	34.55908	32.98821273				
	z3	0.063863	0.023223	0.006615445	0	0.24029	0.087378036	0.009863	0	0.695847	5.5667784	5.67737944				
	z4	3.743294	1.361198	0.4186779	0	-46.6788	-16.97412	-0.11453	0	42.93555	343.4844	327.8714778				
2da Iteracion	z1	0.988173	0.63883	0.02128394	0.702119	-0.02521	-0.143122818	0.000992	0.325352	0.037038	0.29630776	1.819486556	RS2 =	8.604716	IRI =	6.81781
	z2	-0.92852	-0.60026	0.9001616	29.69472	-3.39137	-19.25408863	0.062802	20.59088	4.319885	34.55908	64.99032651				
	z3	0.063863	0.041286	0.006615445	0.218232	0.24029	1.364215235	0.009863	3.233691	0.695847	5.566778401	10.42420289				
	z4	3.743294	2.419951	0.4186779	13.81144	-46.6788	-265.0134297	-0.11453	-37.5495	42.93555	343.4844	57.15284288				
3ra Iteracion	z1	0.988173	1.797967	0.02128394	1.38325	-0.02521	-0.262786962	0.000992	0.056714	0.037038	-0.07407694	2.90106696	RS3 =	0.678116	IRI =	4.771245
	z2	-0.92852	-1.68942	0.9001616	58.5018	-3.39137	-35.35231853	0.062802	3.589294	4.319885	-8.63977	16.40957936				
	z3	0.063863	0.116198	0.006615445	0.42994	0.24029	2.504827543	0.009863	0.56368	0.695847	-1.3916946	2.222951417				
	z4	3.743294	6.810873	0.4186779	27.21001	-46.6788	-486.5895946	-0.11453	-6.54544	42.93555	-85.8711	-544.9852432				
4ta Iteracion	z1	0.988173	2.866755	0.02128394	0.349261	-0.02521	-0.056039071	0.000992	-0.5408	0.037038	-0.22223082	2.396947933	RS4 =	11.11907	IRI =	6.3582
	z2	-0.92852	-2.69369	0.9001616	14.77127	-3.39137	-7.538848523	0.062802	-34.226	4.319885	-25.91931	-55.60655579				
	z3	0.063863	0.185272	0.006615445	0.108557	0.24029	0.534152107	0.009863	-5.37502	0.695847	-4.1750838	-8.722118488				
	z4	3.743294	10.85955	0.4186779	6.870328	-46.6788	-103.7647713	-0.11453	62.41449	42.93555	-257.6133	-281.233707				
5ta Iteracion	z1	0.988173	2.368599	0.02128394	-1.18353	-0.02521	0.219878589	0.000992	-0.27907	0.037038	0	1.125877654	RS5 =	6.210215	IRI =	6.328603
	z2	-0.92852	-2.2256	0.9001616	-50.0549	-3.39137	29.57392225	0.062802	-17.6619	4.319885	0	-40.36251495				
	z3	0.063863	0.153077	0.006615445	-0.36786	0.24029	-2.095834363	0.009863	-2.77372	0.695847	0	-5.084337623				
	z4	3.743294	8.972481	0.4186779	-23.2812	-46.6788	407.1382861	-0.11453	32.20832	42.93555	0	425.0378494				

FIGURA 3.121: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1320m a 1331m.*

N°	Dist	Cota	Y'
1	1320.00	3817.033	
2	1320.50	3817.034	2.00
3	1321.00	3817.034	0.00
4	1321.50	3817.034	0.00
5	1322.00	3817.032	-4.00
6	1322.50	3817.031	-2.00
7	1323.00	3817.030	-2.00
8	1323.50	3817.029	-2.00
9	1324.00	3817.028	-2.00
10	1324.50	3817.027	-2.00
11	1325.00	3817.031	8.00
12	1325.50	3817.037	12.00
13	1326.00	3817.039	4.00
14	1326.50	3817.039	0.00
15	1327.00	3817.040	2.00
16	1327.50	3817.040	0.00
17	1328.00	3817.040	0.00
18	1328.50	3817.041	2.00
19	1329.00	3817.041	0.00
20	1329.50	3817.042	2.00
21	1330.00	3817.042	0.00
22	1330.50	3817.038	-8.00
23	1331.00	3817.036	-4.00

IRI	3.1805

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.272727273
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.269502	0.02128394	0	-0.02521	-0.006875266	0.000992	0	0.037038	0.07407694	0.336703319	RS1 =	1.137942	IRI =	1.137942
	z2	-0.92852	-0.25323	0.9001616	0	-3.39137	-0.924918818	0.062802	0	4.319885	8.639770002	7.461619547				
	z3	0.063863	0.017417	0.006615445	0	0.24029	0.065533527	0.009863	0	0.695847	1.3916946	1.47464538				
	z4	3.743294	1.020898	0.4186779	0	-46.6788	-12.73059	-0.11453	0	42.93555	85.87110002	74.16140838				
2da Iteracion	z1	0.988173	0.332721	0.02128394	0.158813	-0.02521	-0.037174793	0.000992	0.073592	0.037038	0	0.527950487	RS2 =	0.628687	IRI =	0.883314
	z2	-0.92852	-0.31263	0.9001616	6.716663	-3.39137	-5.001066629	0.062802	4.65746	4.319885	0	6.060422638				
	z3	0.063863	0.021503	0.006615445	0.049362	0.24029	0.354341949	0.009863	0.73143	0.695847	0	1.156637093				
	z4	3.743294	1.26038	0.4186779	3.124015	-46.6788	-68.83472102	-0.11453	-8.49334	42.93555	0	-72.94366901				
3ra Iteracion	z1	0.988173	0.521706	0.02128394	0.12899	-0.02521	-0.029158023	0.000992	-0.07238	0.037038	0	0.549154701	RS3 =	0.916838	IRI =	0.894489
	z2	-0.92852	-0.49021	0.9001616	5.45536	-3.39137	-3.922583182	0.062802	-4.58098	4.319885	0	-3.538418148				
	z3	0.063863	0.033717	0.006615445	0.040092	0.24029	0.277927864	0.009863	-0.71942	0.695847	0	-0.367683169				
	z4	3.743294	1.976274	0.4186779	2.537365	-46.6788	-53.99046624	-0.11453	8.353881	42.93555	0	-41.12294634				
4ta Iteracion	z1	0.988173	0.54266	0.02128394	-0.07531	-0.02521	0.009269039	0.000992	-0.04081	0.037038	-0.14815388	0.287656385	RS4 =	3.553316	IRI =	1.559196
	z2	-0.92852	-0.5099	0.9001616	-3.18515	-3.39137	1.246949302	0.062802	-2.58259	4.319885	-17.27954	-22.31022747				
	z3	0.063863	0.035071	0.006615445	-0.02341	0.24029	-0.088350442	0.009863	-0.40558	0.695847	-2.7833892	-3.265659503				
	z4	3.743294	2.055647	0.4186779	-1.48146	-46.6788	17.16302015	-0.11453	4.70961	42.93555	-171.7422	-149.2953803				
5ta Iteracion	z1	0.988173	0.284254	0.02128394	-0.47485	-0.02521	0.082325023	0.000992	-0.14815	0.037038	-0.07407694	-0.330495543	RS5 =	3.447577	IRI =	1.936872
	z2	-0.92852	-0.26709	0.9001616	-20.0828	-3.39137	11.0750564	0.062802	-9.376	4.319885	-8.63977	-27.29061642				
	z3	0.063863	0.018371	0.006615445	-0.14759	0.24029	-0.784704016	0.009863	-1.47245	0.695847	-1.3916946	-3.778072586				
	z4	3.743294	1.076782	0.4186779	-9.3408	-46.6788	152.4371648	-0.11453	17.09807	42.93555	-85.8711	75.40011636				

FIGURA 3.122: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1331m a 1342m.*

N°	Dist	Cota	Y'
1	1331.00	3817.036	
2	1331.50	3817.033	-6.00
3	1332.00	3817.032	-2.00
4	1332.50	3817.031	-2.00
5	1333.00	3817.030	-2.00
6	1333.50	3817.029	-2.00
7	1334.00	3817.028	-2.00
8	1334.50	3817.027	-2.00
9	1335.00	3817.026	-2.00
10	1335.50	3817.025	-2.00
11	1336.00	3817.022	-6.00
12	1336.50	3817.019	-6.00
13	1337.00	3817.017	-4.00
14	1337.50	3817.015	-4.00
15	1338.00	3817.013	-4.00
16	1338.50	3817.009	-8.00
17	1339.00	3817.005	-8.00
18	1339.50	3817.002	-6.00
19	1340.00	3816.998	-8.00
20	1340.50	3816.995	-6.00
21	1341.00	3816.994	-2.00
22	1341.50	3816.993	-2.00
23	1342.00	3816.993	0.00

IRI	2.1172

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -3.90909091
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

Z_j' = Z_j from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-3.86286	0.02128394	0	-0.02521	0.098545485	0.000992	0	0.037038	-0.22223082	-3.986542254	RS1 =	1.377503	IRI =	1.377503
	z2	-0.92852	3.629653	0.9001616	0	-3.39137	13.25716973	0.062802	0	4.319885	-25.91931	-9.032486819				
	z3	0.063863	-0.24965	0.006615445	0	0.24029	-0.939313891	0.009863	0	0.695847	-4.1750838	-5.36404498				
	z4	3.743294	-14.6329	0.4186779	0	-46.6788	182.47179	-0.11453	0	42.93555	-257.6133	-89.77438656				
2da Iteracion	z1	0.988173	-3.93939	0.02128394	-0.19225	-0.02521	0.135223873	0.000992	-0.08908	0.037038	-0.07407694	-4.159576802	RS2 =	0.279194	IRI =	0.828349
	z2	-0.92852	3.701568	0.9001616	-8.1307	-3.39137	18.19145586	0.062802	-5.63798	4.319885	-8.63977	-0.515425057				
	z3	0.063863	-0.25459	0.006615445	-0.05975	0.24029	-1.288924223	0.009863	-0.88542	0.695847	-1.3916946	-3.880382373				
	z4	3.743294	-14.9228	0.4186779	-3.7817	-46.6788	250.3873437	-0.11453	10.28142	42.93555	-85.8711	156.0931621				
3ra Iteracion	z1	0.988173	-4.11038	0.02128394	-0.01097	-0.02521	0.097821762	0.000992	0.154894	0.037038	-0.07407694	-3.942711873	RS3 =	2.889045	IRI =	1.515247
	z2	-0.92852	3.862234	0.9001616	-0.46397	-3.39137	13.15980849	0.062802	9.802911	4.319885	-8.63977	17.72121751				
	z3	0.063863	-0.26564	0.006615445	-0.00341	0.24029	-0.932415528	0.009863	1.539497	0.695847	-1.3916946	-1.053667122				
	z4	3.743294	-15.5705	0.4186779	-0.2158	-46.6788	181.1317091	-0.11453	-17.8766	42.93555	-85.8711	61.59770816				
4ta Iteracion	z1	0.988173	-3.89608	0.02128394	0.377177	-0.02521	0.026562221	0.000992	0.061124	0.037038	-0.07407694	-3.505293203	RS4 =	2.333371	IRI =	1.719778
	z2	-0.92852	3.660871	0.9001616	15.95196	-3.39137	3.573374014	0.062802	3.868439	4.319885	-8.63977	18.41487352				
	z3	0.063863	-0.25179	0.006615445	0.117234	0.24029	-0.253185251	0.009863	0.607518	0.695847	-1.3916946	-1.17192206				
	z4	3.743294	-14.7587	0.4186779	7.419482	-46.6788	49.18394847	-0.11453	-7.05448	42.93555	-85.8711	-51.08088276				
5ta Iteracion	z1	0.988173	-3.46384	0.02128394	0.391941	-0.02521	0.029543347	0.000992	-0.05069	0.037038	-0.07407694	-3.167115982	RS5 =	0.887989	IRI =	1.55342
	z2	-0.92852	3.254721	0.9001616	16.57636	-3.39137	3.974420146	0.062802	-3.20796	4.319885	-8.63977	11.95776824				
	z3	0.063863	-0.22386	0.006615445	0.121823	0.24029	-0.281600683	0.009863	-0.50379	0.695847	-1.3916946	-2.279126552				
	z4	3.743294	-13.1213	0.4186779	7.709901	-46.6788	54.70395062	-0.11453	5.850043	42.93555	-85.8711	-30.72854863				

FIGURA 3.123: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1342m a 1353m.*

N°	Dist	Cota	Y'
1	1342.00	3816.993	
2	1342.50	3816.992	-2.00
3	1343.00	3816.996	8.00
4	1343.50	3816.990	-12.00
5	1344.00	3816.989	-2.00
6	1344.50	3816.989	0.00
7	1345.00	3816.987	-4.00
8	1345.50	3816.986	-2.00
9	1346.00	3816.985	-2.00
10	1346.50	3816.985	0.00
11	1347.00	3816.982	-6.00
12	1347.50	3816.981	-2.00
13	1348.00	3816.980	-2.00
14	1348.50	3816.981	2.00
15	1349.00	3816.977	-8.00
16	1349.50	3816.976	-2.00
17	1350.00	3816.974	-4.00
18	1350.50	3816.975	2.00
19	1351.00	3816.974	-2.00
20	1351.50	3816.973	-2.00
21	1352.00	3816.972	-2.00
22	1352.50	3816.971	-2.00
23	1353.00	3816.970	-2.00

IRI **2.1930**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -2.09090909
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-2.06618	0.02128394	0	-0.02521	0.052710375	0.000992	0	0.037038	-0.07407694	-2.087545846	RS1 =	0.059895	IRI =	0.059895
	z2	-0.92852	1.941443	0.9001616	0	-3.39137	7.091044273	0.062802	0	4.319885	-8.63977	0.39271682				
	z3	0.063863	-0.13353	0.006615445	0	0.24029	-0.502423709	0.009863	0	0.695847	-1.3916946	-2.02765058				
	z4	3.743294	-7.82689	0.4186779	0	-46.6788	97.60119	-0.11453	0	42.93555	-85.8711	3.903202566				
2da Iteracion	z1	0.988173	-2.06286	0.02128394	0.008359	-0.02521	0.051115672	0.000992	0.003873	0.037038	0.29630776	-1.70320061	RS2 =	6.690532	IRI =	3.375214
	z2	-0.92852	1.93832	0.9001616	0.353509	-3.39137	6.876511319	0.062802	0.245128	4.319885	34.55908	43.97254728				
	z3	0.063863	-0.13332	0.006615445	0.002598	0.24029	-0.487223347	0.009863	0.038496	0.695847	5.5667784	4.987331604				
	z4	3.743294	-7.8143	0.4186779	0.164422	-46.6788	94.64835671	-0.11453	-0.44701	42.93555	343.4844	430.035866				
3ra Iteracion	z1	0.988173	-1.68306	0.02128394	0.935909	-0.02521	-0.125727188	0.000992	0.426732	0.037038	-0.44446164	-0.89060443	RS3 =	1.837727	IRI =	2.862718
	z2	-0.92852	1.581449	0.9001616	39.5824	-3.39137	-16.9138818	0.062802	27.00697	4.319885	-51.83862	-0.581683716				
	z3	0.063863	-0.10877	0.006615445	0.290898	0.24029	1.198403916	0.009863	4.241306	0.695847	-8.3501676	-2.728331524				
	z4	3.743294	-6.37558	0.4186779	18.41033	-46.6788	-232.8028041	-0.11453	-49.2499	42.93555	-515.2266	-785.2445515				
4ta Iteracion	z1	0.988173	-0.88007	0.02128394	-0.01238	-0.02521	0.068779355	0.000992	-0.77921	0.037038	-0.07407694	-1.676960216	RS4 =	8.175665	IRI =	4.190955
	z2	-0.92852	0.82694	0.9001616	-0.52361	-3.39137	9.252778951	0.062802	-49.3147	4.319885	-8.63977	-48.39832913				
	z3	0.063863	-0.05688	0.006615445	-0.00385	0.24029	-0.65558969	0.009863	-7.74462	0.695847	-1.3916946	-9.852625023				
	z4	3.743294	-3.33379	0.4186779	-0.24354	-46.6788	127.3553234	-0.11453	89.93021	42.93555	-85.8711	127.8371018				
5ta Iteracion	z1	0.988173	-1.65713	0.02128394	-1.03011	-0.02521	0.248377879	0.000992	0.126855	0.037038	0	-2.312000693	RS5 =	0.778061	IRI =	3.508376
	z2	-0.92852	1.557084	0.9001616	-43.5663	-3.39137	33.41388707	0.062802	8.028383	4.319885	0	-0.56696244				
	z3	0.063863	-0.1071	0.006615445	-0.32018	0.24029	-2.367483326	0.009863	1.260816	0.695847	0	-1.533939529				
	z4	3.743294	-6.27736	0.4186779	-20.2633	-46.6788	459.9090085	-0.11453	-14.6406	42.93555	0	418.7277857				

FIGURA 3.124: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1353m a 1364m.*

N°	Dist	Cota	Y'
1	1353.00	3816.970	
2	1353.50	3816.970	0.00
3	1354.00	3816.968	-4.00
4	1354.50	3816.967	-2.00
5	1355.00	3816.966	-2.00
6	1355.50	3816.965	-2.00
7	1356.00	3816.964	-2.00
8	1356.50	3816.964	0.00
9	1357.00	3816.968	8.00
10	1357.50	3816.963	-10.00
11	1358.00	3816.963	0.00
12	1358.50	3816.962	-2.00
13	1359.00	3816.964	4.00
14	1359.50	3816.963	-2.00
15	1360.00	3816.960	-6.00
16	1360.50	3816.959	-2.00
17	1361.00	3816.959	0.00
18	1361.50	3816.958	-2.00
19	1362.00	3816.957	-2.00
20	1362.50	3816.956	-2.00
21	1363.00	3816.955	-2.00
22	1363.50	3816.954	-2.00
23	1364.00	3816.953	-2.00

IRI 2.1911

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.54545455
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.52718	0.02128394	0	-0.02521	0.038953843	0.000992	0	0.037038	0	-1.488216148	**RS1** =	1.018162	**IRI** =	1.018162
	z2	-0.92852	1.434979	0.9001616	0	-3.39137	5.241206636	0.062802	0	4.319885	0	6.676185909				
	z3	0.063863	-0.0987	0.006615445	0	0.24029	-0.371356655	0.009863	0	0.695847	0	-0.47005442				
	z4	3.743294	-5.78509	0.4186779	0	-46.6788	72.14001	-0.11453	0	42.93555	0	66.35491927				
2da Iteracion	z1	0.988173	-1.47061	0.02128394	0.142096	-0.02521	0.011849748	0.000992	0.065845	0.037038	-0.14815388	-1.39897808	**RS2** =	0.893799	**IRI** =	0.955981
	z2	-0.92852	1.381833	0.9001616	6.009646	-3.39137	1.594127988	0.062802	4.1672	4.319885	-17.27954	-4.126733577				
	z3	0.063863	-0.09504	0.006615445	0.044166	0.24029	-0.112949189	0.009863	0.654437	0.695847	-2.7833892	-2.292777448				
	z4	3.743294	-5.57083	0.4186779	2.795171	-46.6788	21.94159036	-0.11453	-7.5993	42.93555	-171.7422	-160.1755725				
3ra Iteracion	z1	0.988173	-1.38243	0.02128394	-0.08783	-0.02521	0.057799337	0.000992	-0.15894	0.037038	-0.07407694	-1.645487563	**RS3** =	1.993542	**IRI** =	1.301834
	z2	-0.92852	1.298974	0.9001616	-3.71473	-3.39137	7.775654361	0.062802	-10.0593	4.319885	-8.63977	-13.33916265				
	z3	0.063863	-0.08934	0.006615445	-0.0273	0.24029	-0.550930576	0.009863	-1.57976	0.695847	-1.3916946	-3.639029071				
	z4	3.743294	-5.23679	0.4186779	-1.72777	-46.6788	107.0241687	-0.11453	18.34412	42.93555	-85.8711	32.5326338				
4ta Iteracion	z1	0.988173	-1.62603	0.02128394	-0.28391	-0.02521	0.091737412	0.000992	0.032283	0.037038	-0.07407694	-1.859992684	**RS4** =	0.278594	**IRI** =	1.046024
	z2	-0.92852	1.527862	0.9001616	-12.0074	-3.39137	12.34129038	0.062802	2.043104	4.319885	-8.63977	-4.734916354				
	z3	0.063863	-0.10509	0.006615445	-0.08824	0.24029	-0.87442084	0.009863	0.320859	0.695847	-1.3916946	-2.13858718				
	z4	3.743294	-6.15954	0.4186779	-5.58481	-46.6788	169.8656194	-0.11453	-3.7258	42.93555	-85.8711	68.52435988				
5ta Iteracion	z1	0.988173	-1.83799	0.02128394	-0.10078	-0.02521	0.053912307	0.000992	0.067998	0.037038	-0.07407694	-1.890938448	**RS5** =	0.511089	**IRI** =	0.939037
	z2	-0.92852	1.727033	0.9001616	-4.26219	-3.39137	7.252738267	0.062802	4.303444	4.319885	-8.63977	0.381255591				
	z3	0.063863	-0.11879	0.006615445	-0.03132	0.24029	-0.513880258	0.009863	0.675834	0.695847	-1.3916946	-1.379849799				
	z4	3.743294	-6.9625	0.4186779	-1.9824	-46.6788	99.82674743	-0.11453	-7.84776	42.93555	-85.8711	-2.837016008				

FIGURA 3.125: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1364m a 1375m.*

N°	Dist	Cota	Y'
1	1364.00	3816.953	
2	1364.50	3816.952	-2.00
3	1365.00	3816.951	-2.00
4	1365.50	3816.950	-2.00
5	1366.00	3816.949	-2.00
6	1366.50	3816.948	-2.00
7	1367.00	3816.947	-2.00
8	1367.50	3816.946	-2.00
9	1368.00	3816.945	-2.00
10	1368.50	3816.944	-2.00
11	1369.00	3816.943	-2.00
12	1369.50	3816.943	0.00
13	1370.00	3816.943	0.00
14	1370.50	3816.945	4.00
15	1371.00	3816.946	2.00
16	1371.50	3816.946	0.00
17	1372.00	3816.948	4.00
18	1372.50	3816.947	-2.00
19	1373.00	3816.946	-2.00
20	1373.50	3816.947	2.00
21	1374.00	3816.948	2.00
22	1374.50	3816.949	2.00
23	1375.00	3816.950	2.00

IRI	1.4360

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.27272727
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.2695	0.02128394	0	-0.02521	0.006875266	0.000992	0	0.037038	-0.07407694	-0.336703319	RS1 =	1.137942	IRI =	1.137942
	z2	-0.92852	0.253232	0.9001616	0	-3.39137	0.924918818	0.062802	0	4.319885	-8.63977	-7.461619543				
	z3	0.063863	-0.01742	0.006615445	0	0.24029	-0.065533527	0.009863	0	0.695847	-1.3916946	-1.47464538				
	z4	3.743294	-1.0209	0.4186779	0	-46.6788	12.73059	-0.11453	0	42.93555	-85.8711	-74.16140834				
2da Iteracion	z1	0.988173	-0.33272	0.02128394	-0.15881	-0.02521	0.037174793	0.000992	-0.07359	0.037038	-0.07407694	-0.602027427	RS2 =	1.946304	IRI =	1.542123
	z2	-0.92852	0.312634	0.9001616	-6.71666	-3.39137	5.001066627	0.062802	-4.65746	4.319885	-8.63977	-14.70019264				
	z3	0.063863	-0.0215	0.006615445	-0.04936	0.24029	-0.354341948	0.009863	-0.73143	0.695847	-1.3916946	-2.548331693				
	z4	3.743294	-1.26038	0.4186779	-3.12402	-46.6788	68.83472099	-0.11453	8.493343	42.93555	-85.8711	-12.92743104				
3ra Iteracion	z1	0.988173	-0.59491	0.02128394	-0.31288	-0.02521	0.064241684	0.000992	-0.01283	0.037038	-0.07407694	-0.930448446	RS3 =	1.336779	IRI =	1.473675
	z2	-0.92852	0.558992	0.9001616	-13.2325	-3.39137	8.642333105	0.062802	-0.81186	4.319885	-8.63977	-13.48285798				
	z3	0.063863	-0.03845	0.006615445	-0.09725	0.24029	-0.612337603	0.009863	-0.1275	0.695847	-1.3916946	-2.267227068				
	z4	3.743294	-2.25357	0.4186779	-6.15465	-46.6788	118.9531419	-0.11453	1.480515	42.93555	-85.8711	26.15434579				
4ta Iteracion	z1	0.988173	-0.91944	0.02128394	-0.28697	-0.02521	0.05715523	0.000992	0.025953	0.037038	-0.07407694	-1.197380414	RS4 =	0.62977	IRI =	1.262699
	z2	-0.92852	0.863936	0.9001616	-12.1368	-3.39137	7.689003596	0.062802	1.642537	4.319885	-8.63977	-10.58104455				
	z3	0.063863	-0.05942	0.006615445	-0.0892	0.24029	-0.544791085	0.009863	0.257952	0.695847	-1.3916946	-1.827150319				
	z4	3.743294	-3.48294	0.4186779	-5.64497	-46.6788	105.8315069	-0.11453	-2.99533	42.93555	-85.8711	7.837161062				
5ta Iteracion	z1	0.988173	-1.18322	0.02128394	-0.22521	-0.02521	0.046061199	0.000992	0.007777	0.037038	-0.07407694	-1.428663751	RS5 =	0.471248	IRI =	1.104408
	z2	-0.92852	1.111787	0.9001616	-9.52465	-3.39137	6.19654095	0.062802	0.492187	4.319885	-8.63977	-10.36390537				
	z3	0.063863	-0.07647	0.006615445	-0.07	0.24029	-0.439045219	0.009863	0.077295	0.695847	-1.3916946	-1.899911343				
	z4	3.743294	-4.48215	0.4186779	-4.43005	-46.6788	85.28923912	-0.11453	-0.89755	42.93555	-85.8711	-10.39160898				

FIGURA 3.126: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1375m a 1386m.*

N°	Dist	Cota	Y'
1	1375.00	3816.950	
2	1375.50	3816.949	-2.00
3	1376.00	3816.950	2.00
4	1376.50	3816.951	2.00
5	1377.00	3816.952	2.00
6	1377.50	3816.951	-2.00
7	1378.00	3816.950	-2.00
8	1378.50	3816.952	4.00
9	1379.00	3816.953	2.00
10	1379.50	3816.954	2.00
11	1380.00	3816.955	2.00
12	1380.50	3816.953	-4.00
13	1381.00	3816.950	-6.00
14	1381.50	3816.947	-6.00
15	1382.00	3816.945	-4.00
16	1382.50	3816.942	-6.00
17	1383.00	3816.940	-4.00
18	1383.50	3816.939	-2.00
19	1384.00	3816.937	-4.00
20	1384.50	3816.936	-2.00
21	1385.00	3816.935	-2.00
22	1385.50	3816.934	-2.00
23	1386.00	3816.933	-2.00

IRI **2.5706**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.54545455
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.52718	0.02128394	0	-0.02521	0.038959843	0.000992	0	0.037038	-0.07407694	-1.562293088	RS1 =	0.299456	IRI =	0.299456
	z2	-0.92852	1.434979	0.9001616	0	-3.39137	5.241206636	0.062802	0	4.319885	-8.63977	-1.963584093				
	z3	0.063863	-0.0987	0.006615445	0	0.24029	-0.371356655	0.009863	0	0.695847	-1.3916946	-1.86174302				
	z4	3.743294	-5.78509	0.4186779	0	-46.6788	72.14001	-0.11453	0	42.93555	-85.8711	-19.51618074				
2da Iteracion	z1	0.988173	-1.54382	0.02128394	-0.04179	-0.02521	0.046933408	0.000992	-0.01937	0.037038	0.07407694	-1.483964065	RS2 =	2.123055	IRI =	1.211255
	z2	-0.92852	1.450614	0.9001616	-1.76754	-3.39137	6.313877913	0.062802	-1.22565	4.319885	8.639770002	13.4110703				
	z3	0.063863	-0.09977	0.006615445	-0.01299	0.24029	-0.447358927	0.009863	-0.19248	0.695847	1.3916946	0.639090715				
	z4	3.743294	-5.84812	0.4186779	-0.82211	-46.6788	86.90426602	-0.11453	2.235093	42.93555	85.87110002	168.340227				
3ra Iteracion	z1	0.988173	-1.46641	0.02128394	0.28544	-0.02521	-0.016111036	0.000992	0.167047	0.037038	0.07407694	-0.955959672	RS3 =	4.155456	IRI =	2.192656
	z2	-0.92852	1.377884	0.9001616	12.07213	-3.39137	-2.16739244	0.062802	10.57205	4.319885	8.639769998	30.49443982				
	z3	0.063863	-0.09477	0.006615445	0.08872	0.24029	0.153566852	0.009863	1.660286	0.695847	1.3916946	3.199496657				
	z4	3.743294	-5.55491	0.4186779	5.614919	-46.6788	-29.83200685	-0.11453	-19.2792	42.93555	85.87109998	36.81991677				
4ta Iteracion	z1	0.988173	-0.94465	0.02128394	0.649042	-0.02521	-0.080657103	0.000992	0.036537	0.037038	0.07407694	-0.265654575	RS4 =	2.929982	IRI =	2.376987
	z2	-0.92852	0.887624	0.9001616	27.44992	-3.39137	-10.85067378	0.062802	2.312352	4.319885	8.639770002	28.43899608				
	z3	0.063863	-0.06105	0.006615445	0.201734	0.24029	0.768805772	0.009863	0.363143	0.695847	1.3916946	2.664327017				
	z4	3.743294	-3.57844	0.4186779	12.76735	-46.6788	-149.3487605	-0.11453	-4.2168	42.93555	85.87110002	-58.50555524				
5ta Iteracion	z1	0.988173	-0.26251	0.02128394	0.605294	-0.02521	-0.067165846	0.000992	-0.05806	0.037038	-0.07407694	0.143482474	RS5 =	1.300818	IRI =	2.161753
	z2	-0.92852	0.246665	0.9001616	25.59969	-3.39137	-9.035716052	0.062802	-3.67425	4.319885	-8.63977	4.496624108				
	z3	0.063863	-0.01697	0.006615445	0.188137	0.24029	0.640210073	0.009863	-0.57702	0.695847	-1.3916946	-1.157335049				
	z4	3.743294	-0.99442	0.4186779	11.90678	-46.6788	-124.3676679	-0.11453	6.700355	42.93555	-85.8711	-192.6260574				

FIGURA 3.127: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1386m a 1397m.*

N°	Dist	Cota	Y'
1	1386.00	3816.933	
2	1386.50	3816.932	-2.00
3	1387.00	3816.932	0.00
4	1387.50	3816.932	0.00
5	1388.00	3816.930	-4.00
6	1388.50	3816.929	-2.00
7	1389.00	3816.928	-2.00
8	1389.50	3816.926	-4.00
9	1390.00	3816.923	-6.00
10	1390.50	3816.925	4.00
11	1391.00	3816.926	2.00
12	1391.50	3816.927	2.00
13	1392.00	3816.927	0.00
14	1392.50	3816.928	2.00
15	1393.00	3816.928	0.00
16	1393.50	3816.929	2.00
17	1394.00	3816.930	2.00
18	1394.50	3816.931	2.00
19	1395.00	3816.932	2.00
20	1395.50	3816.933	2.00
21	1396.00	3816.932	-2.00
22	1396.50	3816.931	-2.00
23	1397.00	3816.930	-2.00

IRI	2.2108

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.27272727
z2' = z4' = 0

$Y' = (Y_1 - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.2695	0.02128394	0	-0.02521	0.006875266	0.000992	0	0.037038	-0.07407694	-0.336703319	RS1 =	1.137942	IRI =	1.137942
	z2	-0.92852	0.253232	0.9001616	0	-3.39137	0.924918818	0.062802	0	4.319885	-8.63977	-7.461619543				
	z3	0.063863	-0.01742	0.006615445	0	0.24029	-0.065533527	0.009863	0	0.695847	-1.3916946	-1.47464538				
	z4	3.743294	-1.0209	0.4186779	0	-46.6788	12.73059	-0.11453	0	42.93555	-85.8711	-74.16140834				
2da Iteracion	z1	0.988173	-0.33272	0.02128394	-0.15881	-0.02521	0.037174793	0.000992	-0.07359	0.037038	0	-0.527950487	RS2 =	0.628687	IRI =	0.883314
	z2	-0.92852	0.312634	0.9001616	-6.71666	-3.39137	5.001066627	0.062802	-4.65746	4.319885	0	-6.060422634				
	z3	0.063863	-0.0215	0.006615445	-0.04936	0.24029	-0.354341948	0.009863	-0.73143	0.695847	0	-1.156637093				
	z4	3.743294	-1.26038	0.4186779	-3.12402	-46.6788	68.83472099	-0.11453	8.493343	42.93555	0	72.94366898				
3ra Iteracion	z1	0.988173	-0.52171	0.02128394	-0.12899	-0.02521	0.029158023	0.000992	0.072383	0.037038	0	-0.549154701	RS3 =	0.916838	IRI =	0.894489
	z2	-0.92852	0.49021	0.9001616	-5.45536	-3.39137	3.92258318	0.062802	4.580984	4.319885	0	3.538418147				
	z3	0.063863	-0.03372	0.006615445	-0.04009	0.24029	-0.277327864	0.009863	0.71942	0.695847	0	0.367683169				
	z4	3.743294	-1.97627	0.4186779	-2.53737	-46.6788	53.99046621	-0.11453	-8.35388	42.93555	0	41.12294632				
4ta Iteracion	z1	0.988173	-0.54266	0.02128394	0.075311	-0.02521	-0.009269039	0.000992	0.040807	0.037038	-0.14815388	-0.583964145	RS4 =	1.717155	IRI =	1.100155
	z2	-0.92852	0.509899	0.9001616	3.185148	-3.39137	-1.246949301	0.062802	2.58259	4.319885	-17.27954	-12.24885253				
	z3	0.063863	-0.03507	0.006615445	0.023408	0.24029	0.088350442	0.009863	0.405582	0.695847	-2.7833892	-2.301118898				
	z4	3.743294	-2.05565	0.4186779	1.481457	-46.6788	-17.16302014	-0.11453	-4.70961	42.93555	-171.7422	-194.1890197				
5ta Iteracion	z1	0.988173	-0.57706	0.02128394	-0.2607	-0.02521	0.05800962	0.000992	-0.1927	0.037038	-0.07407694	-1.046525557	RS5 =	2.931654	IRI =	1.466455
	z2	-0.92852	0.54222	0.9001616	-11.0259	-3.39137	7.803943295	0.062802	-12.1954	4.319885	-8.63977	-23.51494808				
	z3	0.063863	-0.03729	0.006615445	-0.08103	0.24029	-0.552934939	0.009863	-1.91522	0.695847	-1.3916946	-3.978179164				
	z4	3.743294	-2.18595	0.4186779	-5.12832	-46.6788	107.4135378	-0.11453	22.23952	42.93555	-85.8711	36.46768142				

FIGURA 3.128: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1397m a 1408m.*

N°	Dist	Cota	Y'
1	1397.00	3816.930	
2	1397.50	3816.929	-2.00
3	1398.00	3816.929	0.00
4	1398.50	3816.928	-2.00
5	1399.00	3816.927	-2.00
6	1399.50	3816.927	0.00
7	1400.00	3816.927	0.00
8	1400.50	3816.928	2.00
9	1401.00	3816.929	2.00
10	1401.50	3816.928	-2.00
11	1402.00	3816.929	2.00
12	1402.50	3816.930	2.00
13	1403.00	3816.930	0.00
14	1403.50	3816.929	-2.00
15	1404.00	3816.928	-2.00
16	1404.50	3816.929	2.00
17	1405.00	3816.930	2.00
18	1405.50	3816.931	2.00
19	1406.00	3816.932	2.00
20	1406.50	3816.933	2.00
21	1407.00	3816.933	0.00
22	1407.50	3816.932	-2.00
23	1408.00	3816.934	4.00

IRI **1.4498**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.363636364
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.359336	0.02128394	0	-0.02521	-0.009167022	0.000992	0	0.037038	-0.07407694	0.276091566	RS1 =	1.557185	IRI =	1.557185
	z2	-0.92852	-0.33764	0.9001616	0	-3.39137	-1.233225091	0.062802	0	4.319885	-8.63977	-10.21063727				
	z3	0.063863	0.023223	0.006615445	0	0.24029	0.087378036	0.009863	0	0.695847	-1.3916946	-1.28109356				
	z4	3.743294	1.361198	0.4186779	0	-46.6788	-16.97412	-0.11453	0	42.93555	-85.8711	-101.4840222				
2da Iteracion	z1	0.988173	0.272826	0.02128394	-0.21732	-0.02521	0.032295485	0.000992	-0.1007	0.037038	0	-0.012905228	RS2 =	1.345748	IRI =	1.451467
	z2	-0.92852	-0.25636	0.9001616	-9.19122	-3.39137	4.344660984	0.062802	-6.37337	4.319885	0	-11.4762841				
	z3	0.063863	0.017632	0.006615445	-0.06755	0.24029	-0.307833459	0.009863	-1.0009	0.695847	0	-1.358653697				
	z4	3.743294	1.033492	0.4186779	-4.27497	-46.6788	59.79994848	-0.11453	11.62247	42.93555	0	68.18094				
3ra Iteracion	z1	0.988173	-0.01275	0.02128394	-0.24426	-0.02521	0.034250722	0.000992	0.067657	0.037038	-0.07407694	-0.229182283	RS3 =	0.893281	IRI =	1.265405
	z2	-0.92852	0.011983	0.9001616	-10.3305	-3.39137	4.607696028	0.062802	4.281877	4.319885	-8.63977	-10.06872463				
	z3	0.063863	-0.00082	0.006615445	-0.07592	0.24029	-0.326470353	0.009863	0.672447	0.695847	-1.3916946	-1.122463056				
	z4	3.743294	-0.04831	0.4186779	-4.80487	-46.6788	63.42036493	-0.11453	-7.80843	42.93555	-85.8711	-35.11233865				
4ta Iteracion	z1	0.988173	-0.22647	0.02128394	-0.2143	-0.02521	0.028296519	0.000992	-0.03484	0.037038	-0.07407694	-0.52139678	RS4 =	1.567561	IRI =	1.340944
	z2	-0.92852	0.212799	0.9001616	-9.06348	-3.39137	3.806686413	0.062802	-2.20511	4.319885	-8.63977	-15.88887695				
	z3	0.063863	-0.01464	0.006615445	-0.06661	0.24029	-0.269716199	0.009863	-0.3463	0.695847	-1.3916946	-2.08895798				
	z4	3.743294	-0.8579	0.4186779	-4.21555	-46.6788	52.39526219	-0.11453	4.021244	42.93555	-85.8711	-34.52804284				
5ta Iteracion	z1	0.988173	-0.51523	0.02128394	-0.33818	-0.02521	0.052661189	0.000992	-0.03426	0.037038	0	-0.835009525	RS5 =	0.145894	IRI =	1.101934
	z2	-0.92852	0.484125	0.9001616	-14.3026	-3.39137	7.084427337	0.062802	-2.16842	4.319885	0	-8.902423056				
	z3	0.063863	-0.0333	0.006615445	-0.10511	0.24029	-0.501954878	0.009863	-0.34054	0.695847	0	-0.980904005				
	z4	3.743294	-1.95174	0.4186779	-6.65232	-46.6788	97.51011444	-0.11453	3.954328	42.93555	0	92.86037893				

FIGURA 3.129: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1408m a 1419m.*

N°	Dist	Cota	Y'
1	1408.00	3816.934	
2	1408.50	3816.934	0.00
3	1409.00	3816.935	2.00
4	1409.50	3816.936	2.00
5	1410.00	3816.937	2.00
6	1410.50	3816.936	-2.00
7	1411.00	3816.935	-2.00
8	1411.50	3816.934	-2.00
9	1412.00	3816.933	-2.00
10	1412.50	3816.932	-2.00
11	1413.00	3816.931	-2.00
12	1413.50	3816.932	2.00
13	1414.00	3816.932	0.00
14	1414.50	3816.931	-2.00
15	1415.00	3816.932	2.00
16	1415.50	3816.933	2.00
17	1416.00	3816.933	0.00
18	1416.50	3816.932	-2.00
19	1417.00	3816.932	0.00
20	1417.50	3816.931	-2.00
21	1418.00	3816.931	0.00
22	1418.50	3816.930	-2.00
23	1419.00	3816.929	-2.00

IRI **1.4579**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.45454545
z2' = z4' = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.44917	0.02128394	0	-0.02521	0.011458777	0.000992	0	0.037038	0	-0.437710632	RS1 =	0.299459	IRI =	0.299459
	z2	-0.92852	0.422053	0.9001616	0	-3.39137	1.541531364	0.062802	0	4.319885	0	1.963584091				
	z3	0.063863	-0.02903	0.006615445	0	0.24029	-0.109222545	0.009863	0	0.695847	0	-0.1382513				
	z4	3.743294	-1.7015	0.4186779	0	-46.6788	21.21765	-0.11453	0	42.93555	0	19.51615273				
2da Iteracion	z1	0.988173	-0.43253	0.02128394	0.041793	-0.02521	0.00348522	0.000992	0.019366	0.037038	0.07407694	-0.293812531	RS2 =	1.829805	IRI =	1.064632
	z2	-0.92852	0.406421	0.9001616	1.767543	-3.39137	0.468861173	0.062802	1.225647	4.319885	8.639769998	12.50824248				
	z3	0.063863	-0.02795	0.006615445	0.01299	0.24029	-0.03322035	0.009863	0.192482	0.695847	1.3916946	1.535992174				
	z4	3.743294	-1.63848	0.4186779	0.822109	-46.6788	6.45340893	-0.11453	-2.23509	42.93555	85.87109998	89.27304925				
3ra Iteracion	z1	0.988173	-0.29034	0.02128394	0.266225	-0.02521	-0.038721303	0.000992	0.088587	0.037038	0.07407694	0.099829918	RS3 =	2.605403	IRI =	1.578222
	z2	-0.92852	0.27281	0.9001616	11.25944	-3.39137	-5.209116243	0.062802	5.606497	4.319885	8.639770002	20.56939953				
	z3	0.063863	-0.01876	0.006615445	0.082748	0.24029	0.369082945	0.009863	0.880472	0.695847	1.3916946	2.705232827				
	z4	3.743294	-1.09983	0.4186779	5.236925	-46.6788	-71.69831757	-0.11453	-10.224	42.93555	85.87110002	8.085875566				
4ta Iteracion	z1	0.988173	0.098649	0.02128394	0.437798	-0.02521	-0.068197053	0.000992	0.008024	0.037038	0.07407694	0.5503507	RS4 =	1.713583	IRI =	1.612062
	z2	-0.92852	-0.09269	0.9001616	18.51578	-3.39137	-9.174442747	0.062802	0.507806	4.319885	8.639770002	18.39622366				
	z3	0.063863	0.006375	0.006615445	0.136076	0.24029	0.650039314	0.009863	0.079748	0.695847	1.3916946	2.263933513				
	z4	3.743294	0.373693	0.4186779	8.611953	-46.6788	-126.2771032	-0.11453	-0.92604	42.93555	85.87110002	-32.34633919				
5ta Iteracion	z1	0.988173	0.543842	0.02128394	0.391544	-0.02521	-0.057072202	0.000992	-0.0321	0.037038	-0.07407694	0.772138656	RS5 =	1.782009	IRI =	1.646052
	z2	-0.92852	-0.51101	0.9001616	16.55957	-3.39137	-7.677833933	0.062802	-2.03141	4.319885	-8.63977	-2.300446748				
	z3	0.063863	0.035147	0.006615445	0.121699	0.24029	0.543999678	0.009863	-0.31902	0.695847	-1.3916946	-1.009870652				
	z4	3.743294	2.060124	0.4186779	7.702092	-46.6788	-105.6777676	-0.11453	3.704474	42.93555	-85.8711	-178.0821769				

FIGURA 3.130: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1419m a 1430m.*

N°	Dist	Cota	Y'
1	1419.00	3816.929	
2	1419.50	3816.928	-2.00
3	1420.00	3816.927	-2.00
4	1420.50	3816.927	0.00
5	1421.00	3816.926	-2.00
6	1421.50	3816.926	0.00
7	1422.00	3816.927	2.00
8	1422.50	3816.928	2.00
9	1423.00	3816.929	2.00
10	1423.50	3816.929	0.00
11	1424.00	3816.930	2.00
12	1424.50	3816.931	2.00
13	1425.00	3816.932	2.00
14	1425.50	3816.933	2.00
15	1426.00	3816.934	2.00
16	1426.50	3816.935	2.00
17	1427.00	3816.935	0.00
18	1427.50	3816.936	2.00
19	1428.00	3816.937	2.00
20	1428.50	3816.938	2.00
21	1429.00	3816.939	2.00
22	1429.50	3816.939	0.00
23	1430.00	3816.940	2.00

IRI 1.2425

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 1
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.988173	0.02128394	0	-0.02521	-0.02520931	0.000992	0	0.037038	-0.07407694	0.88888645	RS1 =	1.976428	IRI =	1.976428
	z2	-0.92852	-0.92852	0.9001616	0	-3.39137	-3.391369	0.062802	0	4.319885	-8.63977	-12.959655				
	z3	0.063863	0.063863	0.006615445	0	0.24029	0.2402896	0.009863	0	0.695847	-1.3916946	-1.08754174				
	z4	3.743294	3.743294	0.4186779	0	-46.6788	-46.67883	-0.11453	0	42.93555	-85.8711	-128.806636				
2da Iteracion	z1	0.988173	0.878373	0.02128394	-0.27583	-0.02521	0.027416177	0.000992	-0.12782	0.037038	-0.07407694	0.428063091	RS2 =	3.380428	IRI =	2.678428
	z2	-0.92852	-0.82535	0.9001616	-11.6658	-3.39137	3.688255342	0.062802	-8.08927	4.319885	-8.63977	-25.53191558				
	z3	0.063863	0.056767	0.006615445	-0.08573	0.24029	-0.26132497	0.009863	-1.27038	0.695847	-1.3916946	-2.952364901				
	z4	3.743294	3.327363	0.4186779	-5.42592	-46.6788	50.76517598	-0.11453	14.75159	42.93555	-85.8711	-22.45288899				
3ra Iteracion	z1	0.988173	0.423	0.02128394	-0.54342	-0.02521	0.074427082	0.000992	-0.02228	0.037038	0	-0.068272789	RS3 =	1.004163	IRI =	2.12034
	z2	-0.92852	-0.39746	0.9001616	-22.9828	-3.39137	10.0125588	0.062802	-1.41008	4.319885	0	-14.77783353				
	z3	0.063863	0.027338	0.006615445	-0.1689	0.24029	-0.709422581	0.009863	-0.22145	0.695847	0	-1.072435719				
	z4	3.743294	1.602366	0.4186779	-10.6896	-46.6788	137.8129393	-0.11453	2.571419	42.93555	0	131.2970759				
4ta Iteracion	z1	0.988173	-0.06747	0.02128394	-0.31453	-0.02521	0.027035364	0.000992	0.130288	0.037038	-0.07407694	-0.29874915	RS4 =	0.157822	IRI =	1.62971
	z2	-0.92852	0.063392	0.9001616	-13.3024	-3.39137	3.637025252	0.062802	8.245676	4.319885	-8.63977	-9.996115011				
	z3	0.063863	-0.00436	0.006615445	-0.09776	0.24029	-0.25769515	0.009863	1.294941	0.695847	-1.3916946	-0.456570773				
	z4	3.743294	-0.25557	0.4186779	-6.18715	-46.6788	50.06004462	-0.11453	-15.0368	42.93555	-85.8711	-57.29058354				
5ta Iteracion	z1	0.988173	-0.29522	0.02128394	-0.21276	-0.02521	0.011509834	0.000992	-0.05685	0.037038	0	-0.553313023	RS5 =	0.206643	IRI =	1.345097
	z2	-0.92852	0.277393	0.9001616	-8.99812	-3.39137	1.548399967	0.062802	-3.59794	4.319885	0	-10.77026987				
	z3	0.063863	-0.01908	0.006615445	-0.06613	0.24029	-0.109709208	0.009863	-0.56504	0.695847	0	-0.759355745				
	z4	3.743294	-1.11831	0.4186779	-4.18515	-46.6788	21.31218951	-0.11453	6.56121	42.93555	0	22.56394098				

FIGURA 3.131: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1430m a 1441m.*

N°	Dist	Cota	Y'
1	1430.00	3816.940	
2	1430.50	3816.940	0.00
3	1431.00	3816.941	2.00
4	1431.50	3816.941	0.00
5	1432.00	3816.942	2.00
6	1432.50	3816.941	-2.00
7	1433.00	3816.941	0.00
8	1433.50	3816.940	-2.00
9	1434.00	3816.939	-2.00
10	1434.50	3816.940	2.00
11	1435.00	3816.942	4.00
12	1435.50	3816.943	2.00
13	1436.00	3816.943	0.00
14	1436.50	3816.944	2.00
15	1437.00	3816.944	0.00
16	1437.50	3816.945	2.00
17	1438.00	3816.945	0.00
18	1438.50	3816.946	2.00
19	1439.00	3816.946	0.00
20	1439.50	3816.947	2.00
21	1440.00	3816.947	0.00
22	1440.50	3816.947	0.00
23	1441.00	3816.948	2.00

IRI	1.1031

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.727272727
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.718671	0.02128394	0	-0.02521	-0.018334044	0.000992	0	0.037038	0	0.700337011	RS1 =	0.479135	IRI =	0.479135
	z2	-0.92852	-0.67528	0.9001616	0	-3.39137	-2.466450182	0.062802	0	4.319885	0	-3.141734546				
	z3	0.063863	0.046446	0.006615445	0	0.24029	0.174756073	0.009863	0	0.695847	0	0.22120208				
	z4	3.743294	2.722396	0.4186779	0	-46.6788	-33.94824	-0.11453	0	42.93555	0	-31.22584436				
2da Iteracion	z1	0.988173	0.692054	0.02128394	-0.06687	-0.02521	-0.005576352	0.000992	-0.03099	0.037038	0.07407694	0.662700093	RS2 =	0.438118	IRI =	0.488627
	z2	-0.92852	-0.65027	0.9001616	-2.82807	-3.39137	-0.750177877	0.062802	-1.96104	4.319885	8.639770002	2.450214036				
	z3	0.063863	0.044726	0.006615445	-0.02078	0.24029	0.053152559	0.009863	-0.30797	0.695847	1.3916946	1.160818481				
	z4	3.743294	2.621567	0.4186779	-1.31537	-46.6788	-10.32545429	-0.11453	3.576143	42.93555	85.87110002	80.42798119				
3ra Iteracion	z1	0.988173	0.654862	0.02128394	0.05215	-0.02521	-0.029263433	0.000992	0.07981	0.037038	0	0.757558929	RS3 =	0.373141	IRI =	0.450131
	z2	-0.92852	-0.61533	0.9001616	2.205589	-3.39137	-3.936763813	0.062802	5.051012	4.319885	0	2.704508668				
	z3	0.063863	0.042322	0.006615445	0.016209	0.24029	0.278932609	0.009863	0.793235	0.695847	0	1.130699495				
	z4	3.743294	2.480681	0.4186779	1.02585	-46.6788	-54.18564856	-0.11453	-9.21102	42.93555	0	-59.89013939				
4ta Iteracion	z1	0.988173	0.748599	0.02128394	0.057563	-0.02521	-0.028504154	0.000992	-0.05943	0.037038	0.07407694	0.792304465	RS4 =	0.34668	IRI =	0.424268
	z2	-0.92852	-0.70341	0.9001616	2.434495	-3.39137	-3.834619214	0.062802	-3.7612	4.319885	8.639769998	2.775039277				
	z3	0.063863	0.04838	0.006615445	0.017892	0.24029	0.271695329	0.009863	-0.59068	0.695847	1.3916946	1.13898436				
	z4	3.743294	2.835766	0.4186779	1.132318	-46.6788	-52.77972949	-0.11453	6.858924	42.93555	85.87109998	43.91837849				
5ta Iteracion	z1	0.988173	0.782934	0.02128394	0.059064	-0.02521	-0.02871301	0.000992	0.043581	0.037038	-0.07407694	0.782788393	RS5 =	1.398687	IRI =	0.619152
	z2	-0.92852	-0.73567	0.9001616	2.497984	-3.39137	-3.86271625	0.062802	2.758148	4.319885	-8.63977	-7.982022312				
	z3	0.063863	0.050599	0.006615445	0.018358	0.24029	0.273686096	0.009863	0.433153	0.695847	-1.3916946	-0.615898324				
	z4	3.743294	2.965829	0.4186779	1.161848	-46.6788	-53.16645732	-0.11453	-5.02976	42.93555	-85.8711	-139.9396378				

FIGURA 3.132: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1441m a 1452m.*

N°	Dist	Cota	Y'
1	1441.00	3816.948	
2	1441.50	3816.949	2.00
3	1442.00	3816.949	0.00
4	1442.50	3816.950	2.00
5	1443.00	3816.951	2.00
6	1443.50	3816.950	-2.00
7	1444.00	3816.950	0.00
8	1444.50	3816.948	-4.00
9	1445.00	3816.949	2.00
10	1445.50	3816.950	2.00
11	1446.00	3816.950	0.00
12	1446.50	3816.949	-2.00
13	1447.00	3816.950	2.00
14	1447.50	3816.948	-4.00
15	1448.00	3816.948	0.00
16	1448.50	3816.949	2.00
17	1449.00	3816.950	2.00
18	1449.50	3816.950	0.00
19	1450.00	3816.949	-2.00
20	1450.50	3816.949	0.00
21	1451.00	3816.950	2.00
22	1451.50	3816.951	2.00
23	1452.00	3816.950	-2.00

IRI **1.8799**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.181818182
z2' = **z4'** = 0

$Y' = (Y_1 - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.179668	0.02128394	0	-0.02521	-0.004583511	0.000992	0	0.037038	0.07407694	0.249161193	RS1 =	1.197834	IRI =	1.197834
	z2	-0.92852	-0.16882	0.9001616	0	-3.39137	-0.616612545	0.062802	0	4.319885	8.639769998	7.854336361				
	z3	0.063863	0.011612	0.006615445	0	0.24029	0.043689018	0.009863	0	0.695847	1.3916946	1.44699512				
	z4	3.743294	0.680599	0.4186779	0	-46.6788	-8.48706	-0.11453	0	42.93555	85.87109998	78.06463889				
2da Iteracion	z1	0.988173	0.246214	0.02128394	0.167171	-0.02521	-0.036477749	0.000992	0.077465	0.037038	0	0.454372593	RS2 =	0.731124	IRI =	0.964479
	z2	-0.92852	-0.23135	0.9001616	7.070172	-3.39137	-4.907294392	0.062802	4.90259	4.319885	0	6.83411713				
	z3	0.063863	0.015912	0.006615445	0.05196	0.24029	0.347697879	0.009863	0.769327	0.695847	0	1.185496607				
	z4	3.743294	0.932684	0.4186779	3.288437	-46.6788	-67.5440392	-0.11453	-8.94036	42.93555	0	-72.26327912				
3ra Iteracion	z1	0.988173	0.448999	0.02128394	0.145457	-0.02521	-0.029885551	0.000992	-0.07171	0.037038	0.07407694	0.566938875	RS3 =	0.471137	IRI =	0.800032
	z2	-0.92852	-0.42189	0.9001616	6.15181	-3.39137	-4.020456444	0.062802	-4.53825	4.319885	8.639770002	5.810976537				
	z3	0.063863	0.029018	0.006615445	0.045211	0.24029	0.284862506	0.009863	-0.71271	0.695847	1.3916946	1.038075949				
	z4	3.743294	1.70085	0.4186779	2.861294	-46.6788	-55.3375946	-0.11453	8.275959	42.93555	85.87110002	43.37160869				
4ta Iteracion	z1	0.988173	0.560234	0.02128394	0.12368	-0.02521	-0.026169178	0.000992	0.043038	0.037038	0.07407694	0.77486012	RS4 =	1.368682	IRI =	0.942194
	z2	-0.92852	-0.52641	0.9001616	5.230818	-3.39137	-3.520498594	0.062802	2.723809	4.319885	8.639769998	12.54748698				
	z3	0.063863	0.036207	0.006615445	0.038442	0.24029	0.249438855	0.009863	0.42776	0.695847	1.3916946	2.143542512				
	z4	3.743294	2.122219	0.4186779	2.432927	-46.6788	-48.45617076	-0.11453	-4.96714	42.93555	85.87109998	37.00293774				
5ta Iteracion	z1	0.988173	0.765696	0.02128394	0.26706	-0.02521	-0.054037228	0.000992	0.036719	0.037038	-0.07407694	0.941360035	RS5 =	1.320543	IRI =	1.017864
	z2	-0.92852	-0.71947	0.9001616	11.29477	-3.39137	-7.269543627	0.062802	2.323846	4.319885	-8.63977	-3.010171401				
	z3	0.063863	0.049485	0.006615445	0.083007	0.24029	0.515070973	0.009863	0.364948	0.695847	-1.3916946	-0.379183189				
	z4	3.743294	2.900529	0.4186779	5.253355	-46.6788	-100.0580565	-0.11453	-4.23777	42.93555	-85.8711	-182.0130369				

FIGURA 3.133: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1452m a 1463m.*

N°	Dist	Cota	Y'
1	1452.00	3816.950	
2	1452.50	3816.949	-2.00
3	1453.00	3816.948	-2.00
4	1453.50	3816.947	-2.00
5	1454.00	3816.947	0.00
6	1454.50	3816.947	0.00
7	1455.00	3816.946	-2.00
8	1455.50	3816.945	-2.00
9	1456.00	3816.944	-2.00
10	1456.50	3816.945	2.00
11	1457.00	3816.946	2.00
12	1457.50	3816.944	-4.00
13	1458.00	3816.944	0.00
14	1458.50	3816.943	-2.00
15	1459.00	3816.944	2.00
16	1459.50	3816.943	-2.00
17	1460.00	3816.944	2.00
18	1460.50	3816.944	0.00
19	1461.00	3816.944	0.00
20	1461.50	3816.945	2.00
21	1462.00	3816.944	-2.00
22	1462.50	3816.943	-2.00
23	1463.00	3816.942	-2.00

IRI **1.4617**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.72727273
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.71867	0.02128394	0	-0.02521	0.018334044	0.000992	0	0.037038	-0.07407694	-0.774413951	RS1 =	0.838483	IRI =	0.838483
	z2	-0.92852	0.675284	0.9001616	0	-3.39137	2.466450182	0.062802	0	4.319885	-8.63977	-5.498035456				
	z3	0.063863	-0.04645	0.006615445	0	0.24029	-0.174756073	0.009863	0	0.695847	-1.3916946	-1.61289668				
	z4	3.743294	-2.7224	0.4186779	0	-46.6788	33.94824	-0.11453	0	42.93555	-85.8711	-54.64525565				
2da Iteracion	z1	0.988173	-0.76525	0.02128394	-0.11702	-0.02521	0.040660012	0.000992	-0.05423	0.037038	-0.07407694	-0.969916898	RS2 =	1.434117	IRI =	1.1363
	z2	-0.92852	0.719056	0.9001616	-4.94912	-3.39137	5.469327802	0.062802	-3.43181	4.319885	-8.63977	-10.83172016				
	z3	0.063863	-0.04946	0.006615445	-0.03637	0.24029	-0.387562298	0.009863	-0.53895	0.695847	-1.3916946	-2.404034118				
	z4	3.743294	-2.89886	0.4186779	-2.30191	-46.6788	75.28812395	-0.11453	6.258253	42.93555	-85.8711	-9.525481698				
3ra Iteracion	z1	0.988173	-0.95845	0.02128394	-0.23054	-0.02521	0.060604041	0.000992	-0.00945	0.037038	-0.07407694	-1.211912273	RS3 =	0.984992	IRI =	1.085864
	z2	-0.92852	0.900583	0.9001616	-9.7503	-3.39137	8.152966784	0.062802	-0.59822	4.319885	-8.63977	-9.934734565				
	z3	0.063863	-0.06194	0.006615445	-0.07166	0.24029	-0.577664397	0.009863	-0.09395	0.695847	-1.3916946	-2.196304479				
	z4	3.743294	-3.63068	0.4186779	-4.535	-46.6788	112.2174999	-0.11453	1.090907	42.93555	-85.8711	19.2716207				
4ta Iteracion	z1	0.988173	-1.19758	0.02128394	-0.21145	-0.02521	0.055382446	0.000992	0.019124	0.037038	0	-1.334522924	RS4 =	0.85358	IRI =	1.027793
	z2	-0.92852	1.12528	0.9001616	-8.94287	-3.39137	7.450513745	0.062802	1.21029	4.319885	0	0.843217084				
	z3	0.063863	-0.0774	0.006615445	-0.06572	0.24029	-0.527893298	0.009863	0.19007	0.695847	0	-0.480942829				
	z4	3.743294	-4.53654	0.4186779	-4.15945	-46.6788	102.5489307	-0.11453	-2.20708	42.93555	0	91.64584866				
5ta Iteracion	z1	0.988173	-1.31874	0.02128394	0.017947	-0.02521	0.012124237	0.000992	0.090942	0.037038	0	-1.197726215	RS5 =	1.906386	IRI =	1.203512
	z2	-0.92852	1.239126	0.9001616	0.759032	-3.39137	1.631054601	0.062802	5.755512	4.319885	0	9.384724473				
	z3	0.063863	-0.08523	0.006615445	0.005578	0.24029	-0.11556556	0.009863	0.903874	0.695847	0	0.70865939				
	z4	3.743294	-4.99551	0.4186779	0.353036	-46.6788	22.44984856	-0.11453	-10.4957	42.93555	0	7.311623278				

FIGURA 3.134: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1463m a 1474m.*

N°	Dist	Cota	Y'
1	1463.00	3816.942	
2	1463.50	3816.941	-2.00
3	1464.00	3816.941	0.00
4	1464.50	3816.940	-2.00
5	1465.00	3816.940	0.00
6	1465.50	3816.939	-2.00
7	1466.00	3816.940	2.00
8	1466.50	3816.939	-2.00
9	1467.00	3816.937	-4.00
10	1467.50	3816.936	-2.00
11	1468.00	3816.935	-2.00
12	1468.50	3816.933	-4.00
13	1469.00	3816.931	-4.00
14	1469.50	3816.929	-4.00
15	1470.00	3816.928	-2.00
16	1470.50	3816.930	4.00
17	1471.00	3816.929	-2.00
18	1471.50	3816.930	2.00
19	1472.00	3816.931	2.00
20	1472.50	3816.933	4.00
21	1473.00	3816.932	-2.00
22	1473.50	3816.931	-2.00
23	1474.00	3816.930	-2.00

IRI **1.8489**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.09090909
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.07801	0.02128394	0	-0.02521	0.027501065	0.000992	0	0.037038	-0.07407694	-1.124582456	RS1 =	0.598915	IRI =	0.598915
	z2	-0.92852	1.012927	0.9001616	0	-3.39137	3.699675273	0.062802	0	4.319885	-8.63977	-3.92716818				
	z3	0.063863	-0.06967	0.006615445	0	0.24029	-0.262134109	0.009863	0	0.695847	-1.3916946	-1.72349772				
	z4	3.743294	-4.08359	0.4186779	0	-46.6788	50.92236	-0.11453	0	42.93555	-85.8711	-39.03233343				
2da Iteracion	z1	0.988173	-1.11128	0.02128394	-0.08359	-0.02521	0.043448188	0.000992	-0.03873	0.037038	0	-1.190151534	RS2 =	0.29325	IRI =	0.446083
	z2	-0.92852	1.044193	0.9001616	-3.53509	-3.39137	5.845016738	0.062802	-2.4513	4.319885	0	0.902827826				
	z3	0.063863	-0.07182	0.006615445	-0.02598	0.24029	-0.414138578	0.009863	-0.38496	0.695847	0	-0.896901459				
	z4	3.743294	-4.20964	0.4186779	-1.64422	-46.6788	80.45085706	-0.11453	4.470182	42.93555	0	79.06717766				
3ra Iteracion	z1	0.988173	-1.17608	0.02128394	0.019216	-0.02521	0.022610267	0.000992	0.07846	0.037038	-0.07407694	-1.12986653	RS3 =	0.232436	IRI =	0.374867
	z2	-0.92852	1.105075	0.9001616	0.812691	-3.39137	3.041723804	0.062802	4.965551	4.319885	-8.63977	1.285270284				
	z3	0.063863	-0.07601	0.006615445	0.005973	0.24029	-0.215516093	0.009863	0.779814	0.695847	-1.3916946	-0.89743077				
	z4	3.743294	-4.45509	0.4186779	0.377994	-46.6788	41.86631073	-0.11453	-9.05518	42.93555	-85.8711	-57.13705876				
4ta Iteracion	z1	0.988173	-1.1165	0.02128394	0.027356	-0.02521	0.02262361	0.000992	-0.0567	0.037038	0	-1.12322208	RS4 =	0.2804	IRI =	0.35125
	z2	-0.92852	1.049099	0.9001616	1.156351	-3.39137	3.043518894	0.062802	-3.5883	4.319885	0	1.661266291				
	z3	0.063863	-0.07216	0.006615445	0.008503	0.24029	-0.215643281	0.009863	-0.56352	0.695847	0	-0.842822133				
	z4	3.743294	-4.22942	0.4186779	0.538114	-46.6788	41.89101837	-0.11453	6.543627	42.93555	0	44.74333739				
5ta Iteracion	z1	0.988173	-1.10994	0.02128394	0.035358	-0.02521	0.021246964	0.000992	0.0444	0.037038	-0.07407694	-1.083009527	RS5 =	0.13066	IRI =	0.307132
	z2	-0.92852	1.04293	0.9001616	1.495408	-3.39137	2.858320853	0.062802	2.809356	4.319885	-8.63977	-0.43315504				
	z3	0.063863	-0.07173	0.006615445	0.01099	0.24029	-0.202521393	0.009863	0.441289	0.695847	-1.3916946	-1.213669382				
	z4	3.743294	-4.20455	0.4186779	0.695535	-46.6788	39.34195105	-0.11453	-5.12424	42.93555	-85.8711	-55.16239911				

FIGURA 3.135: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1474m a 1485m.*

N°	Dist	Cota	Y'
1	1474.00	3816.930	
2	1474.50	3816.929	-2.00
3	1475.00	3816.928	-2.00
4	1475.50	3816.927	-2.00
5	1476.00	3816.926	-2.00
6	1476.50	3816.925	-2.00
7	1477.00	3816.926	2.00
8	1477.50	3816.927	2.00
9	1478.00	3816.928	2.00
10	1478.50	3816.928	0.00
11	1479.00	3816.929	2.00
12	1479.50	3816.928	-2.00
13	1480.00	3816.927	-2.00
14	1480.50	3816.927	0.00
15	1481.00	3816.926	-2.00
16	1481.50	3816.925	-2.00
17	1482.00	3816.923	-4.00
18	1482.50	3816.920	-6.00
19	1483.00	3816.917	-6.00
20	1483.50	3816.916	-2.00
21	1484.00	3816.915	-2.00
22	1484.50	3816.913	-4.00
23	1485.00	3816.912	-2.00

IRI	1.7141

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.63636364
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.61701	0.02128394	0	-0.02521	0.041251598	0.000992	0	0.037038	-0.07407694	-1.649835215	RS1 =	0.239564	IRI =	0.239564
	z2	-0.92852	1.51939	0.9001616	0	-3.39137	5.549512909	0.062802	0	4.319885	-8.63977	-1.570867274				
	z3	0.063863	-0.1045	0.006615445	0	0.24029	-0.393201164	0.009863	0	0.695847	-1.3916946	-1.88339328				
	z4	3.743294	-6.12539	0.4186779	0	-46.6788	76.38354	-0.11453	0	42.93555	-85.8711	-15.6129502				
2da Iteracion	z1	0.988173	-1.63032	0.02128394	-0.03343	-0.02521	0.047630452	0.000992	-0.01549	0.037038	-0.07407694	-1.705695839	RS2 =	0.409743	IRI =	0.324654
	z2	-0.92852	1.531898	0.9001616	-1.41403	-3.39137	6.407650148	0.062802	-0.98052	4.319885	-8.63977	-3.094775201				
	z3	0.063863	-0.10536	0.006615445	-0.01039	0.24029	-0.454002997	0.009863	-0.15399	0.695847	-1.3916946	-2.11543897				
	z4	3.743294	-6.17582	0.4186779	-0.65769	-46.6788	88.19494781	-0.11453	1.788075	42.93555	-85.8711	-2.72158316				
3ra Iteracion	z1	0.988173	-1.68552	0.02128394	-0.06587	-0.02521	0.053328757	0.000992	-0.0027	0.037038	-0.07407694	-1.774839328	RS3 =	0.281419	IRI =	0.310242
	z2	-0.92852	1.583766	0.9001616	-2.7858	-3.39137	7.174234144	0.062802	-0.17092	4.319885	-8.63977	-2.838487744				
	z3	0.063863	-0.10893	0.006615445	-0.02047	0.24029	-0.508317984	0.009863	-0.02684	0.695847	-1.3916946	-2.0562593				
	z4	3.743294	-6.38492	0.4186779	-1.29571	-46.6788	98.74621605	-0.11453	0.31169	42.93555	-85.8711	5.506170636				
4ta Iteracion	z1	0.988173	-1.75385	0.02128394	-0.06041	-0.02521	0.051836878	0.000992	0.005464	0.037038	-0.07407694	-1.831038764	RS4 =	0.132573	IRI =	0.265825
	z2	-0.92852	1.647967	0.9001616	-2.5551	-3.39137	6.973534046	0.062802	0.345797	4.319885	-8.63977	-2.22756964				
	z3	0.063863	-0.11335	0.006615445	-0.01878	0.24029	-0.494097725	0.009863	0.054306	0.695847	-1.3916946	-1.963611649				
	z4	3.743294	-6.64375	0.4186779	-1.18841	-46.6788	95.9837783	-0.11453	-0.63059	42.93555	-85.8711	1.649923839				
5ta Iteracion	z1	0.988173	-1.80938	0.02128394	-0.04741	-0.02521	0.049501295	0.000992	0.001637	0.037038	-0.07407694	-1.879732376	RS5 =	0.099197	IRI =	0.232499
	z2	-0.92852	1.700149	0.9001616	-2.00517	-3.39137	6.659331673	0.062802	0.103618	4.319885	-8.63977	-2.181844218				
	z3	0.063863	-0.11694	0.006615445	-0.01474	0.24029	-0.471835458	0.009863	0.016273	0.695847	-1.3916946	-1.978929856				
	z4	3.743294	-6.85412	0.4186779	-0.93263	-46.6788	91.65909433	-0.11453	-0.18896	42.93555	-85.8711	-2.187713975				

FIGURA 3.136: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1485m a 1496m.*

N°	Dist	Cota	Y'
1	1485.00	3816.912	
2	1485.50	3816.911	-2.00
3	1486.00	3816.910	-2.00
4	1486.50	3816.909	-2.00
5	1487.00	3816.908	-2.00
6	1487.50	3816.908	0.00
7	1488.00	3816.907	-2.00
8	1488.50	3816.906	-2.00
9	1489.00	3816.904	-4.00
10	1489.50	3816.904	0.00
11	1490.00	3816.903	-2.00
12	1490.50	3816.902	-2.00
13	1491.00	3816.902	0.00
14	1491.50	3816.903	2.00
15	1492.00	3816.904	2.00
16	1492.50	3816.905	2.00
17	1493.00	3816.906	2.00
18	1493.50	3816.907	2.00
19	1494.00	3816.908	2.00
20	1494.50	3816.909	2.00
21	1495.00	3816.910	2.00
22	1495.50	3816.909	-2.00
23	1496.00	3816.910	2.00

IRI	1.6606

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -0.18181818
z2' = z4' = 0

$Y' = (Y_1 - Y_{1-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |z_3 - z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.17967	0.02128394	0	-0.02521	0.004583511	0.000992	0	0.037038	-0.07407694	-0.249161193	RS1 =	1.197834	IRI =	1.197834
	z2	-0.92852	0.168821	0.9001616	0	-3.39137	0.616612545	0.062802	0	4.319885	-8.63977	-7.854336365				
	z3	0.063863	-0.01161	0.006615445	0	0.24029	-0.043689018	0.003863	0	0.695847	-1.3916946	-1.44699512				
	z4	3.743294	-0.6806	0.4186779	0	-46.6788	8.48706	-0.11453	0	42.93555	-85.8711	-78.06463893				
2da Iteracion	z1	0.988173	-0.24621	0.02128394	-0.16717	-0.02521	0.036477749	0.000992	-0.07746	0.037038	-0.07407694	-0.528449533	RS2 =	2.048742	IRI =	1.623288
	z2	-0.92852	0.23135	0.9001616	-7.07017	-3.39137	4.907294394	0.062802	-4.90259	4.319885	-8.63977	-15.47388713				
	z3	0.063863	-0.01591	0.006615445	-0.05196	0.24029	-0.347697879	0.003863	-0.76993	0.695847	-1.3916946	-2.577191208				
	z4	3.743294	-0.93268	0.4186779	-3.28844	-46.6788	67.54403923	-0.11453	8.940361	42.93555	-85.8711	-13.60782082				
3ra Iteracion	z1	0.988173	-0.5222	0.02128394	-0.32935	-0.02521	0.064969212	0.000992	-0.0135	0.037038	-0.07407694	-0.87415568	RS3 =	1.407136	IRI =	1.551237
	z2	-0.92852	0.490674	0.9001616	-13.929	-3.39137	8.740206369	0.062802	-0.85459	4.319885	-8.63977	-14.19248266				
	z3	0.063863	-0.03375	0.006615445	-0.10237	0.24029	-0.619272244	0.003863	-0.13421	0.695847	-1.3916946	-2.281291586				
	z4	3.743294	-1.97814	0.4186779	-6.47857	-46.6788	120.3002703	-0.11453	1.558437	42.93555	-85.8711	27.53089074				
4ta Iteracion	z1	0.988173	-0.86382	0.02128394	-0.30207	-0.02521	0.057509787	0.000992	0.027319	0.037038	-0.07407694	-1.155136524	RS4 =	0.662916	IRI =	1.329157
	z2	-0.92852	0.811668	0.9001616	-12.7755	-3.39137	7.736701565	0.062802	1.728986	4.319885	-8.63977	-11.13794288				
	z3	0.063863	-0.05583	0.006615445	-0.09389	0.24029	-0.548170643	0.003863	0.271528	0.695847	-1.3916946	-1.818052897				
	z4	3.743294	-3.27222	0.4186779	-5.94208	-46.6788	106.4880221	-0.11453	-3.15298	42.93555	-85.8711	8.249643587				
5ta Iteracion	z1	0.988173	-1.14147	0.02128394	-0.23706	-0.02521	0.045831859	0.000992	0.008186	0.037038	0	-1.32451557	RS5 =	0.821567	IRI =	1.227639
	z2	-0.92852	1.072563	0.9001616	-10.0259	-3.39137	6.165688234	0.062802	0.518091	4.319885	0	-2.269606109				
	z3	0.063863	-0.07377	0.006615445	-0.07368	0.24029	-0.436859203	0.003863	0.081364	0.695847	0	-0.502948841				
	z4	3.743294	-4.32402	0.4186779	-4.66321	-46.6788	84.8645821	-0.11453	-0.94479	42.93555	0	74.93256469				

FIGURA 3.137: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1496m a 1507m.*

N°	Dist	Cota	Y'
1	1496.00	3816.910	
2	1496.50	3816.911	2.00
3	1497.00	3816.912	2.00
4	1497.50	3816.913	2.00
5	1498.00	3816.914	2.00
6	1498.50	3816.915	2.00
7	1499.00	3816.916	2.00
8	1499.50	3816.917	2.00
9	1500.00	3816.917	0.00
10	1500.50	3816.916	-2.00
11	1501.00	3816.915	-2.00
12	1501.50	3816.914	-2.00
13	1502.00	3816.913	-2.00
14	1502.50	3816.913	0.00
15	1503.00	3816.914	2.00
16	1503.50	3816.915	2.00
17	1504.00	3816.916	2.00
18	1504.50	3816.917	2.00
19	1505.00	3816.917	0.00
20	1505.50	3816.916	-2.00
21	1506.00	3816.915	-2.00
22	1506.50	3816.914	-2.00
23	1507.00	3816.915	2.00

IRI	1.6581

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.454545455
z2' = **z4'** = 0

$$Y' = (Y_1 - Y_{i-1}) / dx = \text{slope input} \quad (8)$$

and

$$Z_j' = Z_j \text{ from previous position, } j=1,4 \quad (9)$$

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.449169	0.02128394	0	-0.02521	-0.011458777	0.000932	0	0.037038	0.07407694	0.511787572	RS1 =	1.018158	IRI =	1.018158
	z2	-0.92852	-0.42205	0.9001616	0	-3.39137	-1.541531364	0.062802	0	4.319885	8.639769998	6.676185907				
	z3	0.063863	0.029029	0.006615445	0	0.24029	0.109222545	0.009863	0	0.695847	1.3916946	1.5293459				
	z4	3.743294	1.701497	0.4186779	0	-46.6788	-21.21765	-0.11453	0	42.93555	85.87109998	66.35494725				
2da Iteracion	z1	0.988173	0.505735	0.02128394	0.142096	-0.02521	-0.03856888	0.000932	0.065845	0.037038	0.07407694	0.749183215	RS2 =	1.741429	IRI =	1.379794
	z2	-0.92852	-0.4752	0.9001616	6.009646	-3.39137	-5.188611096	0.062802	4.167202	4.319885	8.639770002	13.15280365				
	z3	0.063863	0.032684	0.006615445	0.044166	0.24029	0.367630088	0.009863	0.654438	0.695847	1.3916946	2.490612663				
	z4	3.743294	1.915771	0.4186779	2.795171	-46.6788	-71.41608456	-0.11453	-7.59931	42.93555	85.87110002	11.56665133				
3ra Iteracion	z1	0.988173	0.740322	0.02128394	0.279943	-0.02521	-0.062786627	0.000932	0.011478	0.037038	0.07407694	1.043033977	RS3 =	1.196064	IRI =	1.318551
	z2	-0.92852	-0.69563	0.9001616	11.83965	-3.39137	-8.446586577	0.062802	0.726405	4.319885	8.639769998	12.06360861				
	z3	0.063863	0.047845	0.006615445	0.087012	0.24029	0.598468321	0.009863	0.114078	0.695847	1.3916946	2.239098033				
	z4	3.743294	2.804413	0.4186779	5.506788	-46.6788	-116.2588851	-0.11453	-1.32467	42.93555	85.87109998	-23.40125578				
4ta Iteracion	z1	0.988173	1.030698	0.02128394	0.256761	-0.02521	-0.056446116	0.000932	-0.02322	0.037038	0.07407694	1.281868194	RS4 =	0.563477	IRI =	1.129782
	z2	-0.92852	-0.96847	0.9001616	10.8592	-3.39137	-7.593607656	0.062802	-1.46964	4.319885	8.639770002	9.467247898				
	z3	0.063863	0.066612	0.006615445	0.079806	0.24029	0.538031971	0.009863	-0.2308	0.695847	1.3916946	1.845345163				
	z4	3.743294	3.904383	0.4186779	5.050766	-46.6788	-104.5184764	-0.11453	2.680031	42.93555	85.87110002	-7.012196094				
5ta Iteracion	z1	0.988173	1.266707	0.02128394	0.2015	-0.02521	-0.046519878	0.000932	-0.00696	0.037038	0.07407694	1.488806235	RS5 =	0.421641	IRI =	0.988154
	z2	-0.92852	-1.19024	0.9001616	8.522053	-3.39137	-6.25824638	0.062802	-0.44038	4.319885	8.639769998	9.27296388				
	z3	0.063863	0.081864	0.006615445	0.06263	0.24029	0.443417251	0.009863	-0.06916	0.695847	1.3916946	1.910447144				
	z4	3.743294	4.79841	0.4186779	3.963727	-46.6788	-86.13855315	-0.11453	0.803072	42.93555	85.87109998	9.297756276				

FIGURA 3.138: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1507m a 1518m.*

N°	Dist	Cota	Y'
1	1507.00	3816.915	
2	1507.50	3816.915	0.00
3	1508.00	3816.917	4.00
4	1508.50	3816.918	2.00
5	1509.00	3816.919	2.00
6	1509.50	3816.920	2.00
7	1510.00	3816.919	-2.00
8	1510.50	3816.921	4.00
9	1511.00	3816.922	2.00
10	1511.50	3816.923	2.00
11	1512.00	3816.925	4.00
12	1512.50	3816.927	4.00
13	1513.00	3816.929	4.00
14	1513.50	3816.932	6.00
15	1514.00	3816.934	4.00
16	1514.50	3816.937	6.00
17	1515.00	3816.938	2.00
18	1515.50	3816.939	2.00
19	1516.00	3816.942	6.00
20	1516.50	3816.943	2.00
21	1517.00	3816.946	6.00
22	1517.50	3816.948	4.00
23	1518.00	3816.949	2.00

IRI **1.4049**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 3.090909091
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	3.054352	0.02128394	0	-0.02521	-0.077919685	0.000992	0	0.037038	0	2.976432296	**RS1** =	2.036323	**IRI** =	2.036323
	z2	-0.92852	-2.86996	0.9001616	0	-3.39137	-10.48241327	0.062802	0	4.319885	0	-13.35237182				
	z3	0.063863	0.197396	0.006615445	0	0.24029	0.742713309	0.009863	0	0.695847	0	0.94010884				
	z4	3.743294	11.57018	0.4186779	0	-46.6788	-144.28002	-0.11453	0	42.93555	0	-132.7098385				
2da Iteracion	z1	0.988173	2.941229	0.02128394	-0.28419	-0.02521	-0.023699495	0.000992	-0.13169	0.037038	0.14815388	2.64980228	**RS2** =	0.847637	**IRI** =	1.44198
	z2	-0.92852	-2.76367	0.9001616	-12.0193	-3.39137	-3.188255977	0.062802	-8.3344	4.319885	17.27954	-9.026072849				
	z3	0.063863	0.190085	0.006615445	-0.08833	0.24029	0.225898377	0.009863	-1.30887	0.695847	2.783389201	1.802165695				
	z4	3.743294	11.14166	0.4186779	-5.59034	-46.6788	-43.88318072	-0.11453	15.19861	42.93555	171.7422	148.608945				
3ra Iteracion	z1	0.988173	2.618462	0.02128394	-0.19211	-0.02521	-0.045431354	0.000992	0.147467	0.037038	0.07407694	2.602464575	**RS3** =	0.797468	**IRI** =	1.227143
	z2	-0.92852	-2.46038	0.9001616	-8.12492	-3.39137	-6.111808873	0.062802	9.33289	4.319885	8.639769998	1.275543057				
	z3	0.063863	0.169225	0.006615445	-0.05971	0.24029	0.433041674	0.009863	1.465682	0.695847	1.3916946	3.399932267				
	z4	3.743294	9.918989	0.4186779	-3.77902	-46.6788	-84.12298613	-0.11453	-17.0195	42.93555	85.87109998	-9.131368689				
4ta Iteracion	z1	0.988173	2.571684	0.02128394	0.027149	-0.02521	-0.085709946	0.000992	-0.00906	0.037038	0.07407694	2.578138814	**RS4** =	0.284895	**IRI** =	0.991581
	z2	-0.92852	-2.41643	0.9001616	1.148195	-3.39137	-11.53042489	0.062802	-0.57347	4.319885	8.639770002	-4.732355212				
	z3	0.063863	0.166202	0.006615445	0.008438	0.24029	0.816968364	0.009863	-0.09006	0.695847	1.3916946	2.293243354				
	z4	3.743294	9.74179	0.4186779	0.534042	-46.6788	-158.7048603	-0.11453	1.045771	42.93555	85.87110002	-61.51215765				
5ta Iteracion	z1	0.988173	2.547646	0.02128394	-0.10072	-0.02521	-0.057811083	0.000992	-0.06104	0.037038	0.07407694	2.402149556	**RS5** =	0.932745	**IRI** =	0.979814
	z2	-0.92852	-2.39384	0.9001616	-4.25988	-3.39137	-7.777234421	0.062802	-3.86307	4.319885	8.639769998	-9.654258227				
	z3	0.063863	0.164648	0.006615445	-0.03131	0.24029	0.551042528	0.009863	-0.60667	0.695847	1.3916946	1.469404115				
	z4	3.743294	9.650732	0.4186779	-1.98133	-46.6788	-107.0459167	-0.11453	7.044686	42.93555	85.87109998	-6.460731682				

FIGURA 3.139: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1518m a 1529m.*

N°	Dist	Cota	Y'
1	1518.00	3816.949	
2	1518.50	3816.950	2.00
3	1519.00	3816.952	4.00
4	1519.50	3816.954	4.00
5	1520.00	3816.957	6.00
6	1520.50	3816.956	-2.00
7	1521.00	3816.954	-4.00
8	1521.50	3816.953	-2.00
9	1522.00	3816.952	-2.00
10	1522.50	3816.952	0.00
11	1523.00	3816.952	0.00
12	1523.50	3816.952	0.00
13	1524.00	3816.953	2.00
14	1524.50	3816.954	2.00
15	1525.00	3816.955	2.00
16	1525.50	3816.955	0.00
17	1526.00	3816.955	0.00
18	1526.50	3816.955	0.00
19	1527.00	3816.955	0.00
20	1527.50	3816.956	2.00
21	1528.00	3816.956	0.00
22	1528.50	3816.957	2.00
23	1529.00	3816.957	0.00

IRI 1.7855

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.727272727
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.718671	0.02128394	0	-0.02521	-0.018334044	0.000992	0	0.037038	0.07407694	0.774413951	RS1 =	0.838483	IRI =	0.838483
	z2	-0.92852	-0.67528	0.9001616	0	-3.39137	-2.466450182	0.062802	0	4.319885	8.639770002	5.498035456				
	z3	0.063863	0.046446	0.006615445	0	0.24029	0.174756073	0.009863	0	0.695847	1.3916946	1.61289668				
	z4	3.743294	2.722396	0.4186779	0	-46.6788	-33.94824	-0.11453	0	42.93555	85.87110002	54.64525565				
2da Iteracion	z1	0.988173	0.765255	0.02128394	0.11702	-0.02521	-0.040660012	0.000992	0.054225	0.037038	0.14815388	1.043993838	RS2 =	2.751735	IRI =	1.795109
	z2	-0.92852	-0.71906	0.9001616	4.94912	-3.39137	-5.469927802	0.062802	3.431813	4.319885	17.27954	19.47149016				
	z3	0.063863	0.049457	0.006615445	0.036372	0.24029	0.387562298	0.009863	0.538949	0.695847	2.7833892	3.795728719				
	z4	3.743294	2.898859	0.4186779	2.301906	-46.6788	-75.28812995	-0.11453	-6.25825	42.93555	171.7422	95.39658172				
3ra Iteracion	z1	0.988173	1.031646	0.02128394	0.41443	-0.02521	-0.095687702	0.000992	0.094664	0.037038	0.14815388	1.593206018	RS3 =	3.238609	IRI =	2.276275
	z2	-0.92852	-0.96936	0.9001616	17.52749	-3.39137	-12.87271671	0.062802	5.991065	4.319885	17.27954	26.95601069				
	z3	0.063863	0.066673	0.006615445	0.128813	0.24029	0.912074136	0.009863	0.940866	0.695847	2.7833892	4.831814716				
	z4	3.743294	3.907976	0.4186779	8.152283	-46.6788	-177.1801756	-0.11453	-10.9253	42.93555	171.7422	-4.303020175				
4ta Iteracion	z1	0.988173	1.574363	0.02128394	0.57373	-0.02521	-0.121806715	0.000992	-0.00427	0.037038	0.22223082	2.244246954	RS4 =	3.329506	IRI =	2.539583
	z2	-0.92852	-1.47932	0.9001616	24.26477	-3.39137	-16.38646664	0.062802	-0.27024	4.319885	25.91931	32.04805494				
	z3	0.063863	0.101747	0.006615445	0.178326	0.24029	1.161034825	0.009863	-0.04244	0.695847	4.1750838	5.573752651				
	z4	3.743294	5.963839	0.4186779	11.28589	-46.6788	-225.5434577	-0.11453	0.492804	42.93555	257.6133	49.81237058				
5ta Iteracion	z1	0.988173	2.217704	0.02128394	0.682109	-0.02521	-0.140510458	0.000992	0.04943	0.037038	-0.07407694	2.734654689	RS5 =	1.940414	IRI =	2.419749
	z2	-0.92852	-2.08382	0.9001616	28.84843	-3.39137	-18.90265195	0.062802	3.1283	4.319885	-8.63977	2.350487308				
	z3	0.063863	0.143325	0.006615445	0.212012	0.24029	1.339314795	0.009863	0.491283	0.695847	-1.3916946	0.794240737				
	z4	3.743294	8.400876	0.4186779	13.41781	-46.6788	-260.1762525	-0.11453	-5.70477	42.93555	-85.8711	-329.9334307				

FIGURA 3.140: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1529m a 1540m.*

N°	Dist	Cota	Y'
1	1529.00	3816.957	
2	1529.50	3816.957	0.00
3	1530.00	3816.957	0.00
4	1530.50	3816.956	-2.00
5	1531.00	3816.956	0.00
6	1531.50	3816.955	-2.00
7	1532.00	3816.955	0.00
8	1532.50	3816.955	0.00
9	1533.00	3816.955	0.00
10	1533.50	3816.956	2.00
11	1534.00	3816.956	0.00
12	1534.50	3816.957	2.00
13	1535.00	3816.958	2.00
14	1535.50	3816.959	2.00
15	1536.00	3816.960	2.00
16	1536.50	3816.961	2.00
17	1537.00	3816.962	2.00
18	1537.50	3816.963	2.00
19	1538.00	3816.964	2.00
20	1538.50	3816.963	-2.00
21	1539.00	3816.962	-2.00
22	1539.50	3816.962	0.00
23	1540.00	3816.962	0.00

IRI 1.2254

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0.454545455
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0.449169	0.02128394	0	-0.02521	-0.011458777	0.000992	0	0.037038	0	0.437710632	**RS1** =	0.299459	**IRI** =	0.299459
	z2	-0.92852	-0.42205	0.9001616	0	-3.39137	-1.541531364	0.062802	0	4.319885	0	-1.963584091				
	z3	0.063863	0.029029	0.006615445	0	0.24029	0.109222545	0.009863	0	0.695847	0	0.1382513				
	z4	3.743294	1.701497	0.4186779	0	-46.6788	-21.21765	-0.11453	0	42.93555	0	-19.51615273				
2da Iteracion	z1	0.988173	0.432534	0.02128394	-0.04179	-0.02521	-0.00348522	0.000992	-0.01937	0.037038	0	0.367889471	**RS2** =	0.512187	**IRI** =	0.405823
	z2	-0.92852	-0.40642	0.9001616	-1.76754	-3.39137	-0.468861173	0.062802	-1.22565	4.319885	0	-3.868472478				
	z3	0.063863	0.027954	0.006615445	-0.01299	0.24029	0.03322035	0.009863	-0.19248	0.695847	0	-0.144297574				
	z4	3.743294	1.63848	0.4186779	-0.82211	-46.6788	-6.45340893	-0.11453	2.235089	42.93555	0	-3.401949269				
3ra Iteracion	z1	0.988173	0.363538	0.02128394	-0.08234	-0.02521	0.003637642	0.000992	-0.00338	0.037038	-0.07407694	0.207386887	**RS3** =	1.669404	**IRI** =	0.827017
	z2	-0.92852	-0.34159	0.9001616	-3.48225	-3.39137	0.48936632	0.062802	-0.21365	4.319885	-8.63977	-12.18789341				
	z3	0.063863	0.023495	0.006615445	-0.02559	0.24029	-0.034673206	0.009863	-0.03355	0.695847	-1.3916946	-1.46201719				
	z4	3.743294	1.377118	0.4186779	-1.61964	-46.6788	6.735641939	-0.11453	0.389609	42.93555	-85.8711	-78.98837498				
4ta Iteracion	z1	0.988173	0.204934	0.02128394	-0.25941	-0.02521	0.036856445	0.000992	-0.07838	0.037038	0	-0.095997355	**RS4** =	1.101731	**IRI** =	0.895695
	z2	-0.92852	-0.19256	0.9001616	-10.9711	-3.39137	4.958239775	0.062802	-4.9606	4.319885	0	-11.16599776				
	z3	0.063863	0.013244	0.006615445	-0.08063	0.24029	-0.351307526	0.009863	-0.77904	0.695847	0	-1.197728528				
	z4	3.743294	0.77631	0.4186779	-5.1028	-46.6788	68.24525186	-0.11453	9.046152	42.93555	0	72.96491187				
5ta Iteracion	z1	0.988173	-0.09486	0.02128394	-0.23766	-0.02521	0.03019391	0.000992	0.072404	0.037038	-0.07407694	-0.303997136	**RS5** =	0.735868	**IRI** =	0.86373
	z2	-0.92852	0.089135	0.9001616	-10.0512	-3.39137	4.061939399	0.062802	4.582318	4.319885	-8.63977	-9.957579617				
	z3	0.063863	-0.00613	0.006615445	-0.07387	0.24029	-0.287801709	0.009863	0.71963	0.695847	-1.3916946	-1.03986548				
	z4	3.743294	-0.35935	0.4186779	-4.67496	-46.6788	55.90856633	-0.11453	-8.35631	42.93555	-85.8711	-43.35315033				

FIGURA 3.141: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1540m a 1551m.*

N°	Dist	Cota	Y'
1	1540.00	3816.962	
2	1540.50	3816.961	-2.00
3	1541.00	3816.961	0.00
4	1541.50	3816.963	4.00
5	1542.00	3816.964	2.00
6	1542.50	3816.965	2.00
7	1543.00	3816.966	2.00
8	1543.50	3816.967	2.00
9	1544.00	3816.958	-18.00
10	1544.50	3816.957	-2.00
11	1545.00	3816.956	-2.00
12	1545.50	3816.956	0.00
13	1546.00	3816.955	-2.00
14	1546.50	3816.954	-2.00
15	1547.00	3816.953	-2.00
16	1547.50	3816.952	-2.00
17	1548.00	3816.951	-2.00
18	1548.50	3816.952	2.00
19	1549.00	3816.952	0.00
20	1549.50	3816.953	2.00
21	1550.00	3816.953	0.00
22	1550.50	3816.954	2.00
23	1551.00	3816.952	-4.00

IRI **3.0339**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -0.90909091
z2' = **z4'** = 0

$Y' = (Y_1 - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-0.89834	0.02128394	0	-0.02521	0.022917555	0.000992	0	0.037038	-0.07407694	-0.949498204	RS1 =	0.718699	IRI =	0.718699
	z2	-0.92852	0.844105	0.9001616	0	-3.39137	3.083062727	0.062802	0	4.319885	-8.63977	-4.712601816				
	z3	0.063863	-0.05806	0.006615445	0	0.24029	-0.218445091	0.009863	0	0.695847	-1.3916946	-1.6681972				
	z4	3.743294	-3.40299	0.4186779	0	-46.6788	42.4353	-0.11453	0	42.93555	-85.8711	-46.83879452				
2da Iteracion	z1	0.988173	-0.93827	0.02128394	-0.1003	-0.02521	0.0420541	0.000992	-0.04648	0.037038	0	-1.042995746	RS2 =	0.088375	IRI =	0.403537
	z2	-0.92852	0.881624	0.9001616	-4.2421	-3.39137	5.657472269	0.062802	-2.94155	4.319885	0	-0.644561165				
	z3	0.063863	-0.06064	0.006615445	-0.03118	0.24029	-0.400850438	0.009863	-0.46196	0.695847	0	-0.954620489				
	z4	3.743294	-3.55425	0.4186779	-1.97306	-46.6788	77.86949349	-0.11453	5.364218	42.93555	0	77.70639796				
3ra Iteracion	z1	0.988173	-1.03066	0.02128394	-0.01372	-0.02521	0.024065324	0.000992	0.077109	0.037038	0.14815388	-0.795050179	RS3 =	4.044574	IRI =	1.617216
	z2	-0.92852	0.968438	0.9001616	-0.58021	-3.39137	3.237470332	0.062802	4.880092	4.319885	17.27954	25.78533092				
	z3	0.063863	-0.06661	0.006615445	-0.00426	0.24029	-0.229385375	0.009863	0.766393	0.695847	2.7833892	3.249523994				
	z4	3.743294	-3.90424	0.4186779	-0.26986	-46.6788	44.5605675	-0.11453	-8.89933	42.93555	171.7422	203.2293313				
4ta Iteracion	z1	0.988173	-0.78565	0.02128394	0.548813	-0.02521	-0.081918258	0.000992	0.201668	0.037038	0.07407694	-0.043006945	RS4 =	4.339721	IRI =	2.297842
	z2	-0.92852	0.738217	0.9001616	23.21096	-3.39137	-11.02033494	0.062802	12.76314	4.319885	8.639769998	34.33175801				
	z3	0.063863	-0.05077	0.006615445	0.170581	0.24029	0.780826821	0.009863	2.004386	0.695847	1.3916946	4.296714224				
	z4	3.743294	-2.97611	0.4186779	10.79575	-46.6788	-151.6839781	-0.11453	-23.2749	42.93555	85.87109998	-81.26809597				
5ta Iteracion	z1	0.988173	-0.0425	0.02128394	0.730715	-0.02521	-0.108317201	0.000992	-0.08064	0.037038	0.07407694	0.573332855	RS5 =	1.27367	IRI =	2.093008
	z2	-0.92852	0.039933	0.9001616	30.90413	-3.39137	-14.57174342	0.062802	-5.10377	4.319885	8.639770002	19.90831729				
	z3	0.063863	-0.00275	0.006615445	0.22712	0.24029	1.032455742	0.009863	-0.80152	0.695847	1.3916946	1.847002411				
	z4	3.743294	-0.16099	0.4186779	14.37395	-46.6788	-200.5655928	-0.11453	9.307237	42.93555	85.87110002	-91.17429526				

FIGURA 3.142: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1551m a 1562m.*

N°	Dist	Cota	Y'
1	1551.00	3816.952	
2	1551.50	3816.951	-2.00
3	1552.00	3816.949	-4.00
4	1552.50	3816.948	-2.00
5	1553.00	3816.947	-2.00
6	1553.50	3816.946	-2.00
7	1554.00	3816.947	2.00
8	1554.50	3816.946	-2.00
9	1555.00	3816.945	-2.00
10	1555.50	3816.944	-2.00
11	1556.00	3816.944	0.00
12	1556.50	3816.943	-2.00
13	1557.00	3816.942	-2.00
14	1557.50	3816.942	0.00
15	1558.00	3816.941	-2.00
16	1558.50	3816.942	2.00
17	1559.00	3816.940	-4.00
18	1559.50	3816.939	-2.00
19	1560.00	3816.938	-2.00
20	1560.50	3816.937	-2.00
21	1561.00	3816.936	-2.00
22	1561.50	3816.935	-2.00
23	1562.00	3816.934	-2.00

IRI **1.0784**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = z3' = (ya-y1)/11 = -1.63636364
z2' = z4' = 0

$Y' = (Y_1 - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.61701	0.02128394	0	-0.02521	0.041251598	0.000992	0	0.037038	-0.07407694	-1.649835215	RS1 =	0.239564	IRI =	0.239564
	z2	-0.92852	1.51939	0.9001616	0	-3.39137	5.549512909	0.062802	0	4.319885	-8.63977	-1.570867274				
	z3	0.063863	-0.1045	0.006615445	0	0.24029	-0.393201164	0.009863	0	0.695847	-1.3916946	-1.88939928				
	z4	3.743294	-6.12539	0.4186779	0	-46.6788	76.38354	-0.11453	0	42.93555	-85.8711	-15.6129502				
2da Iteracion	z1	0.988173	-1.63032	0.02128394	-0.03343	-0.02521	0.047630452	0.000992	-0.01549	0.037038	-0.14815388	-1.779772779	RS2 =	1.727361	IRI =	0.983462
	z2	-0.92852	1.531898	0.9001616	-1.41403	-3.39137	6.407650148	0.062802	-0.98052	4.319885	-17.27954	-11.7345452				
	z3	0.063863	-0.10536	0.006615445	-0.01039	0.24029	-0.454002997	0.009863	-0.15399	0.695847	-2.7833892	-3.50713357				
	z4	3.743294	-6.17582	0.4186779	-0.65769	-46.6788	88.19494781	-0.11453	1.788075	42.93555	-171.7422	-88.59268318				
3ra Iteracion	z1	0.988173	-1.75872	0.02128394	-0.24976	-0.02521	0.088412417	0.000992	-0.08791	0.037038	-0.07407694	-2.082056733	RS3 =	1.217418	IRI =	1.061448
	z2	-0.92852	1.652548	0.9001616	-10.563	-3.39137	11.89398407	0.062802	-5.56377	4.319885	-8.63977	-11.21999387				
	z3	0.063863	-0.11366	0.006615445	-0.07763	0.24029	-0.842727723	0.009863	-0.87376	0.695847	-1.3916946	-3.299474937				
	z4	3.743294	-6.66221	0.4186779	-4.91299	-46.6788	163.7088917	-0.11453	10.14609	42.93555	-85.8711	76.40867012				
4ta Iteracion	z1	0.988173	-2.05743	0.02128394	-0.23881	-0.02521	0.083177487	0.000992	0.075822	0.037038	-0.07407694	-2.211315163	RS4 =	0.573193	IRI =	0.939384
	z2	-0.92852	1.933223	0.9001616	-10.0998	-3.39137	11.18973702	0.062802	4.798592	4.319885	-8.63977	-0.818025539				
	z3	0.063863	-0.13297	0.006615445	-0.07423	0.24029	-0.792829513	0.009863	0.753594	0.695847	-1.3916946	-1.638122033				
	z4	3.743294	-7.79375	0.4186779	-4.69756	-46.6788	154.0156297	-0.11453	-8.75071	42.93555	-85.8711	46.90250513				
5ta Iteracion	z1	0.988173	-2.18516	0.02128394	-0.01741	-0.02521	0.041295926	0.000992	0.046542	0.037038	-0.07407694	-2.188810971	RS5 =	0.719444	IRI =	0.895396
	z2	-0.92852	2.053242	0.9001616	-0.73636	-3.39137	5.555476282	0.062802	2.945556	4.319885	-8.63977	1.17814827				
	z3	0.063863	-0.14122	0.006615445	-0.00541	0.24029	-0.393623688	0.009863	0.462584	0.695847	-1.3916946	-1.469367287				
	z4	3.743294	-8.2776	0.4186779	-0.34249	-46.6788	76.46561991	-0.11453	-5.37151	42.93555	-85.8711	-23.39708618				

FIGURA 3.143: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1562m a 1573m.*

N°	Dist	Cota	Y'
1	1562.00	3816.934	
2	1562.50	3816.933	-2.00
3	1563.00	3816.932	-2.00
4	1563.50	3816.931	-2.00
5	1564.00	3816.931	0.00
6	1564.50	3816.930	-2.00
7	1565.00	3816.928	-4.00
8	1565.50	3816.928	0.00
9	1566.00	3816.927	-2.00
10	1566.50	3816.926	-2.00
11	1567.00	3816.925	-2.00
12	1567.50	3816.924	-2.00
13	1568.00	3816.924	0.00
14	1568.50	3816.922	-4.00
15	1569.00	3816.921	-2.00
16	1569.50	3816.920	-2.00
17	1570.00	3816.919	-2.00
18	1570.50	3816.921	4.00
19	1571.00	3816.924	6.00
20	1571.50	3816.927	6.00
21	1572.00	3816.932	10.00
22	1572.50	3816.933	2.00
23	1573.00	3816.934	2.00

IRI	2.2862

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$RS_i = |Z_3 - Z_1|$

$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0	0.02128394	0	-0.02521	0	0.000992	0	0.037038	-0.07407694	-0.07407694	RS1 =	1.317618	IRI =	1.317618
	z2	-0.92852	0	0.9001616	0	-3.39137	0	0.062802	0	4.319885	-8.63977	-8.639770002				
	z3	0.063863	0	0.006615445	0	0.24029	0	0.009863	0	0.695847	-1.3916946	-1.3916946				
	z4	3.743294	0	0.4186779	0	-46.6788	0	-0.11453	0	42.93555	-85.8711	-85.87110002				
2da Iteracion	z1	0.988173	-0.0732	0.02128394	-0.18389	-0.02521	0.035083661	0.000992	-0.08521	0.037038	-0.07407694	-0.381293745	RS2 =	2.253616	IRI =	1.785617
	z2	-0.92852	0.068782	0.9001616	-7.77719	-3.39137	4.719749925	0.062802	-5.39285	4.319885	-8.63977	-17.02127612				
	z3	0.063863	-0.00473	0.006615445	-0.05716	0.24029	-0.334409739	0.009863	-0.84692	0.695847	-1.3916946	-2.634910237				
	z4	3.743294	-0.27729	0.4186779	-3.61728	-46.6788	64.96267566	-0.11453	9.834396	42.93555	-85.8711	-14.96860053				
3ra Iteracion	z1	0.988173	-0.37678	0.02128394	-0.36228	-0.02521	0.066424269	0.000992	-0.01485	0.037038	-0.07407694	-0.761570149	RS3 =	1.54785	IRI =	1.706362
	z2	-0.92852	0.354037	0.9001616	-15.3219	-3.39137	8.935952897	0.062802	-0.94005	4.319885	-8.63977	-15.61173202				
	z3	0.063863	-0.02435	0.006615445	-0.1126	0.24029	-0.633141527	0.009863	-0.14763	0.695847	-1.3916946	-2.309420622				
	z4	3.743294	-1.42729	0.4186779	-7.12643	-46.6788	122.994527	-0.11453	1.71428	42.93555	-85.8711	30.28398076				
4ta Iteracion	z1	0.988173	-0.75256	0.02128394	-0.33228	-0.02521	0.0582189	0.000992	0.030051	0.037038	0	-0.996571804	RS4 =	0.588408	IRI =	1.426873
	z2	-0.92852	0.70713	0.9001616	-14.0531	-3.39137	7.832097505	0.062802	1.901885	4.319885	0	-3.611969536				
	z3	0.063863	-0.04864	0.006615445	-0.10328	0.24029	-0.554929757	0.009863	0.298681	0.695847	0	-0.408163453				
	z4	3.743294	-2.85078	0.4186779	-6.53629	-46.6788	107.8010526	-0.11453	-3.46828	42.93555	0	94.94570853				
5ta Iteracion	z1	0.988173	-0.98479	0.02128394	-0.07688	-0.02521	0.010289519	0.000992	0.094216	0.037038	-0.07407694	-1.031233221	RS5 =	0.390341	IRI =	1.219567
	z2	-0.92852	0.925333	0.9001616	-3.25136	-3.39137	1.384232882	0.062802	5.962749	4.319885	-8.63977	-3.618811472				
	z3	0.063863	-0.06364	0.006615445	-0.02389	0.24029	-0.098077433	0.009863	0.936419	0.695847	-1.3916946	-0.640892002				
	z4	3.743294	-3.73046	0.4186779	-1.51225	-46.6788	19.05259244	-0.11453	-10.8737	42.93555	-85.8711	-82.93488738				

FIGURA 3.144: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1573m a 1584m.*

N°	Dist	Cota	Y'
1	1573.00	3816.934	
2	1573.50	3816.937	6.00
3	1574.00	3816.936	-2.00
4	1574.50	3816.937	2.00
5	1575.00	3816.941	8.00
6	1575.50	3816.943	4.00
7	1576.00	3816.944	2.00
8	1576.50	3816.946	4.00
9	1577.00	3816.948	4.00
10	1577.50	3816.949	2.00
11	1578.00	3816.950	2.00
12	1578.50	3816.951	2.00
13	1579.00	3816.953	4.00
14	1579.50	3816.955	4.00
15	1580.00	3816.957	4.00
16	1580.50	3816.959	4.00
17	1581.00	3816.960	2.00
18	1581.50	3816.961	2.00
19	1582.00	3816.962	2.00
20	1582.50	3816.963	2.00
21	1583.00	3816.964	2.00
22	1583.50	3816.964	0.00
23	1584.00	3816.965	2.00

IRI **1.6928**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 2.818181818
z2' = **z4'** = 0

$Y' = (Y_1 - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	2.78485	0.02128394	0	-0.02521	-0.071044419	0.000992	0	0.037038	0.22223082	2.936036737	RS1 =	2.096205	IRI =	2.096205
	z2	-0.92852	-2.61673	0.9001616	0	-3.39137	-9.557494455	0.062802	0	4.319885	25.91931	13.74508864				
	z3	0.063863	0.179978	0.006615445	0	0.24029	0.677179782	0.009863	0	0.695847	4.1750838	5.03224186				
	z4	3.743294	10.54928	0.4186779	0	-46.6788	-131.54943	-0.11453	0	42.93555	257.6133	136.6131531				
2da Iteracion	z1	0.988173	2.901311	0.02128394	0.29255	-0.02521	-0.126859345	0.000992	0.135563	0.037038	-0.07407694	3.128488193	RS2 =	1.685181	IRI =	1.890693
	z2	-0.92852	-2.72616	0.9001616	12.3728	-3.39137	-17.06618905	0.062802	8.579534	4.319885	-8.63977	-7.479780995				
	z3	0.063863	0.187505	0.006615445	0.09093	0.24029	1.209195384	0.009863	1.347372	0.695847	-1.3916946	1.443307352				
	z4	3.743294	10.99045	0.4186779	5.754765	-46.6788	-234.8991623	-0.11453	-15.6456	42.93555	-85.8711	-319.6706838				
3ra Iteracion	z1	0.988173	3.091487	0.02128394	-0.1592	-0.02521	-0.036384782	0.000992	-0.31721	0.037038	0.07407694	2.652765078	RS3 =	3.916755	IRI =	2.566047
	z2	-0.92852	-2.90485	0.9001616	-6.73301	-3.39137	-4.89478781	0.062802	-20.0759	4.319885	8.639770002	-25.96873357				
	z3	0.063863	0.199795	0.006615445	-0.04948	0.24029	0.346811746	0.009863	-3.15281	0.695847	1.3916946	-1.263989938				
	z4	3.743294	11.71085	0.4186779	-3.13162	-46.6788	-67.37189851	-0.11453	36.61032	42.93555	85.87110002	63.68875062				
4ta Iteracion	z1	0.988173	2.62139	0.02128394	-0.55272	-0.02521	0.031864314	0.000992	0.063199	0.037038	0.29630776	2.460044535	RS4 =	3.428771	IRI =	2.781728
	z2	-0.92852	-2.46313	0.9001616	-23.3761	-3.39137	4.286656293	0.062802	3.99976	4.319885	34.55908	17.00630461				
	z3	0.063863	0.169414	0.006615445	-0.17179	0.24029	-0.303723637	0.009863	0.628142	0.695847	5.5667784	5.888816027				
	z4	3.743294	9.93008	0.4186779	-10.8725	-46.6788	59.00157144	-0.11453	-7.29396	42.93555	343.4844	394.2495557				
5ta Iteracion	z1	0.988173	2.430949	0.02128394	0.361961	-0.02521	-0.148452989	0.000992	0.39122	0.037038	0.14815388	3.183831247	RS5 =	5.172547	IRI =	3.259892
	z2	-0.92852	-2.28419	0.9001616	15.30842	-3.39137	-19.97114812	0.062802	24.75953	4.319885	17.27954	35.09215403				
	z3	0.063863	0.157106	0.006615445	0.112504	0.24029	1.415021248	0.009863	3.888357	0.695847	2.7833892	8.356378392				
	z4	3.743294	9.20867	0.4186779	7.120164	-46.6788	-274.8830422	-0.11453	-45.1515	42.93555	171.7422	-131.9634782				

FIGURA 3.145: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1584m a 1595m.*

N°	Dist	Cota	Y'
1	1584.00	3816.965	
2	1584.50	3816.965	0.00
3	1585.00	3816.964	-2.00
4	1585.50	3816.965	2.00
5	1586.00	3816.965	0.00
6	1586.50	3816.966	2.00
7	1587.00	3816.967	2.00
8	1587.50	3816.968	2.00
9	1588.00	3816.969	2.00
10	1588.50	3816.970	2.00
11	1589.00	3816.971	2.00
12	1589.50	3816.972	2.00
13	1590.00	3816.972	0.00
14	1590.50	3816.971	-2.00
15	1591.00	3816.970	-2.00
16	1591.50	3816.969	-2.00
17	1592.00	3816.968	-2.00
18	1592.50	3816.968	0.00
19	1593.00	3816.967	-2.00
20	1593.50	3816.966	-2.00
21	1594.00	3816.965	-2.00
22	1594.50	3816.966	2.00
23	1595.00	3816.965	-2.00

IRI	1.5095

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = 0
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |Z_3 - Z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	0	0.02128394	0	-0.02521	0	0.000992	0	0.037038	0	0	RS1 =	0	IRI =	0
	z2	-0.92852	0	0.9001616	0	-3.39137	0	0.062802	0	4.319885	0	0				
	z3	0.063863	0	0.006615445	0	0.24029	0	0.009863	0	0.695847	0	0				
	z4	3.743294	0	0.4186779	0	-46.6788	0	-0.11453	0	42.93555	0	0				
2da Iteracion	z1	0.988173	0	0.02128394	0	-0.02521	0	0.000992	0	0.037038	-0.07407694	-0.07407694	RS2 =	1.317618	IRI =	0.658809
	z2	-0.92852	0	0.9001616	0	-3.39137	0	0.062802	0	4.319885	-8.63977	-8.639770002				
	z3	0.063863	0	0.006615445	0	0.24029	0	0.009863	0	0.695847	-1.3916946	-1.3916946				
	z4	3.743294	0	0.4186779	0	-46.6788	0	-0.11453	0	42.93555	-85.8711	-85.87110002				
3ra Iteracion	z1	0.988173	-0.0732	0.02128394	-0.18389	-0.02521	0.035083661	0.000992	-0.08521	0.037038	0.07407694	-0.233139865	RS3 =	0.381619	IRI =	0.566412
	z2	-0.92852	0.068782	0.9001616	-7.77719	-3.39137	4.719749925	0.062802	-5.39285	4.319885	8.639770002	0.258263876				
	z3	0.063863	-0.00473	0.006615445	-0.05716	0.24029	-0.334409739	0.009863	-0.84692	0.695847	1.3916946	0.148478963				
	z4	3.743294	-0.27729	0.4186779	-3.61728	-46.6788	64.96267566	-0.11453	9.834396	42.93555	85.87110002	156.7735995				
4ta Iteracion	z1	0.988173	-0.23038	0.02128394	0.005497	-0.02521	-0.003743052	0.000992	0.155569	0.037038	0	-0.0730596	RS4 =	1.641765	IRI =	0.83525
	z2	-0.92852	0.216474	0.9001616	0.232479	-3.39137	-0.503546951	0.062802	9.845644	4.319885	0	9.791050227				
	z3	0.063863	-0.01489	0.006615445	0.001709	0.24029	0.035677951	0.009863	1.546208	0.695847	0	1.568705253				
	z4	3.743294	-0.87271	0.4186779	0.108129	-46.6788	-6.930824254	-0.11453	-17.9545	42.93555	0	-25.64991809				
5ta Iteracion	z1	0.988173	-0.0722	0.02128394	0.208392	-0.02521	-0.039545977	0.000992	-0.02545	0.037038	0.07407694	0.14527475	RS5 =	1.430493	IRI =	0.954299
	z2	-0.92852	0.067837	0.9001616	8.813527	-3.39137	-5.320058366	0.062802	-1.61086	4.319885	8.639770002	10.59021839				
	z3	0.063863	-0.00467	0.006615445	0.064772	0.24029	0.376943558	0.009863	-0.25298	0.695847	1.3916946	1.575767554				
	z4	3.743294	-0.27348	0.4186779	4.099296	-46.6788	-73.22532583	-0.11453	2.937559	42.93555	85.87110002	19.40914641				

FIGURA 3.146: *Cálculo de IRI con el programa del banco mundial en su publicación N° 46, del tramo 1595m a 1600m.*

N°	Dist	Cota	Y'
1	1595.00	3816.965	
2	1595.50	3816.964	-2.00
3	1596.00	3816.963	-2.00
4	1596.50	3816.962	-2.00
5	1597.00	3816.962	0.00
6	1597.50	3816.961	-2.00
7	1598.00	3816.960	-2.00
8	1598.50	3816.958	-4.00
9	1599.00	3816.957	-2.00
10	1599.50	3816.955	-4.00
11	1600.00	3816.952	-6.00
12	1600.00	3816.953	2.00
13	1600.00	3816.953	0.00
14	1600.00	3816.953	0.00
15	1600.00	3816.953	0.00
16	1600.00	3816.953	0.00
17	1600.00	3816.953	0.00
18	1600.00	3816.953	0.00
19	1600.00	3816.953	0.00
20	1600.00	3816.953	0.00
21	1600.00	3816.953	0.00
22	1600.00	3816.953	0.00
23	1600.00	3816.953	0.00

IRI | **1.2385**

ya = cota N° 23 **a=11/dx+1=** 0.5
y1 = cota N° 1
z1' = **z3'** = (ya-y1)/11 = -1.09090909
z2' = **z4'** = 0

$Y' = (Y_i - Y_{i-1}) / dx$ = slope input (8)

and

$Z_j' = Z_j$ from previous position, j=1,4 (9)

$$RS_i = |z_3 - z_1|$$

$$IRI = \frac{1}{(n-1)} \sum_{i=2}^{n} RS_i$$

			z1'		z2'		z3'		z4'		y'	resultado				
1ra Iteracion	z1	0.988173	-1.07801	0.02128394	0	-0.02521	0.027501065	0.000992	0	0.037038	-0.07407694	-1.124582456	RS1 =	0.598915	IRI =	0.598915
	z2	-0.92852	1.012927	0.9001616	0	-3.39137	3.699675273	0.062802	0	4.319885	-8.63977	-3.927168184				
	z3	0.063863	-0.06967	0.006615445	0	0.24029	-0.262134109	0.009863	0	0.695847	-1.3916946	-1.72349772				
	z4	3.743294	-4.08359	0.4186779	0	-46.6788	50.92236	-0.11453	0	42.93555	-85.8711	-39.03233347				
2da Iteracion	z1	0.988173	-1.11128	0.02128394	-0.08359	-0.02521	0.043448188	0.000992	-0.03873	0.037038	-0.07407694	-1.264228474	RS2 =	1.024368	IRI =	0.811641
	z2	-0.92852	1.044193	0.9001616	-3.53509	-3.39137	5.84501674	0.062802	-2.4513	4.319885	-8.63977	-7.736942175				
	z3	0.063863	-0.07182	0.006615445	-0.02598	0.24029	-0.414138578	0.009863	-0.38496	0.695847	-1.3916946	-2.288596059				
	z4	3.743294	-4.20964	0.4186779	-1.64422	-46.6788	80.45085709	-0.11453	4.470182	42.93555	-85.8711	-6.803922283				
3ra Iteracion	z1	0.988173	-1.24928	0.02128394	-0.16467	-0.02521	0.057693928	0.000992	-0.00675	0.037038	-0.07407694	-1.437083335	RS3 =	0.703563	IRI =	0.775615
	z2	-0.92852	1.173856	0.9001616	-6.9645	-3.39137	7.761473728	0.062802	-0.4273	4.319885	-8.63977	-7.096235837				
	z3	0.063863	-0.08074	0.006615445	-0.05118	0.24029	-0.543925832	0.009863	-0.0671	0.695847	-1.3916946	-2.140646407				
	z4	3.743294	-4.73238	0.4186779	-3.23929	-46.6788	106.8289864	-0.11453	0.77922	42.93555	-85.8711	13.76544068				
4ta Iteracion	z1	0.988173	-1.42009	0.02128394	-0.15104	-0.02521	0.053964219	0.000992	0.01366	0.037038	0	-1.503498484	RS4 =	0.986166	IRI =	0.828253
	z2	-0.92852	1.334355	0.9001616	-6.38776	-3.39137	7.259721866	0.062802	0.864493	4.319885	0	3.070810394				
	z3	0.063863	-0.09178	0.006615445	-0.04694	0.24029	-0.514375069	0.009863	0.135764	0.695847	0	-0.517332517				
	z4	3.743294	-5.37943	0.4186779	-2.97104	-46.6788	99.92286974	-0.11453	-1.57649	42.93555	0	89.99591872				
5ta Iteracion	z1	0.988173	-1.48572	0.02128394	0.065359	-0.02521	0.013041596	0.000992	0.089304	0.037038	-0.07407694	-1.392088122	RS5 =	0.687981	IRI =	0.800199
	z2	-0.92852	1.396022	0.9001616	2.764226	-3.39137	1.754465461	0.062802	5.651894	4.319885	-8.63977	2.926837448				
	z3	0.063863	-0.09602	0.006615445	0.020315	0.24029	-0.124309624	0.009863	0.887601	0.695847	-1.3916946	-0.704106813				
	z4	3.743294	-5.62804	0.4186779	1.28568	-46.6788	24.14847662	-0.11453	-10.3068	42.93555	-85.8711	-76.37177136				

ANEXO 4

Datos obtenidos por el Sensor vl53l0x.

ANEXO 4. Datos obtenidos por el Sensor VL53L0X

TABLA 4.1: *Datos Obtenidos Por El Sensor VL53L0X realizado en el KM 1326+000 al KM 1327+600 de la carretera PUNO – JULIACA*

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1	1	218	214	209
2	2	221	216	210
3	3	218	212	210
4	4	205	218	215
5	5	211	219	214
6	6	217	213	210
7	7	211	216	217
8	8	215	211	216
9	9	221	213	212
10	10	224	202	208
11	11	222	218	211
12	12	218	210	208
13	13	220	210	218
14	14	219	207	216
15	15	220	213	214
16	16	222	210	213
17	17	225	215	210
18	18	208	219	216
19	19	221	208	215
20	20	224	216	210
21	21	218	202	213
22	22	213	216	211
23	23	205	220	216
24	24	215	219	213
25	25	213	217	218
26	26	205	210	215
27	27	211	216	218
28	28	218	220	207
29	29	220	210	211
30	30	210	215	213
31	31	217	213	210
32	32	218	210	216
33	33	213	216	211
34	34	218	206	214
35	35	219	210	216
36	36	210	221	204

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
37	37	234	208	214
38	38	220	207	214
39	39	218	209	211
40	40	221	208	217
41	41	211	215	212
42	42	214	220	216
43	43	219	208	217
44	44	218	214	213
45	45	211	210	216
46	46	210	216	214
47	47	218	210	212
48	48	219	214	214
49	49	217	215	204
50	50	215	217	212
51	51	215	218	205
52	52	219	214	211
53	53	209	216	212
54	54	216	212	211
55	55	217	215	219
56	56	213	211	215
57	57	215	214	218
58	58	210	218	216
59	59	214	219	211
60	60	206	210	216
61	61	213	219	215
62	62	216	217	210
63	63	215	210	217
64	64	211	212	215
65	65	218	209	213
66	66	213	208	213
67	67	226	210	221
68	68	207	210	214
69	69	217	215	213
70	70	210	215	215
71	71	217	213	214
72	72	217	216	214
73	73	207	212	216
74	74	215	217	213
75	75	210	215	216
76	76	217	215	210
77	77	216	214	213
78	78	219	213	214
79	79	217	212	218

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
80	80	212	218	214
81	81	210	214	216
82	82	213	218	217
83	83	219	210	216
84	84	210	216	213
85	85	209	212	216
86	86	224	210	215
87	87	210	216	206
88	88	218	213	215
89	89	218	216	215
90	90	216	209	214
91	91	214	210	215
92	92	211	214	215
93	93	219	216	217
94	94	209	214	217
95	95	215	210	215
96	96	213	209	216
97	97	218	212	214
98	98	212	215	213
99	99	220	212	215
100	100	218	213	216
101	101	217	208	213
102	102	212	211	216
103	103	209	214	218
104	104	215	217	220
105	105	215	210	212
106	106	210	211	216
107	107	218	213	215
108	108	215	212	214
109	109	214	212	217
110	110	220	212	217
111	111	213	214	217
112	112	211	214	215
113	113	221	214	210
114	114	217	212	213
115	115	220	216	217
116	116	214	211	209
117	117	211	209	217
118	118	214	213	216
119	119	212	216	210
120	120	216	214	218
121	121	224	210	214
122	122	208	215	217

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
123	123	210	212	214
124	124	208	215	211
125	125	222	214	216
126	126	211	213	214
127	127	216	211	218
128	128	214	216	217
129	129	213	211	215
130	130	216	214	216
131	131	211	214	214
132	132	213	218	212
133	133	213	217	213
134	134	217	217	213
135	135	214	214	213
136	136	210	213	210
137	137	218	212	219
138	138	214	213	215
139	139	217	213	219
140	140	211	209	212
141	141	213	217	216
142	142	213	216	215
143	143	212	210	214
144	144	218	207	213
145	145	223	215	217
146	146	213	207	210
147	147	217	211	216
148	148	221	217	212
149	149	217	209	211
150	150	222	207	216
151	151	214	211	217
152	152	217	215	211
153	153	210	216	218
154	154	217	212	213
155	155	217	210	211
156	156	215	211	213
157	157	216	215	213
158	158	215	219	213
159	159	208	214	216
160	160	210	213	217
161	161	218	217	214
162	162	211	215	210
163	163	214	212	214
164	164	215	211	218
165	165	214	215	214

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
166	166	213	210	216
167	167	214	216	218
168	168	214	210	216
169	169	213	216	219
170	170	216	212	207
171	171	214	211	212
172	172	216	218	222
173	173	218	214	218
174	174	217	215	211
175	175	215	217	214
176	176	212	215	216
177	177	213	216	210
178	178	214	218	211
179	179	215	217	214
180	180	212	216	211
181	181	214	213	215
182	182	214	215	212
183	183	216	214	218
184	184	214	211	214
185	185	212	217	211
186	186	217	213	216
187	187	216	210	211
188	188	220	218	215
189	189	214	212	210
190	190	217	215	213
191	191	209	216	214
192	192	211	216	209
193	193	214	217	218
194	194	207	210	215
195	195	221	217	216
196	196	216	213	211
197	197	214	213	215
198	198	215	215	213
199	199	209	214	213
200	200	214	216	220
201	201	215	213	210
202	202	218	216	217
203	203	215	217	213
204	204	216	212	210
205	205	211	208	218
206	206	217	213	214
207	207	214	212	216
208	208	214	215	217

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
209	209	216	207	214
210	210	215	214	217
211	211	214	210	216
212	212	215	213	212
213	213	216	208	215
214	214	212	211	217
215	215	208	217	211
216	216	221	213	212
217	217	217	222	211
218	218	217	214	211
219	219	215	210	209
220	220	227	208	215
221	221	216	209	215
222	222	212	215	211
223	223	215	217	214
224	224	222	212	213
225	225	217	213	217
226	226	215	213	212
227	227	216	219	211
228	228	214	218	214
229	229	209	212	214
230	230	216	212	210
231	231	210	216	215
232	232	218	230	208
233	233	215	216	205
234	234	214	221	212
235	235	211	210	217
236	236	216	215	216
237	237	205	215	217
238	238	216	214	212
239	239	212	208	216
240	240	218	216	213
241	241	212	218	217
242	242	209	214	217
243	243	215	215	214
244	244	212	211	217
245	245	219	213	215
246	246	213	211	215
247	247	211	215	208
248	248	217	214	216
249	249	214	211	217
250	250	213	219	212
251	251	216	214	215

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
252	252	213	209	216
253	253	216	220	214
254	254	215	215	216
255	255	213	210	216
256	256	215	217	212
257	257	213	211	212
258	258	215	212	218
259	259	213	218	211
260	260	213	212	213
261	261	215	213	219
262	262	213	217	211
263	263	214	212	213
264	264	215	211	218
265	265	212	216	210
266	266	215	213	214
267	267	214	211	217
268	268	213	218	211
269	269	216	214	215
270	270	215	212	218
271	271	213	218	211
272	272	214	211	213
273	273	217	214	219
274	274	212	217	209
275	275	216	214	215
276	276	210	207	213
277	277	215	219	213
278	278	214	212	214
279	279	214	211	217
280	280	217	218	215
281	281	213	210	212
282	282	215	212	218
283	283	213	217	211
284	284	215	213	214
285	285	213	210	216
286	286	217	221	215
287	287	217	215	216
288	288	209	206	212
289	289	218	219	216
290	290	213	210	212
291	291	214	212	217
292	292	213	218	211
293	293	216	214	215
294	294	212	210	214

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
295	295	215	220	213
296	296	214	213	214
297	297	215	212	216
298	298	212	218	215
299	299	213	211	212
300	300	216	213	218
301	301	214	219	212
302	302	215	212	214
303	303	211	209	215
304	304	214	219	212
305	305	211	212	213
306	306	220	217	223
307	307	212	218	220
308	308	214	212	213
309	309	213	211	217
310	310	215	216	221
311	311	212	210	211
312	312	215	213	219
313	313	212	216	210
314	314	215	213	214
315	315	216	213	219
316	316	218	216	214
317	317	217	218	219
318	318	215	221	218
319	319	213	218	211
320	320	217	215	216
321	321	219	211	217
322	322	214	219	212
323	323	210	211	214
324	324	209	210	217
325	325	213	218	214
326	326	216	219	215
327	327	212	210	216
328	328	213	217	215
329	329	215	216	214
330	330	217	214	220
331	331	211	215	212
332	332	216	213	217
333	333	214	211	216
334	334	214	219	212
335	335	215	213	213
336	336	214	211	217
337	337	213	218	211

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
338	338	222	215	216
339	339	221	211	217
340	340	216	217	212
341	341	218	215	217
342	342	211	208	213
343	343	217	223	216
344	344	214	215	213
345	345	213	214	216
346	346	214	219	212
347	347	213	211	213
348	348	215	212	217
349	349	214	218	212
350	350	213	211	214
351	351	219	217	223
352	352	211	208	216
353	353	214	212	213
354	354	215	211	218
355	355	213	218	211
356	356	214	211	213
357	357	218	217	222
358	358	208	213	210
359	359	218	215	217
360	360	211	208	214
361	361	216	221	214
362	362	217	214	215
363	363	212	210	216
364	364	211	215	209
365	365	217	215	216
366	366	214	211	217
367	367	216	220	214
368	368	215	213	214
369	369	213	210	216
370	370	214	219	212
371	371	215	212	214
372	372	213	210	216
373	373	212	217	210
374	374	213	211	212
375	375	217	214	220
376	376	215	220	212
377	377	212	210	211
378	378	217	214	220
379	379	213	217	211
380	380	212	210	211

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
381	381	216	213	219
382	382	215	220	213
383	383	213	210	212
384	384	215	212	217
385	385	213	218	211
386	386	215	213	214
387	387	214	211	216
388	388	214	218	212
389	389	215	213	214
390	390	213	210	215
391	391	213	218	211
392	392	218	216	217
393	393	213	210	215
394	394	211	217	210
395	395	215	214	215
396	396	216	213	218
397	397	212	217	210
398	398	215	213	214
399	399	217	212	218
400	400	213	217	211
401	401	216	213	215
402	402	213	210	216
403	403	214	219	212
404	404	215	214	215
405	405	213	211	217
406	406	212	217	210
407	407	214	211	213
408	408	215	212	217
409	409	214	219	212
410	410	217	214	216
411	411	216	213	215
412	412	213	218	211
413	413	215	213	214
414	414	214	211	217
415	415	215	220	213
416	416	214	219	212
417	417	213	218	216
418	418	216	220	214
419	419	218	216	217
420	420	213	210	216
421	421	212	217	210
422	422	215	212	214
423	423	214	211	217

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
424	424	212	216	220
425	425	214	218	219
426	426	217	221	218
427	427	213	218	217
428	428	216	213	215
429	429	215	212	217
430	430	212	217	210
431	431	217	216	215
432	432	214	210	217
433	433	215	219	213
434	434	216	213	215
435	435	214	210	217
436	436	210	215	209
437	437	213	214	217
438	438	217	213	220
439	439	211	216	209
440	440	214	212	213
441	441	215	211	218
442	442	217	218	223
443	443	215	214	219
444	444	214	212	218
445	445	213	218	211
446	446	216	216	215
447	447	215	213	219
448	448	213	217	211
449	449	218	213	219
450	450	214	212	218
451	451	210	216	209
452	452	216	214	215
453	453	214	212	218
454	454	215	217	219
455	455	217	216	213
456	456	215	212	218
457	457	213	219	220
458	458	212	212	213
459	459	216	211	217
460	460	215	221	214
461	461	214	212	213
462	462	215	211	218
463	463	212	217	215
464	464	215	212	214
465	465	214	219	217
466	466	211	218	213

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
467	467	216	213	215
468	468	214	213	217
469	469	213	219	215
470	470	216	215	216
471	471	213	214	216
472	472	214	220	213
473	473	213	212	213
474	474	214	210	217
475	475	213	218	211
476	476	214	212	213
477	477	216	211	217
478	478	212	217	210
479	479	215	216	215
480	480	214	215	217
481	481	212	218	209
482	482	215	217	214
483	483	219	212	218
484	484	216	219	212
485	485	214	212	212
486	486	215	214	218
487	487	213	218	211
488	488	215	212	214
489	489	219	211	217
490	490	214	219	212
491	491	215	213	214
492	492	213	211	217
493	493	220	218	216
494	494	216	214	214
495	495	214	211	217
496	496	213	218	211
497	497	216	213	215
498	498	213	210	216
499	499	210	218	211
500	500	213	212	213
501	501	214	210	217
502	502	217	218	215
503	503	215	214	215
504	504	215	212	218
505	505	214	222	217
506	506	212	210	211
507	507	219	216	222
508	508	210	215	208
509	509	211	213	214

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
510	510	213	211	217
511	511	214	222	213
512	512	215	213	214
513	513	214	212	218
514	514	217	219	212
515	515	215	213	214
516	516	214	211	217
517	517	215	218	211
518	518	216	213	215
519	519	213	211	217
520	520	216	217	220
521	521	214	212	213
522	522	215	211	217
523	523	217	219	212
524	524	214	212	213
525	525	213	209	216
526	526	212	218	211
527	527	218	217	218
528	528	215	212	217
529	529	213	217	211
530	530	215	214	215
531	531	212	210	216
532	532	219	217	212
533	533	216	214	215
534	534	214	210	217
535	535	213	222	212
536	536	215	212	214
537	537	217	211	218
538	538	213	217	211
539	539	216	214	215
540	540	214	211	216
541	541	213	219	212
542	542	212	212	214
543	543	210	211	217
544	544	209	215	212
545	545	211	212	214
546	546	213	210	215
547	547	214	219	212
548	548	215	213	213
549	549	214	211	217
550	550	213	219	212
551	551	216	214	215
552	552	213	211	217

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
553	553	214	218	212
554	554	215	213	213
555	555	214	215	217
556	556	213	218	215
557	557	211	213	214
558	558	214	211	217
559	559	213	215	212
560	560	212	214	211
561	561	210	210	216
562	562	212	217	210
563	563	217	215	216
564	564	216	214	220
565	565	211	217	210
566	566	215	214	215
567	567	213	217	216
568	568	212	218	211
569	569	214	213	210
570	570	212	211	208
571	571	214	219	212
572	572	215	218	216
573	573	214	217	216
574	574	213	218	211
575	575	216	213	215
576	576	214	212	218
577	577	212	217	210
578	578	215	213	214
579	579	214	212	218
580	580	213	219	221
581	581	216	212	217
582	582	212	210	216
583	583	214	218	212
584	584	215	217	213
585	585	216	216	219
586	586	215	219	212
587	587	216	212	213
588	588	213	210	211
589	589	210	209	213
590	590	216	205	212
591	591	214	211	217
592	592	213	218	211
593	593	215	213	213
594	594	214	211	217
595	595	213	217	211

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
596	596	210	213	214
597	597	213	211	216
598	598	216	219	212
599	599	214	213	214
600	600	213	211	217
601	601	214	218	212
602	602	215	213	214
603	603	219	213	217
604	604	213	219	212
605	605	215	213	214
606	606	214	215	216
607	607	215	217	213
608	608	216	214	215
609	609	216	213	219
610	610	212	217	210
611	611	216	214	215
612	612	214	211	217
613	613	213	218	211
614	614	216	214	215
615	615	222	211	217
616	616	216	217	210
617	617	215	213	214
618	618	212	209	215
619	619	219	218	211
620	620	216	214	215
621	621	215	212	218
622	622	220	218	211
623	623	215	213	214
624	624	213	210	216
625	625	214	219	212
626	626	217	215	216
627	627	214	211	217
628	628	215	220	213
629	629	216	214	215
630	630	220	211	217
631	631	221	218	211
632	632	223	213	214
633	633	225	210	216
634	634	217	218	211
635	635	215	213	214
636	636	214	211	217
637	637	214	219	212
638	638	215	213	214

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
639	639	216	212	218
640	640	218	220	213
641	641	217	213	214
642	642	207	210	216
643	643	212	211	210
644	644	216	213	214
645	645	218	211	217
646	646	217	218	211
647	647	219	213	214
648	648	213	210	216
649	649	210	219	212
650	650	215	213	214
651	651	215	212	218
652	652	213	218	211
653	653	216	214	215
654	654	213	210	216
655	655	214	219	212
656	656	217	215	216
657	657	214	211	217
658	658	212	217	210
659	659	217	215	216
660	660	215	212	218
661	661	217	218	211
662	662	216	214	215
663	663	214	211	217
664	664	213	218	211
665	665	215	213	214
666	666	210	211	217
667	667	215	218	211
668	668	216	214	215
669	669	211	210	216
670	670	214	219	212
671	671	218	213	214
672	672	214	211	217
673	673	216	218	211
674	674	215	213	214
675	675	213	210	216
676	676	224	219	212
677	677	216	214	215
678	678	214	211	217
679	679	210	219	212
680	680	216	214	215
681	681	217	210	216

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
682	682	213	218	211
683	683	215	213	214
684	684	219	211	217
685	685	213	218	211
686	686	218	216	217
687	687	219	211	217
688	688	212	209	210
689	689	220	213	214
690	690	214	211	217
691	691	213	218	211
692	692	217	215	216
693	693	213	210	216
694	694	213	218	211
695	695	214	212	213
696	696	215	212	218
697	697	213	218	211
698	698	216	214	215
699	699	213	210	216
700	700	216	221	214
701	701	214	212	213
702	702	212	209	215
703	703	214	219	212
704	704	215	213	214
705	705	213	210	216
706	706	215	220	213
707	707	214	212	213
708	708	214	211	217
709	709	213	218	211
710	710	216	214	215
711	711	214	211	217
712	712	214	219	212
713	713	216	214	215
714	714	213	210	216
715	715	214	219	212
716	716	213	212	213
717	717	216	213	218
718	718	212	217	210
719	719	215	213	214
720	720	217	214	219
721	721	212	217	210
722	722	215	212	214
723	723	214	211	217
724	724	215	220	213

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
725	725	214	212	213
726	726	214	211	217
727	727	211	215	209
728	728	214	212	213
729	729	212	210	216
730	730	216	221	214
731	731	217	215	215
732	732	212	210	216
733	733	212	217	210
734	734	215	213	214
735	735	214	211	217
736	736	212	218	211
737	737	217	216	217
738	738	213	210	216
739	739	215	221	214
740	740	213	212	213
741	741	215	211	218
742	742	211	217	210
743	743	214	212	213
744	744	215	212	218
745	745	212	217	210
746	746	214	212	213
747	747	216	213	219
748	748	212	217	210
749	749	216	213	215
750	750	213	210	216
751	751	214	218	212
752	752	215	212	214
753	753	215	212	218
754	754	213	218	211
755	755	215	214	215
756	756	215	212	218
757	757	213	217	211
758	758	217	215	216
759	759	213	209	216
760	760	214	219	212
761	761	215	213	213
762	762	214	212	218
763	763	212	217	210
764	764	214	212	213
765	765	216	214	220
766	766	209	215	208
767	767	214	213	214

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
768	768	216	214	220
769	769	213	218	211
770	770	215	213	214
771	771	213	210	216
772	772	214	218	212
773	773	216	214	214
774	774	215	212	217
775	775	214	218	212
776	776	214	212	213
777	777	214	211	217
778	778	212	216	210
779	779	216	215	216
780	780	212	209	215
781	781	214	218	212
782	782	216	213	215
783	783	215	211	218
784	784	212	218	211
785	785	220	213	214
786	786	215	213	219
787	787	212	218	211
788	788	215	213	214
789	789	214	212	218
790	790	212	217	210
791	791	216	214	215
792	792	213	211	217
793	793	214	220	213
794	794	212	211	212
795	795	209	211	217
796	796	214	219	212
797	797	215	212	214
798	798	215	212	218
799	799	212	217	210
800	800	216	214	215
801	801	214	210	217
802	802	213	219	212
803	803	215	213	214
804	804	214	212	218
805	805	211	216	209
806	806	216	214	215
807	807	214	210	217
808	808	212	218	211
809	809	216	214	215
810	810	214	212	218

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
811	811	213	219	212
812	812	214	212	213
813	813	213	211	217
814	814	213	219	212
815	815	215	213	214
816	816	214	211	217
817	817	213	217	211
818	818	215	214	215
819	819	214	212	218
820	820	213	218	211
821	821	216	215	216
822	822	215	211	218
823	823	212	217	209
824	824	216	214	215
825	825	212	209	215
826	826	212	217	209
827	827	219	217	218
828	828	214	211	217
829	829	211	215	209
830	830	217	215	216
831	831	213	210	215
832	832	214	218	212
833	833	215	213	214
834	834	215	212	218
835	835	211	217	210
836	836	215	213	214
837	837	217	215	221
838	838	207	212	205
839	839	217	215	216
840	840	214	212	218
841	841	212	218	211
842	842	215	214	215
843	843	215	212	217
844	844	213	217	211
845	845	215	213	214
846	846	214	212	218
847	847	213	217	211
848	848	215	214	215
849	849	213	209	216
850	850	216	220	214
851	851	214	212	213
852	852	214	211	217
853	853	213	218	210

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
854	854	217	215	216
855	855	211	208	214
856	856	215	219	213
857	857	216	213	215
858	858	216	213	219
859	859	212	217	210
860	860	212	210	211
861	861	215	212	218
862	862	212	217	210
863	863	219	214	215
864	864	214	211	216
865	865	213	218	211
866	866	215	213	214
867	867	217	211	217
868	868	216	218	211
869	869	215	213	214
870	870	214	212	218
871	871	213	218	210
872	872	215	213	214
873	873	214	211	216
874	874	213	219	212
875	875	217	215	216
876	876	213	210	216
877	877	213	219	212
878	878	214	212	213
879	879	214	211	217
880	880	212	218	211
881	881	215	213	214
882	882	212	209	215
883	883	213	219	212
884	884	216	214	215
885	885	217	214	220
886	886	212	217	210
887	887	213	212	213
888	888	214	212	218
889	889	212	218	211
890	890	214	213	214
891	891	214	211	217
892	892	212	218	211
893	893	220	214	215
894	894	214	211	217
895	895	215	219	213
896	896	210	213	214

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
897	897	214	211	217
898	898	213	218	210
899	899	209	213	214
900	900	212	209	215
901	901	213	217	211
902	902	215	213	214
903	903	215	212	218
904	904	211	217	210
905	905	219	216	218
906	906	213	210	216
907	907	213	217	211
908	908	215	214	215
909	909	214	211	216
910	910	211	216	209
911	911	216	214	214
912	912	214	212	218
913	913	212	218	211
914	914	215	213	214
915	915	216	213	218
916	916	213	217	211
917	917	214	212	213
918	918	215	211	218
919	919	213	219	212
920	920	213	211	212
921	921	214	210	217
922	922	214	218	212
923	923	214	212	213
924	924	214	211	217
925	925	218	223	216
926	926	213	212	213
927	927	214	212	218
928	928	212	218	211
929	929	215	214	215
930	930	212	209	215
931	931	212	218	211
932	932	216	215	216
933	933	214	210	217
934	934	213	218	211
935	935	215	212	214
936	936	213	211	217
937	937	214	218	212
938	938	215	213	213
939	939	218	212	218

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
940	940	215	219	213
941	941	216	213	215
942	942	214	211	217
943	943	213	218	211
944	944	216	213	215
945	945	209	208	214
946	946	214	220	213
947	947	215	212	214
948	948	214	211	217
949	949	213	218	211
950	950	216	215	216
951	951	215	212	218
952	952	211	217	210
953	953	215	212	214
954	954	214	211	217
955	955	212	216	210
956	956	215	213	214
957	957	214	212	218
958	958	213	215	216
959	959	216	213	215
960	960	214	211	216
961	961	213	214	211
962	962	215	214	215
963	963	213	215	217
964	964	217	219	212
965	965	218	216	215
966	966	214	219	217
967	967	213	218	210
968	968	215	213	214
969	969	214	211	217
970	970	218	220	216
971	971	215	225	214
972	972	218	226	217
973	973	214	219	212
974	974	219	213	214
975	975	210	214	210
976	976	213	210	211
977	977	215	211	215
978	978	214	210	217
979	979	213	218	211
980	980	216	214	215
981	981	214	211	217
982	982	213	218	211

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
983	983	215	213	214
984	984	214	212	218
985	985	211	216	209
986	986	215	214	215
987	987	214	211	217
988	988	213	218	211
989	989	215	213	214
990	990	214	211	217
991	991	213	218	211
992	992	215	213	214
993	993	214	211	217
994	994	213	219	212
995	995	213	211	212
996	996	212	211	217
997	997	214	220	213
998	998	214	212	213
999	999	214	211	217
1000	1000	215	219	213
1001	1001	216	213	215
1002	1002	214	211	216
1003	1003	213	218	211
1004	1004	215	213	214
1005	1005	213	210	216
1006	1006	213	217	211
1007	1007	216	213	215
1008	1008	215	212	218
1009	1009	212	217	210
1010	1010	215	212	214
1011	1011	214	211	217
1012	1012	212	218	211
1013	1013	215	213	214
1014	1014	214	212	218
1015	1015	216	219	212
1016	1016	215	213	214
1017	1017	214	211	217
1018	1018	216	218	211
1019	1019	215	214	215
1020	1020	214	210	217
1021	1021	213	218	211
1022	1022	214	213	214
1023	1023	215	212	218
1024	1024	213	217	211
1025	1025	214	212	213

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1026	1026	216	213	218
1027	1027	212	217	210
1028	1028	215	213	214
1029	1029	214	212	218
1030	1030	213	219	212
1031	1031	215	213	213
1032	1032	214	212	218
1033	1033	212	218	211
1034	1034	215	214	215
1035	1035	214	212	218
1036	1036	210	216	209
1037	1037	216	215	216
1038	1038	216	213	219
1039	1039	213	218	211
1040	1040	215	214	215
1041	1041	212	209	215
1042	1042	213	218	211
1043	1043	215	214	215
1044	1044	213	211	217
1045	1045	214	218	212
1046	1046	215	213	213
1047	1047	214	211	217
1048	1048	213	218	211
1049	1049	216	213	215
1050	1050	215	212	218
1051	1051	214	219	212
1052	1052	214	212	213
1053	1053	215	212	217
1054	1054	213	219	212
1055	1055	212	211	212
1056	1056	214	212	218
1057	1057	213	218	211
1058	1058	215	213	214
1059	1059	214	211	217
1060	1060	211	217	210
1061	1061	215	213	214
1062	1062	215	212	218
1063	1063	212	218	211
1064	1064	214	213	214
1065	1065	215	213	219
1066	1066	212	218	211
1067	1067	215	214	215
1068	1068	213	211	217

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1069	1069	213	218	211
1070	1070	215	214	215
1071	1071	216	212	219
1072	1072	212	217	210
1073	1073	215	213	214
1074	1074	214	212	218
1075	1075	211	216	209
1076	1076	216	214	215
1077	1077	214	211	217
1078	1078	213	219	212
1079	1079	215	212	214
1080	1080	213	209	216
1081	1081	214	219	212
1082	1082	215	213	214
1083	1083	213	211	217
1084	1084	214	218	212
1085	1085	215	213	214
1086	1086	214	211	217
1087	1087	213	219	212
1088	1088	212	214	213
1089	1089	214	212	218
1090	1090	215	220	213
1091	1091	214	212	212
1092	1092	213	210	216
1093	1093	214	218	212
1094	1094	216	213	215
1095	1095	215	212	217
1096	1096	214	219	212
1097	1097	215	213	213
1098	1098	214	211	217
1099	1099	212	217	210
1100	1100	215	212	214
1101	1101	213	209	216
1102	1102	213	218	211
1103	1103	219	217	217
1104	1104	215	213	219
1105	1105	210	215	208
1106	1106	215	213	214
1107	1107	214	211	217
1108	1108	213	218	211
1109	1109	215	213	214
1110	1110	213	211	217
1111	1111	212	217	210

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1112	1112	216	215	216
1113	1113	213	210	216
1114	1114	214	218	212
1115	1115	215	212	214
1116	1116	214	210	217
1117	1117	213	218	211
1118	1118	217	214	216
1119	1119	214	210	217
1120	1120	213	217	211
1121	1121	214	213	214
1122	1122	214	211	217
1123	1123	213	219	212
1124	1124	215	213	214
1125	1125	214	212	218
1126	1126	213	218	211
1127	1127	215	213	214
1128	1128	214	211	217
1129	1129	213	218	211
1130	1130	215	214	215
1131	1131	214	211	217
1132	1132	213	218	211
1133	1133	215	213	214
1134	1134	214	211	217
1135	1135	213	218	211
1136	1136	215	213	214
1137	1137	214	211	217
1138	1138	213	218	211
1139	1139	216	214	215
1140	1140	212	209	214
1141	1141	213	218	210
1142	1142	216	213	215
1143	1143	215	211	218
1144	1144	213	217	211
1145	1145	215	213	214
1146	1146	214	212	218
1147	1147	212	218	211
1148	1148	216	214	215
1149	1149	213	210	216
1150	1150	214	219	212
1151	1151	215	214	215
1152	1152	214	211	217
1153	1153	213	218	211
1154	1154	215	213	214

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1155	1155	213	211	217
1156	1156	213	218	211
1157	1157	215	214	215
1158	1158	214	210	217
1159	1159	213	218	211
1160	1160	215	213	214
1161	1161	214	211	217
1162	1162	213	217	211
1163	1163	215	214	215
1164	1164	213	211	217
1165	1165	214	220	213
1166	1166	215	214	215
1167	1167	213	211	217
1168	1168	212	218	211
1169	1169	216	215	216
1170	1170	214	212	218
1171	1171	212	218	211
1172	1172	214	213	214
1173	1173	213	211	217
1174	1174	212	218	211
1175	1175	216	214	215
1176	1176	214	211	217
1177	1177	213	219	213
1178	1178	214	212	213
1179	1179	217	211	218
1180	1180	210	215	208
1181	1181	217	213	215
1182	1182	214	210	217
1183	1183	213	219	212
1184	1184	214	213	214
1185	1185	216	213	219
1186	1186	213	218	211
1187	1187	215	212	214
1188	1188	216	211	217
1189	1189	212	217	210
1190	1190	216	214	215
1191	1191	215	211	218
1192	1192	213	217	211
1193	1193	215	213	214
1194	1194	215	210	216
1195	1195	214	220	213
1196	1196	215	213	214
1197	1197	214	211	217

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1198	1198	212	218	211
1199	1199	216	214	215
1200	1200	212	209	215
1201	1201	212	217	210
1202	1202	216	215	216
1203	1203	214	212	218
1204	1204	212	218	211
1205	1205	213	211	211
1206	1206	218	216	222
1207	1207	210	216	209
1208	1208	215	213	214
1209	1209	214	211	217
1210	1210	213	218	211
1211	1211	215	214	215
1212	1212	214	211	217
1213	1213	211	217	210
1214	1214	216	213	215
1215	1215	217	214	220
1216	1216	211	215	209
1217	1217	215	213	214
1218	1218	214	211	217
1219	1219	213	218	211
1220	1220	215	212	214
1221	1221	214	212	218
1222	1222	212	217	210
1223	1223	216	214	215
1224	1224	214	210	217
1225	1225	212	217	210
1226	1226	215	213	214
1227	1227	218	215	220
1228	1228	211	216	209
1229	1229	214	213	214
1230	1230	215	212	218
1231	1231	213	218	211
1232	1232	214	213	214
1233	1233	212	210	216
1234	1234	213	218	211
1235	1235	217	215	215
1236	1236	216	213	219
1237	1237	213	218	211
1238	1238	214	212	212
1239	1239	214	211	217
1240	1240	212	217	210

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1241	1241	216	214	214
1242	1242	214	211	217
1243	1243	213	217	211
1244	1244	215	213	214
1245	1245	214	212	218
1246	1246	213	218	210
1247	1247	216	213	215
1248	1248	213	210	216
1249	1249	215	219	213
1250	1250	216	213	215
1251	1251	215	212	217
1252	1252	213	218	211
1253	1253	215	213	214
1254	1254	214	210	217
1255	1255	213	217	211
1256	1256	214	211	213
1257	1257	217	213	220
1258	1258	211	216	209
1259	1259	217	214	216
1260	1260	214	210	217
1261	1261	213	218	210
1262	1262	216	214	215
1263	1263	213	210	216
1264	1264	213	218	211
1265	1265	215	213	214
1266	1266	212	209	215
1267	1267	217	219	215
1268	1268	213	216	212
1269	1269	214	211	217
1270	1270	215	219	213
1271	1271	214	212	213
1272	1272	210	213	217
1273	1273	213	218	211
1274	1274	214	211	213
1275	1275	217	214	219
1276	1276	211	217	210
1277	1277	215	213	214
1278	1278	214	211	217
1279	1279	212	217	209
1280	1280	217	215	216
1281	1281	212	209	215
1282	1282	215	220	213
1283	1283	215	212	214

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1284	1284	214	210	217
1285	1285	213	219	212
1286	1286	215	213	214
1287	1287	214	210	217
1288	1288	212	217	210
1289	1289	218	215	217
1290	1290	212	209	215
1291	1291	214	218	212
1292	1292	216	214	214
1293	1293	214	211	217
1294	1294	213	219	212
1295	1295	213	210	212
1296	1296	217	214	220
1297	1297	212	217	210
1298	1298	215	213	214
1299	1299	213	210	217
1300	1300	211	216	209
1301	1301	212	211	212
1302	1302	213	210	215
1303	1303	212	209	211
1304	1304	216	214	215
1305	1305	215	212	219
1306	1306	215	220	218
1307	1307	216	219	214
1308	1308	213	209	216
1309	1309	216	218	211
1310	1310	221	219	220
1311	1311	212	209	215
1312	1312	213	218	210
1313	1313	215	213	214
1314	1314	214	211	217
1315	1315	214	219	212
1316	1316	215	213	214
1317	1317	214	211	217
1318	1318	213	217	211
1319	1319	215	213	214
1320	1320	213	211	217
1321	1321	214	220	213
1322	1322	215	213	214
1323	1323	214	211	217
1324	1324	210	216	209
1325	1325	213	210	212
1326	1326	218	214	221

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1327	1327	214	218	212
1328	1328	215	212	214
1329	1329	214	211	217
1330	1330	216	222	215
1331	1331	214	212	213
1332	1332	213	210	216
1333	1333	213	218	211
1334	1334	215	213	214
1335	1335	215	212	218
1336	1336	213	219	212
1337	1337	214	213	214
1338	1338	216	213	219
1339	1339	212	218	211
1340	1340	213	212	213
1341	1341	212	210	216
1342	1342	211	216	209
1343	1343	220	218	219
1344	1344	211	209	215
1345	1345	213	218	211
1346	1346	215	214	215
1347	1347	214	210	217
1348	1348	213	219	212
1349	1349	215	213	214
1350	1350	213	209	216
1351	1351	214	219	212
1352	1352	215	213	214
1353	1353	214	211	217
1354	1354	213	218	211
1355	1355	215	213	214
1356	1356	211	208	214
1357	1357	217	213	216
1358	1358	212	210	211
1359	1359	216	214	220
1360	1360	212	216	210
1361	1361	216	213	215
1362	1362	214	211	217
1363	1363	213	218	211
1364	1364	215	213	214
1365	1365	214	211	217
1366	1366	213	218	211
1367	1367	215	213	214
1368	1368	214	211	217
1369	1369	212	217	210

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1370	1370	213	212	213
1371	1371	214	212	218
1372	1372	215	220	213
1373	1373	213	211	212
1374	1374	214	211	217
1375	1375	214	219	212
1376	1376	214	212	213
1377	1377	216	213	219
1378	1378	211	215	209
1379	1379	216	213	215
1380	1380	218	215	220
1381	1381	213	218	211
1382	1382	215	213	214
1383	1383	213	210	216
1384	1384	212	218	211
1385	1385	215	213	214
1386	1386	214	210	217
1387	1387	213	219	212
1388	1388	215	213	214
1389	1389	216	215	218
1390	1390	209	214	207
1391	1391	216	217	215
1392	1392	214	211	217
1393	1393	213	218	210
1394	1394	215	213	214
1395	1395	217	212	218
1396	1396	214	219	212
1397	1397	215	212	214
1398	1398	214	212	218
1399	1399	212	217	210
1400	1400	214	212	213
1401	1401	215	212	218
1402	1402	213	217	211
1403	1403	217	214	216
1404	1404	212	209	215
1405	1405	213	218	211
1406	1406	216	213	215
1407	1407	214	211	217
1408	1408	213	218	211
1409	1409	215	212	214
1410	1410	216	213	219
1411	1411	213	218	211
1412	1412	215	213	214

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1413	1413	213	210	215
1414	1414	213	219	212
1415	1415	214	213	214
1416	1416	215	212	218
1417	1417	213	218	211
1418	1418	215	214	215
1419	1419	214	211	217
1420	1420	213	217	211
1421	1421	214	212	213
1422	1422	214	210	217
1423	1423	213	219	212
1424	1424	215	213	213
1425	1425	214	211	217
1426	1426	213	219	212
1427	1427	215	213	213
1428	1428	214	211	217
1429	1429	213	219	212
1430	1430	215	213	214
1431	1431	214	211	217
1432	1432	214	219	212
1433	1433	216	213	215
1434	1434	211	209	215
1435	1435	214	219	212
1436	1436	215	213	214
1437	1437	214	211	217
1438	1438	213	218	211
1439	1439	215	213	214
1440	1440	214	211	217
1441	1441	213	218	211
1442	1442	215	213	213
1443	1443	216	212	219
1444	1444	213	218	211
1445	1445	214	212	213
1446	1446	215	211	218
1447	1447	214	219	212
1448	1448	213	211	212
1449	1449	216	213	218
1450	1450	212	217	210
1451	1451	216	214	214
1452	1452	215	212	218
1453	1453	212	218	211
1454	1454	215	213	214
1455	1455	214	212	218

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1456	1456	211	216	209
1457	1457	217	215	216
1458	1458	213	210	216
1459	1459	213	218	211
1460	1460	215	213	214
1461	1461	214	211	217
1462	1462	214	219	212
1463	1463	215	212	214
1464	1464	214	211	217
1465	1465	212	218	211
1466	1466	216	215	216
1467	1467	213	211	217
1468	1468	214	219	212
1469	1469	218	212	214
1470	1470	218	214	215
1471	1471	217	217	211
1472	1472	223	217	215
1473	1473	216	213	219
1474	1474	213	218	211
1475	1475	215	213	214
1476	1476	213	210	216
1477	1477	212	217	210
1478	1478	216	213	215
1479	1479	215	213	219
1480	1480	212	218	211
1481	1481	216	214	215
1482	1482	215	213	219
1483	1483	211	216	209
1484	1484	215	214	215
1485	1485	214	210	217
1486	1486	213	218	211
1487	1487	214	213	214
1488	1488	215	212	218
1489	1489	212	217	210
1490	1490	215	213	214
1491	1491	212	210	216
1492	1492	213	218	211
1493	1493	215	213	214
1494	1494	214	211	217
1495	1495	214	219	212
1496	1496	214	212	213
1497	1497	214	211	217
1498	1498	213	218	211

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1499	1499	216	213	215
1500	1500	215	213	219
1501	1501	213	218	211
1502	1502	214	212	212
1503	1503	214	210	217
1504	1504	213	219	212
1505	1505	216	215	216
1506	1506	213	210	216
1507	1507	212	217	210
1508	1508	215	213	214
1509	1509	215	212	218
1510	1510	211	217	210
1511	1511	215	213	214
1512	1512	213	211	217
1513	1513	212	218	211
1514	1514	215	214	215
1515	1515	214	211	217
1516	1516	213	218	211
1517	1517	215	214	215
1518	1518	214	211	217
1519	1519	212	217	210
1520	1520	219	217	218
1521	1521	213	211	217
1522	1522	212	217	210
1523	1523	215	212	214
1524	1524	213	211	217
1525	1525	214	219	212
1526	1526	215	213	214
1527	1527	214	210	217
1528	1528	213	218	211
1529	1529	216	214	214
1530	1530	214	212	218
1531	1531	216	218	211
1532	1532	214	213	214
1533	1533	213	211	217
1534	1534	216	218	211
1535	1535	215	213	214
1536	1536	214	211	217
1537	1537	213	218	211
1538	1538	217	215	216
1539	1539	213	210	216
1540	1540	214	219	211
1541	1541	213	211	212

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1542	1542	215	212	217
1543	1543	218	223	216
1544	1544	212	210	211
1545	1545	213	211	217
1546	1546	214	219	211
1547	1547	215	213	214
1548	1548	213	210	215
1549	1549	213	218	211
1550	1550	216	214	215
1551	1551	215	212	218
1552	1552	213	218	210
1553	1553	214	212	213
1554	1554	215	212	218
1555	1555	213	218	210
1556	1556	216	214	214
1557	1557	214	210	217
1558	1558	213	218	211
1559	1559	216	214	214
1560	1560	214	211	217
1561	1561	213	218	211
1562	1562	215	213	214
1563	1563	214	210	217
1564	1564	214	219	212
1565	1565	214	212	213
1566	1566	215	212	217
1567	1567	213	218	210
1568	1568	216	214	215
1569	1569	214	211	216
1570	1570	210	214	208
1571	1571	214	212	212
1572	1572	217	214	220
1573	1573	213	218	211
1574	1574	214	212	210
1575	1575	215	212	218
1576	1576	212	218	211
1577	1577	216	214	215
1578	1578	214	211	216
1579	1579	212	218	211
1580	1580	219	215	214
1581	1581	214	212	217
1582	1582	217	218	211
1583	1583	210	214	215
1584	1584	215	212	218

DATOS OBTENIDOS POR EL SENSOR VL53L0X				
N°	**DISTANCIA (m)**	**1ra Toma de Datos**	**2da Toma de Datos**	**3ra Toma de Datos**
1585	1585	212	217	210
1586	1586	214	213	214
1587	1587	214	211	217
1588	1588	213	218	211
1589	1589	216	214	214
1590	1590	216	213	218
1591	1591	213	218	211
1592	1592	214	213	214
1593	1593	215	212	217
1594	1594	212	217	210
1595	1595	216	214	215
1596	1596	214	211	216
1597	1597	214	218	212
1598	1598	215	214	215
1599	1599	215	212	218
1600	1600	213	218	211

ANEXO 5

Cálculo de IRI con Rugosímetro de Merlín.

ENSAYO DE INDICE DE RUGOSIDAD INTERNACIONAL (IRI) CON EL EQUIPO DE MERLIN

STANDARD PRACTICE FOR COMPUTING INTERNATIONAL ROUGHNESS INDEX OF ROADS FROM LONGITUDINAL PROFILE MEASUREMENTS (ASTM E1926 - 08_REAPPROVED 2021)

TESIS	: "DETERMINAR EL NIVEL DE EFICIENCIA DEL EQUIPO BASADO EN EL SENSOR DE DISTANCIA VL53L0X PARA EL CÁLCULO DEL ÍNDICE DE RUGOSIDAD INTERNACIONAL (IRI) APLICADO AL TRAMO KM 1326+000 - KM 1327+600 DE LA CARRETERA PUNO – JULIACA"	Registro N°	: T_UNAP_AAFD-05/23-01-G&C
		Fecha	: 04 de mayo del 2023

DATOS GENERALES

UBICACIÓN	: PROVINCIA DE PUNO - DEPARTAMENTO PUNO		
TIPO DE VIA	: ASFALTADA	COORDENADAS	
TRAMO	: KM 1326+000 AL KM 1327+600	NORTE	:
TESISTA	: BACH. ALAVE ARACA, KEYLA PAMELA - BACH. FLORES DUEÑAS, GERMAN ARMANDO	ESTE	:

1.- DATOS

PROGRESIVA	1326+000 / 1326+400	HUELLA:	DER	POS. PUNTERO FIN:	14.0 mm	PASTILLA	PIVOT/PUNTERO
		CARRIL:	DER	POS. PUNTERO INIC:	25.0 mm	e =6.05 mm	1:10

2.- PERSONAL

ESPECIALISTA	: A.L.G.C
ASISTENTE	: M.C.Y.C

3.- LECTURAS DEL ENSAYO

200	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	29	28	28	29	34	25	25	26	28	24	27	28	24	27	26	23	27	30	25	27
2	29	27	25	31	32	26	27	24	29	28	25	27	26	26	26	29	27	29	27	29
3	30	26	27	31	26	30	26	25	27	27	27	24	28	23	27	31	28	27	29	30
4	29	28	27	30	28	27	28	25	28	27	29	26	28	27	28	30	27	24	26	30
5	26	26	25	30	26	27	27	25	27	30	28	28	24	29	32	23	26	23	27	30
6	25	27	25	30	28	24	29	24	27	28	24	26	25	30	27	27	28	24	25	31
7	28	25	25	31	27	24	30	23	28	26	26	27	23	27	25	25	27	25	26	30
8	27	26	27	27	27	29	30	23	30	29	24	23	27	24	21	25	26	26	26	27
9	28	28	26	27	26	26	29	26	29	27	26	26	28	25	27	28	26	27	27	28
10	26	27	27	29	25	26	28	29	26	24	27	27	28	24	27	29	29	25	28	30

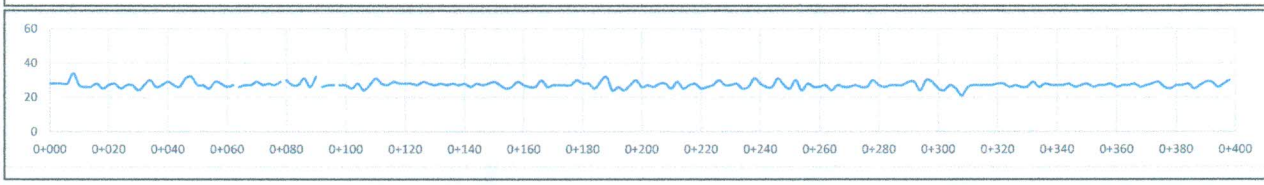
TIPO DE PAVIMENTO	
AFIRMADO	
BASE GRANULAR	
BASE IMPRIMADA	
TRAT. BI-CAPA	
CARPETA EN FRIO	
CARPETA EN CALIENTE	x
RECAPEO ASFÁLTICO	
SELLO	
RECUBRIMIENTO BITUMINOSO	

NOTA: Se registra desde la primera fila, posición [1] hasta la posición [20], continuando sucesivamente hacia abajo

4.- CONTEO DE DESVIACIONES (V) POR INTERVALO

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
$V_{1/25}$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	8	15	22
$V_{26/50}$	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
	33	48	28	20	17	5	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

5.- HISTOGRAMA DE FRECUENCIAS PARA 200 DESVIACIONES CONSECUTIVAS



6.- CALCULOS

1	Fracción de datos remanentes en el intervalo	[24]	=	14	=	0.93	und
2	Fracción de datos remanentes en el intervalo	[30]	=	16	=	0.94	und
3	Número de datos centrales intervalos desde	[25]	al	[30]	=	5.00	und
4	Rango de los valores agrupados en intervalos de frecuencia (D)					6.87	und
5	**Rango de los valores agrupados en intervalos de frecuencia (D)**					**34.37**	**mm**

7.- INDICE DE RUGOSIDAD INTERNACIONAL

1	Valor máximo registrado	34
2	Valor mínimo registrado	21
3	Factor de corrección	1.09
4	Rango de D, corregido	37.47 mm
5	**IRI=0.0485*Dc**	**1.82 m/Km = [mm/m]**

8.- EQUIPOS DE MEDICION

EQ.	MERLIN	VERNIER	PASTILLA	-	-	-	-		EQ
ID	MER01	VER01	PAS02	-	-	-	-		ID

9.- OBSERVACIONES

LA EVALUACION SE REALIZO EN PRESENCIA DEL SOLICITANTE

G&C CONSULTORES Y CONTRATISTAS GENERALES S.A.C.

BACH. ~~JC~~ MARY C. YANA CONDORI
TÉCNICO ESPECIALISTA EN ENSAYO DE MATERIALES

G&C CONSULTORES Y CONTRATISTAS GENERALES S.A.C

ING. ALEX LUIS GOMEZ CALLA
ESPECIALISTA EN GEOTECNIA Y ENSAYO DE MATERIALES
CIP N° 209176

ENSAYO DE INDICE DE RUGOSIDAD INTERNACIONAL (IRI) CON EL EQUIPO DE MERLIN

STANDARD PRACTICE FOR COMPUTING INTERNATIONAL ROUGHNESS INDEX OF ROADS FROM LONGITUDINAL PROFILE MEASUREMENTS (ASTM E1926 - 08_REAPPROVED 2021)

TESIS	: "DETERMINAR EL NIVEL DE EFICIENCIA DEL EQUIPO BASADO EN EL SENSOR DE DISTANCIA VL53L0X PARA EL CÁLCULO DEL ÍNDICE DE RUGOSIDAD INTERNACIONAL (IRI) APLICADO AL TRAMO KM 1326+000 - KM 1327+600 DE LA CARRETERA PUNO – JULIACA"	Registro N°	: T_UNAP_AAFD-05/23-02-G&C
		Fecha	: 04 de mayo del 2023

DATOS GENERALES

UBICACIÓN	: PROVINCIA DE PUNO - DEPARTAMENTO PUNO		
TIPO DE VIA	: ASFALTADA	COORDENADAS	
TRAMO	: KM 1326+000 AL KM 1327+600	NORTE	:
TESISTA	: BACH. ALAVE ARACA, KEYLA PAMELA - BACH. FLORES DUEÑAS, GERMAN ARMANDO	ESTE	:

1.- DATOS

PROGRESIVA	1326+400 – 1326+800	HUELLA:	DER	POS. PUNTERO FIN:	14.0 mm	PASTILLA	PIVOT/PUNTERO
		CARRIL:	DER	POS. PUNTERO INIC:	25.0 mm	e =6.05 mm	1:10

2.- PERSONAL

ESPECIALISTA	: A.L.G.C
ASISTENTE	: M.C.Y.C

3.- LECTURAS DEL ENSAYO

200	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	26	24	28	27	28	25	26	24	29	25	26	29	25	28	27	28	24	27	27	27
2	27	25	28	28	27	24	30	28	29	26	28	27	27	27	26	27	25	30	27	28
3	23	30	27	32	30	24	30	31	29	26	24	24	28	27	28	24	27	29	29	25
4	26	31	29	29	31	25	26	30	27	26	25	26	29	29	30	26	28	28	29	26
5	24	29	27	30	29	23	27	27	29	27	26	28	23	28	27	28	27	24	27	29
6	22	27	24	25	28	29	28	27	28	29	26	30	25	24	29	28	26	27	29	30
7	25	26	25	23	26	27	25	26	24	28	24	27	25	24	29	27	27	28	25	27
8	30	24	26	25	24	28	27	28	25	25	26	27	27	25	27	26	29	27	25	26
9	27	28	25	27	27	27	30	26	27	27	28	28	29	28	26	30	29	27	27	27
10	26	26	26	28	25	27	28	29	26	28	30	27	28	27	27	28	27	29	29	28

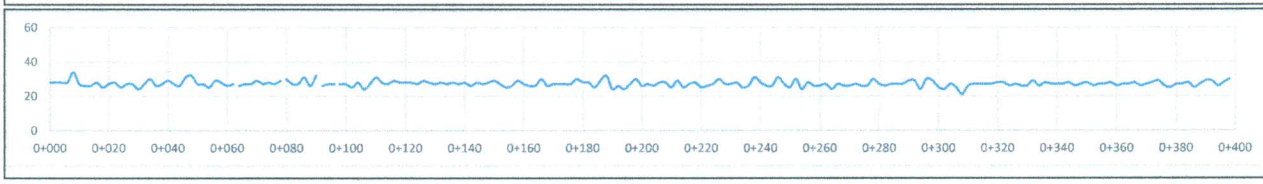
TIPO DE PAVIMENTO	
AFIRMADO	
BASE GRANULAR	
BASE IMPRIMADA	
TRAT. BI-CAPA	
CARPETA EN FRIO	
CARPETA EN CALIENTE	x
RECAPEO ASFÁLTICO	
SELLO	
RECUBRIMIENTO BITUMINOSO	

NOTA: Se registra desde la primera fila, posición [1] hasta la posición [20], continuando sucesivamente hacia abajo

4.- CONTEO DE DESVIACIONES (V) POR INTERVALO

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
$V_{1/25}$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	17	22
$V_{26/50}$	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
	28	50	34	26	14	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

5.- HISTOGRAMA DE FRECUENCIAS PARA 200 DESVIACIONES CONSECUTIVAS



6.- CALCULOS

1	Fracción de datos remanentes en el intervalo	[24]	=	12	=	0.71 und
2	Fracción de datos remanentes en el intervalo	[30]	=	8	=	0.57 und
3	Número de datos centrales intervalos desde	[25]	al	[29]	=	5.00 und
4	Rango de los valores agrupados en intervalos de frecuencia (D)					6.28 und
5	**Rango de los valores agrupados en intervalos de frecuencia (D)**					**31.39 mm**

7.- INDICE DE RUGOSIDAD INTERNACIONAL

1	Valor máximo registrado	32
2	Valor mínimo registrado	22
3	Factor de corrección	1.09
4	Rango de D, corregido	33.49 mm
5	**IRI=0.0485*Dc**	**1.66 m/Km = [mm/m]**

8.- EQUIPOS DE MEDICION

EQ.	MERLIN	VERNIER	PASTILLA	-	-	-	-		EQ
ID	MER01	VER01	PAS02	-	-	-	-		ID

9.- OBSERVACIONES

LA EVALUACION SE REALIZO EN PRESENCIA DEL SOLICITANTE

G&C CONSULTORES Y CONTRATISTAS GENERALES S.A.C.

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BACH. MARY C. YANA CONDORI
TÉCNICO ESPECIALISTA EN ENSAYO DE MATERIALES

ING. ALEX LUIS GOMEZ CALLA
ESPECIALISTA EN GEOTECNIA Y ENSAYO DE MATERIALES
CIP N° 209176

ENSAYO DE INDICE DE RUGOSIDAD INTERNACIONAL (IRI) CON EL EQUIPO DE MERLIN

STANDARD PRACTICE FOR COMPUTING INTERNATIONAL ROUGHNESS INDEX OF ROADS FROM LONGITUDINAL PROFILE MEASUREMENTS (ASTM E1926 - 08_REAPPROVED 2021)

TESIS	: "DETERMINAR EL NIVEL DE EFICIENCIA DEL EQUIPO BASADO EN EL SENSOR DE DISTANCIA VL53L0X PARA EL CÁLCULO DEL INDICE DE RUGOSIDAD INTERNACIONAL (IRI) APLICADO AL TRAMO KM 1326+000 - KM 1327+600 DE LA CARRETERA PUNO – JULIACA"	Registro N°	: T_UNAP_AAFD-05/23-03-G&C
		Fecha	: 04 de mayo del 2023

DATOS GENERALES

UBICACIÓN	: PROVINCIA DE PUNO - DEPARTAMENTO PUNO		
TIPO DE VIA	: ASFALTADA	COORDENADAS	
TRAMO	: KM 1326+000 AL KM 1327+600	NORTE	:
TESISTA	: BACH. ALAVE ARACA, KEYLA PAMELA - BACH. FLORES DUEÑAS, GERMAN ARMANDO	ESTE	:

1.- DATOS

PROGRESIVA	1326+800 – 1327+200	HUELLA:	DER	POS. PUNTERO FIN:	14.0 mm	PASTILLA	PIVOT/PUNTERO
		CARRIL:	DER	POS. PUNTERO INIC:	25.0 mm	e =6.05 mm	1:10

2.- PERSONAL

ESPECIALISTA	: A.L.G.C
ASISTENTE	: M.C.Y.C

3.- LECTURAS DEL ENSAYO

200	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	27	25	27	31	28	28	27	28	28	27	28	25	26	28	27	26	27	28	31	29
2	27	26	29	27	29	27	26	27	28	26	29	25	26	27	25	27	26	28	27	27
3	26	27	29	27	29	29	28	28	28	29	27	27	27	23	24	27	27	27	26	27
4	25	26	26	29	28	26	27	27	28	26	27	26	27	23	25	28	26	24	28	27
5	24	25	27	29	27	26	28	29	29	27	28	26	28	28	25	23	24	28	27	27
6	25	25	29	28	25	27	27	28	29	25	27	28	28	27	27	27	25	28	28	23
7	26	27	26	27	25	29	26	27	27	25	27	29	26	26	27	27	27	28	27	27
8	27	25	27	27	25	28	27	27	26	27	28	26	26	28	26	28	29	29	27	30
9	28	25	26	26	27	27	28	28	27	29	28	29	29	28	24	28	27	22	29	28
10	26	25	27	24	28	26	29	24	27	27	27	24	28	27	27	27	27	22	26	28

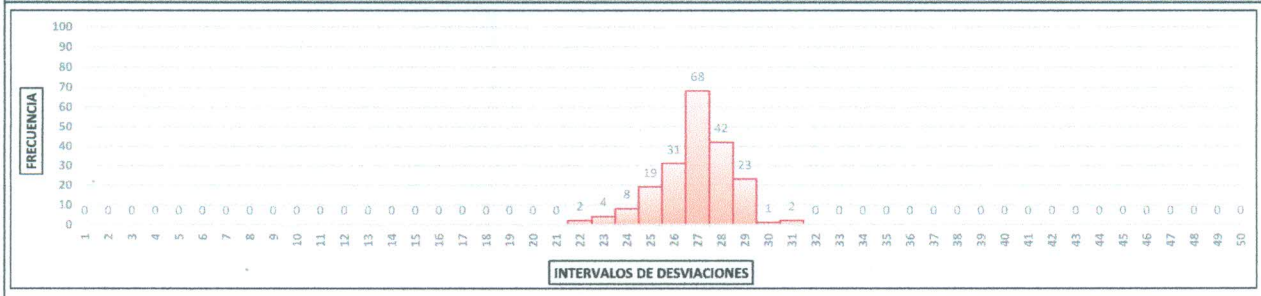
TIPO DE PAVIMENTO	
AFIRMADO	
BASE GRANULAR	
BASE IMPRIMADA	
TRAT. BI-CAPA	
CARPETA EN FRIO	
CARPETA EN CALIENTE	x
RECAPEO ASFÁLTICO	
SELLO	
RECUBRIMIENTO BITUMINOSO	

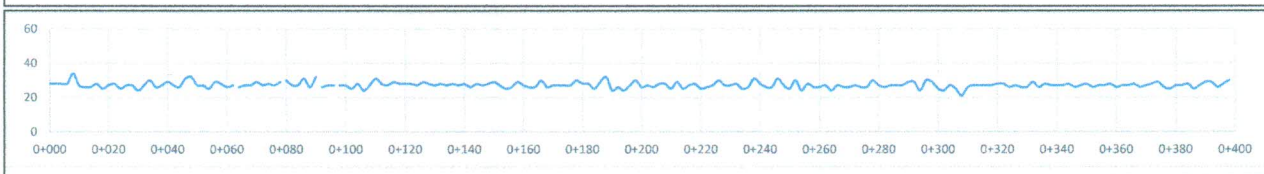
NOTA: Se registra desde la primera fila, posición [1] hasta la posición [20], continuando sucesivamente hacia abajo

4.- CONTEO DE DESVIACIONES (V) POR INTERVALO

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
$V_{1/25}$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	8	19
$V_{26/50}$	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
	31	68	42	23	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

5.- HISTOGRAMA DE FRECUENCIAS PARA 200 DESVIACIONES CONSECUTIVAS





6.- CALCULOS

1	Fracción de datos remanentes en el intervalo	[24]	=	4	=	0.50 und
2	Fracción de datos remanentes en el intervalo	[29]	=	16	=	0.70 und
3	Número de datos centrales intervalos desde	[25]	al	[28]	=	4.00 und
4	Rango de los valores agrupados en intervalos de frecuencia (D)					5.20 und
5	**Rango de los valores agrupados en intervalos de frecuencia (D)**					**25.98 mm**

7.- INDICE DE RUGOSIDAD INTERNACIONAL

1	Valor máximo registrado	31
2	Valor mínimo registrado	22
3	Factor de corrección	1.09
4	Rango de D, corregido	28.32 mm
5	**IRI=0.0485*Dc**	**1.37 m/Km = [mm/m]**

8.- EQUIPOS DE MEDICION

EQ.	MERLIN	VERNIER	PASTILLA	-	-	-	-		EQ
ID	MER01	VER01	PAS02	-	-	-	-		ID

9.- OBSERVACIONES

LA EVALUACION SE REALIZO EN PRESENCIA DEL SOLICITANTE

G&C CONSULTORES Y CONTRATISTAS GENERALES S.A.C.

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STANDARD PRACTICE FOR COMPUTING INTERNATIONAL ROUGHNESS INDEX OF ROADS FROM LONGITUDINAL PROFILE MEASUREMENTS (ASTM E1926 - 08_REAPPROVED 2021)

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		Fecha	: 04 de mayo del 2023

DATOS GENERALES

UBICACIÓN	: PROVINCIA DE PUNO - DEPARTAMENTO PUNO		
TIPO DE VIA	: ASFALTADA	**COORDENADAS**	
TRAMO	: KM 1326+000 AL KM 1327+600	**NORTE**	:
TESISTA	: BACH. ALAVE ARACA, KEYLA PAMELA - BACH. FLORES DUEÑAS, GERMAN ARMANDO	**ESTE**	:

1.- DATOS

PROGRESIVA	1327+200 1327+600	**HUELLA:**	DER	**POS. PUNTERO FIN:**	14.0 mm	**PASTILLA**	**PIVOT/PUNTERO**
		CARRIL:	DER	**POS. PUNTERO INIC:**	25.0 mm	e =6.95 mm	1:10

2.- PERSONAL

ESPECIALISTA	: A.L.G.C
ASISTENTE	: M.C.Y.C

3.- LECTURAS DEL ENSAYO

200	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	26	27	28	29	27	26	24	29	27	27	27	27	27	24	26	28	28	27	25	30
2	26	28	27	28	28	26	25	27	28	28	29	27	25	29	29	27	27	27	25	29
3	25	27	25	30	28	26	26	25	29	26	27	26	25	24	29	25	28	29	25	27
4	25	25	26	27	28	27	28	27	28	26	27	27	27	27	28	27	29	29	28	25
5	27	24	25	26	27	28	27	27	26	26	27	24	27	27	27	30	27	27	28	25
6	25	26	27	25	26	26	26	24	25	27	26	26	29	26	28	29	27	23	27	28
7	27	27	26	28	30	27	25	26	28	28	27	27	27	25	24	26	28	22	29	27
8	27	29	24	27	27	26	26	23	27	25	28	29	29	25	25	27	29	27	28	27
9	26	26	27	23	24	26	28	26	27	27	27	27	27	25	28	27	26	26	24	28
10	28	28	28	26	27	24	28	26	26	26	28	28	28	28	29	27	30	24	28	28

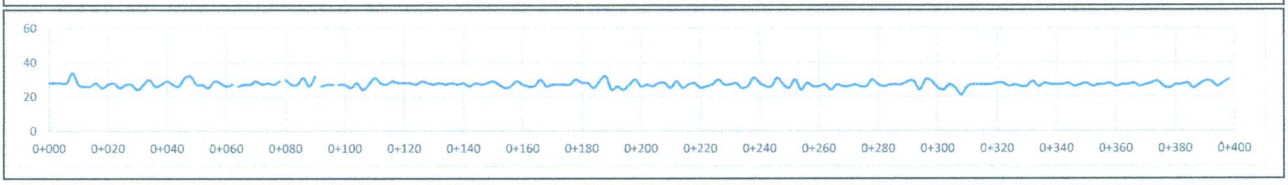
TIPO DE PAVIMENTO	
AFIRMADO	
BASE GRANULAR	
BASE IMPRIMADA	
TRAT. BI-CAPA	
CARPETA EN FRIO	
CARPETA EN CALIENTE	x
RECAPEO ASFÁLTICO	
SELLO	
RECUBRIMIENTO BITUMINOSO	

NOTA: Se registra desde la primera fila, posición [1] hasta la posición [20], continuando sucesivamente hacia abajo

4.- CONTEO DE DESVIACIONES (V) POR INTERVALO

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
$V_{1/25}$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	12	24
$V_{26/50}$	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
	36	62	38	19	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

5.- HISTOGRAMA DE FRECUENCIAS PARA 200 DESVIACIONES CONSECUTIVAS



6.- CALCULOS

1	Fracción de datos remanentes en el intervalo	[24]	= 6	=	0.50	und
2	Fracción de datos remanentes en el intervalo	[29]	= 14	=	0.74	und
3	Número de datos centrales intervalos desde	[25]	al	[28] =	4.00	und
4	Rango de los valores agrupados en intervalos de frecuencia (D)				5.24	und
5	**Rango de los valores agrupados en intervalos de frecuencia (D)**				**26.18**	**mm**

7.- INDICE DE RUGOSIDAD INTERNACIONAL

1	Valor máximo registrado	30
2	Valor mínimo registrado	22
3	Factor de corrección	1.09
4	Rango de D, corregido	28.54 mm
5	**IRI=0.0485*Dc**	**1.38 m/Km = [mm/m]**

8.- EQUIPOS DE MEDICION

EQ.	MERLIN	VERNIER	PASTILLA	-	-	-	-		EQ
ID	MER01	VER01	PAS02	-	-	-	-		ID

9.- OBSERVACIONES

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