CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Application of RJSeal™
Wei-Lai Expressway, PingDu, ShanDong, Peoples Republic of China

November 2003

TS^2 Consulting Inc.
Lamma, Hong Kong

TS² CONSULTING INC. <

(British Virgin Islands Incorporated) website: http://ts2.stormloader.com

Hong Kong
2/F 81 Po Wah Yuen.
Lamma Island, Hong Kong
Phone (85-2)-2982-4131
Fax: (85-2)-2390-5465
Cellular: (85-2)-9157-6693
Email: speed_cny@yahoo.co.uk

Canada (Liaison Office)
1016 Cannock Road S.W.
Calgary, Alberta
Canada, T2W IM5
Phone: (403)-281-3043
Fax: (403)-281-3043
Email: speed_cny@yahoo.co.uk

January 29, 2004

Crown Capital Enterprise Limited
B5, Centre Point Building
181 – 185 Gloucestor Road,
Wanchai, Hong Kong.
Attn: Charence Chiang
General Manager

Dear Charence

Re: Application of RJSeal™ on the We—Lai Expressway, ShanDong.

This is the final report on the application of RJSeal™ to four bridges on the We-Lai Expressway, near the City of PingDu, ShanDong Province. This application demonstration was undertaken on November 3 thru 6 inclusive and collectively encompassed 1050 lineal metres of bridge deck on this four lane, divided highway. The principal interest of the Ludong Expressway Management Company was a significant reduction in water penetration as well as restoration of the asphalt pavement's ductility. Testing conducted in the field showed that the water penetration was appreciably reduced.

Yours Sincerely

Anthony G. Speed, P.Eng. (Ontario, Canada)

Crown Capital Enterprise Limited.
RejuvaSeal Demo
Wei_Lai Highway Bridges
Date of Work November 2 thru 8
Prepared by A.G. Speed
Updated by A.G. Speed
Updated 2-Nov-03

	Bridge Loc'n	Length	Width	Area
Assumptions				
	Km 75+694	111	24.0	2664
	Km 70+040	206	24.00	4944
	Km 96+560	306	24.0	7344
	Km110+600	406	24.0	9744

Weather Conditions

Temperature	24 Celsius
Humidity	40%
Cloud Cover	Cloudy

Conversion Factors			
US Gallon=	3.78	Litres	
Sq Metre=	10.76	Sq Feet	
Sq Metre=	1.20	Sq Yds	
One Litre	1.10	kgs	
One Full Drun	208	Litres	
One Full`Drur	55	US Gallon	
90% full drum	50	US Gallon	

Crew Consist	**No**
Desco Op	1
Desco Help	2
Labourers	8
Truck Driver	2
Supervisor	3
Total	16

Work Schedule	Work Time	Work Time	Test Length (m)	Total Area m^2	Total Area yd^2	RejuvaSeal Applied			Application Rate				16 Man Crew	
am/pm						US gals	litres	kilograms	USGal /yd^2	Litres/m^2	m^2 /Litre	m^2/Kg	m^2 /man hr	yd^2 /man hr
2-Nov-03	10.30-4.00	5.0	111.0	2,664	3,184	233	882	971	**0.073**	**0.33**	**3.02**	**2.74**	33.3	39.8
3-Nov-03	9.00-5.00	8.0	206.0	4,944	5,910	225	851	936	**0.038**	**0.17**	**5.81**	**5.28**	38.6	46.2
3-Nov-03	9.00-5.00	8.0	306.0	7,344	8,779	395	1,495	936	**0.045**	**0.20**	**4.91**	**7.85**	57.4	68.6
4-Nov-03	9.00-5.00	8.0	406.0	9,744	11,648	726	2,744	936	**0.062**	**0.28**	**3.55**	**10.41**	76.1	91.0
Totals		29.0	1,029.0	24,696.0	29,521.0	1580	5972	936	**0.054**	**0.24**	**4.14**	**26.38**	53.2	63.6
						32	Drums (90% full)							

FlowMeter Readings	**Time (sec)**	**Location**
August 10, 2002	**Time**	**Location**
Untreated	**32**	West Shoulder
Untreated	**6**	Centre
Untreated	**10**	East Shoulder

CROWN CAPITAL ENTERPRISE LIMITED

Application of RJSeal
Wei-Lai Expressway, PingDu, ShanDong,
Peoples Republic of China

November 2003

TABLE OF CONTENTS

FIGURES

TABLES

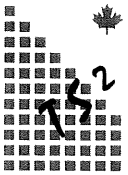
CROWN CAPITAL ENTERPRISE LIMITED

Application of RJSeal
Wei-Lai Expressway, PingDu, ShanDong,
Peoples Republic of China

November 2003

APPENDICES

No.	Description
A	RJSeal™ Descriptive Literature
B	Desco D200 Sprayer - Specifications



TS² Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED

Application of RJSeal™
Wei-Lai Expressway, PingDu, ShanDong
Peoples Republic of China

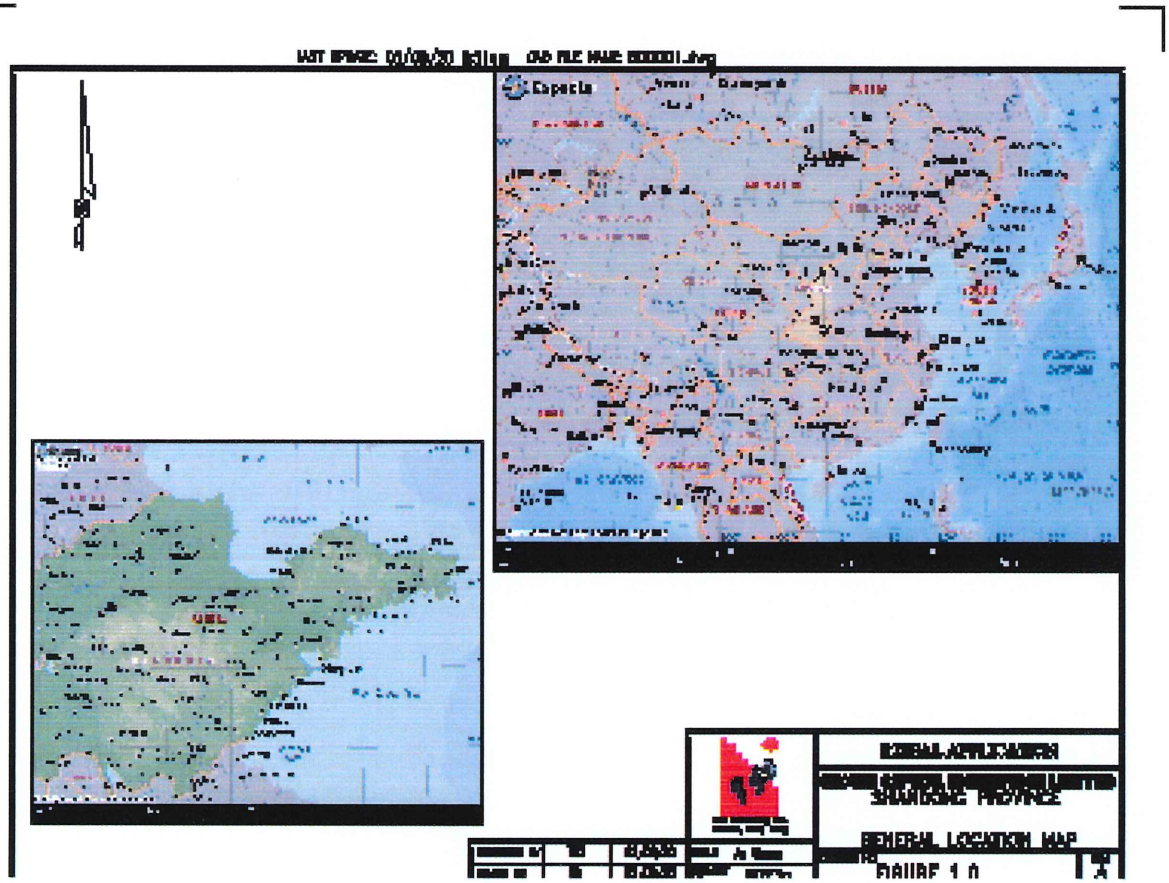
November 2003

1.0 INTRODUCTION

Crown Capital Enterprise Limited of Hong Kong entered into an arrangement with the Ludong Expressway Management Company of ShanDong Province, China in November 2003. This arrangement calls for the analysis of the performance of RJSeal™, a sealer/rejuvenator for asphalt pavement on highways within ShanDong Province.

ShanDong Province straddles the Yellow River (HuangHe) at it's confluence with the Sea of Bohai. ShanDong is bordered by Henan, Hebei and JiangSu Provinces. ShanDong has seen a major growth in the highway system, due to a government drive to build national highways linking ShanDong with major cities in the adjoining provinces. PingDu, lies approximately 70 kilometres north of QingDao, approximately 100 kilometres north east of Jinan, the capital city of ShanDong and also south of the Sea of Bohai. The present population of PingDu is estimated at approximately 300,000. See figure 1.0 for a map showing the location of PingDu and ShanDong. The majority of the area lies at 50 to 60 metres in elevation, on the extensive plain that borders the Sea of Bohai and the East China Sea. The regions' latitude (37 degrees north), mean that there are four seasons, with temperatures ranging from 45 Celsius in the long, hot summer to minus 5 Celsius in the short winter. Their is no rainy season per-se, just thunderstorms and these occur primarily in June thru August, but can extend into September.

In the immediate PingDu area there are small hills, with exposures of a weakly cemented fine grained sandstone. However to the south of PingDu, on the vast plain that lies astraddle the Yellow River, there are no opportunities to see the bedrock. The asphalt in the area is manufactured from imported materials, which is comprised of crushed and screened sandstone and diorites hauled in from quarries near WeiHai in ShanDong Province, as well as washed gravels from the various rivers. The bitumen binder for the asphalt is sourced from various locations. Since ShanDong Province has it's own indigenous oil fields and petroleum refining capacity, there is some domestic asphalt production. Shandong Province also borders the East China Sea, so the possibility of bitumen being sourced from offshore is a distinct possibility so refineries in Singapore and the like should not be forgotten.


Expedia
SHANGANI PROVINCE
GENERAL LOCATION MAP
FIGURE 1.0

2.0 CO-OPERATIVE PROGRAM

The intent of the contract with the Ludong Expressway Management Company was to apply RJSeal™ at six different bridges located near PingDu. The RJSeal™ application will subsequently allow analysis of the performance of RJSeal™ on these bridge decks. This follows an earlier trial application of RJSeal™ that was undertaken on a bridge deck on the Wei-Lai Expressway, some 35 kilometres north-east of the City of Weifang (south-east of PingDu) in June 2002. That bridge deck had an asphalt overlay of 1998 vintage. The surface of the bridge decks was quite porous and concern has been expressed about water percolating through the asphalt pavement and causing corrosion and exacerbating maintenance problems with the concrete superstructure of the bridges on this expressway. Furthermore, there were concerns that asphalt pavement which has a low bitumen content, will suffer an abbreviated life and interest was expressed in having the life extended.

3.0 RJSEAL™

RJSeal™ is a proprietary product that is supplied by Crown Capital Enterprise Limited of Wanchai, Hong Kong. RJSeal™ has been proven in numerous applications in North and South America to rejuvenate asphalt pavement at various stages of its life and economically extend the life of the pavement. RJSeal™ is a three component, asphalt sealer rejuvenator that is comprised of Coal Tar, Coal Tar Oils and Petroleum Solvents.

3.1 PRIOR EXPERIENCE

Refer to Appendix A for a copy of the brochure this outlines the experience with RJSeal™ at various locations in North America and South America. Further information is available from Crown Capital Enterprise Limited. RJSeal™ has been used at numerous airports in North and South America, as well as highways in Alberta, Canada; Cearo State, Brazil and North Dakota and Texas, as well as other locations in the U.S.A. Since 2000, RJSeal™ has been demonstrated successfully at over thirty one (31) locations in China and eleven (11) commercial-scale applications have taken place at various locations, including Shanghai, DaQing and Kunming.

4.0 TEST PROGRAM

Since ShanDong Province is located in a semi-tropical climate (Latitude: 35 to 37 degrees North) at a low altitude (10 to 100 metres), it's a demanding setting for asphalt, given the year round warm climate (extremes of 45 Celsius in summer and minus 5 Celsius in the winter) and intense exposure to ultraviolet radiation, all which contribute to the oxidation and breakdown of the asphalt binder.

ShanDong has the greatest concentration of highways in China, with some 26,000 kms of National and Provincial highway.The Ludong Expressway Management Company is responsible for administering a portion of the Wei-Lai Expressway which stretches 140 kilometres from WeiFang to LaiYun. The owner of the Expressway is the ShanDong Provincial Expressway.

In view of this extensive network of roads and the relatively short life of the asphalt surface, ShanDong is definitely interested in determining how to economically extend the life of the asphalt road surface. To this end, the Ludong Expressway Management Company Limited contracted to apply RJSeal™ on six (6) bridges on the Wei-Lai Expressway, nearby the city of PingDu. See Figure 4.0, showing the location of this Expressway with respect to PingDu and ShanDong

This followed a year long trial with RJSeal™ initiated in June 2002, on the inside lane of the southbound segment of the Jiao Lai He Bridge at Kilometre 42+109.5 of the Wei-Lai Expressway. This demonstration strip was located at the following geographic location:

Table 4.1		**Jiao Lai He Bridge Demo**	
Location	**System**	**Northing**	**Easting**
East End of Test Strip	Geographic (deg, min)	36^0 44.959'	119^0 29.070'
	Universal Transverse Mercator Grid (metres) 50S	4069957	0721805
West End of Test Strip	Geographic (deg, min)	36^0 44.957'	119^0 28.984'
	Universal Transverse Mercator Grid (metres) 50S	4069950	0721679

See Figure No 4.1 for a photo showing the demonstration strip as implemented in June 2002. Particulars of the demonstration strip follow.

Table 4.2				**Details on RJSeal™ Demo Section on Jiao Lai he Bridge – Wei-Lai Expressway, 2002**					
Work Time (hrs)	No. of Panels	Test Length (m)	Total Area m^2	Total Area yd^2	RJSeal™ Applied		Application Rate		
					US gals	litres	US Gal /yd^2	m^2 /Litre	m^2 /Kg
1.42	17	119.0	541	647	85	321	0.131	1.69	1.53
0.08	1	3.1	14	17	5	19	0.293	0.76	0.69
1.50	18	122.1	556	664	90	340	0.135	1.63	1.9

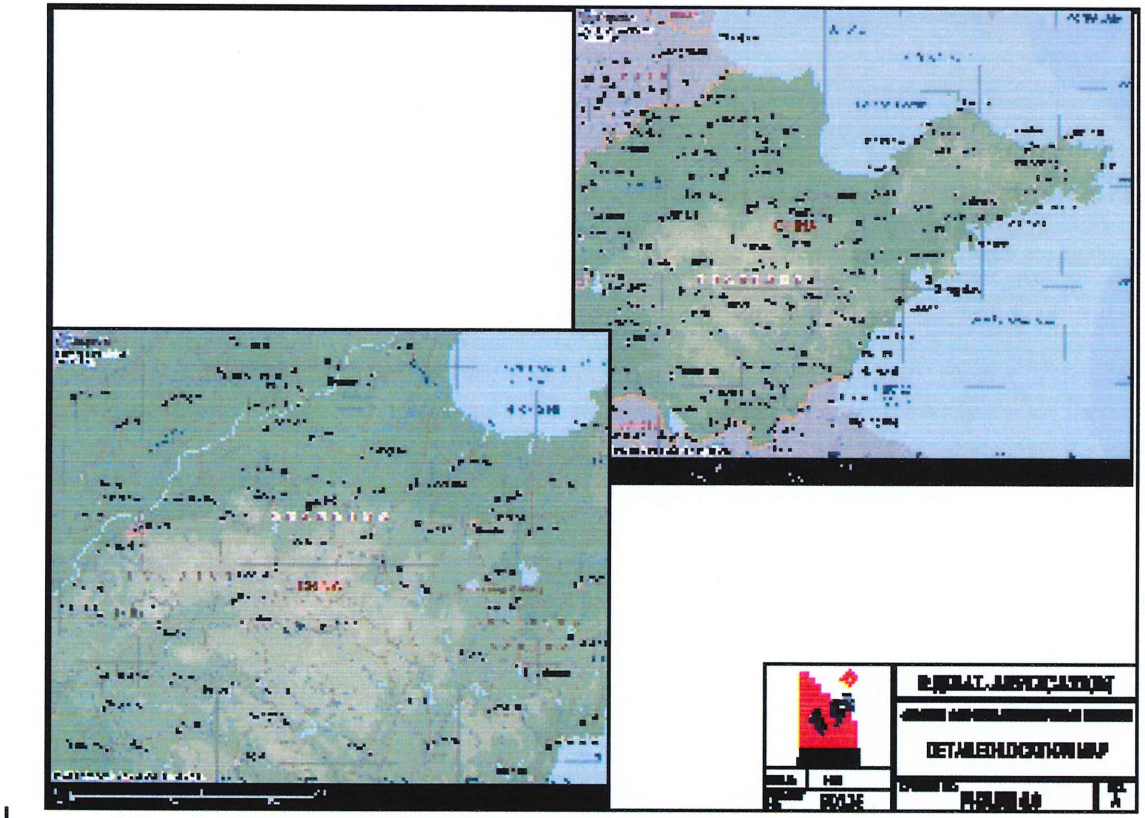


Figure 4.1 June 2002, Demo Strip
Jiao Lai He Bridge

Subsequent inspection of the 122.5 metre long, demo strip on October 18, 2003 showed that the demonstration strip was performing very well. Concern had previously been expressed about water percolating thru the asphalt pavement and causing damage to the underlying concrete bridge deck, thru corrosion of the rebar. However these fears were allayed following successful application of RJSeal™

The application of RJSeal™ on six (6) bridge decks on the Wei-Lai Expressway was contracted by the Ludong Expressway Management Company following competitive bids that were submitted in late-October 2003. The six bridges are geographically located as follows:

Table 4.3		**Location of Application Sites**		
Bridge Name	**Hwy Km marker**	**System**	**North end of Bridge**	
			Northing	**Easting**
	70+040	Geographic (deg, min)	36^0 47.882'	119^0 50.079'
		Universal Transverse Mercator Grid (metres) 50S	4076233	0752912
	75+694	Geographic (deg, min)	36^0 48.554'	119^0 53.730'
		Universal Transverse Mercator Grid (metres) 50S	4077637	0758305
	96+560	Geographic (deg, min)	36^0 48.609'	120^0 07.650'
		Universal Transverse Mercator Grid (metres) 51S	4077676	0243752
	110+600	Geographic (deg, min)	36^0 50.639'	120^0 16.365'
		Universal Transverse Mercator Grid (metres) 51S	4081052	0256819
	128+472	Geographic (deg, min)	36^0	120^0
		Universal Transverse Mercator Grid (metres) 51S		
	136+220	Geographic (deg, min)	36^0	120^0
		Universal Transverse Mercator Grid (metres) 51S		

Work commenced on the Application section at 10:00 am on November 3, on a breezy, mid-Autumn sunny day, where the mid-day temperature reached 21 Celsius. This was the first sunny day, following a lengthy extended rainy period. The asphalt surface on the six bridge decks treated, was reputedly 1998 vintage. No significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. The asphalt pavement surface was not appreciably worn. There was some minor aging and

oxidation of the bitumen, which extended to a depth of several millimetres. There were no longitudinal cracks and no lateral cracks.

Details of the application by the "A" Team are summarized in the table that follows:

Table 4.4A			**Details on RJSeal™ Application Section on Wei-Lai Expressway**							
Work Schedule	Work Time (hrs)	Test Length (m)	Total Area m^2	Total Area yd^2	RJSeal™ Applied			Application Rate		
					US gals	litres	Kgs	US Gal /yd^2	m^2 /Litre	m^2/Kg
Nov 3, 03	5	111	2664	3184	247	933	971	0.078	2.85	2.74
Nov 4, 03	5	200	4800	5738	238	900	936	0.041	5.33	5.13
Nov 4, 03	2.5	300	4900	5857	291	1100	1144	0.050	4.45	4.28
Nov 5, 03	8	400	12050	14404	608	2300	2392	0.042	5.24	5.04
Totals	20.5	1,011	24413	29183	1384	5233	5443	0.047	4.66	4.49

Details of the application by the "B" Team are summarized in the table that follows:

Table 4.4B			**Details on RJSeal™ Application Section on Wei-Lai Expressway**							
Work Schedule	Work Time (hrs)	Test Length (m)	Total Area m^2	Total Area yd^2	RJSeal™ Applied			Application Rate		
					US gals	litres	Kgs	US Gal /yd^2	m^2 /Litre	m^2/Kg
Nov 5, 03	11	231	5778	6906	317	1200	1248	0.046	4.81	4.63
Nov 6, 03	5	156	3903	4665	212	800	832	0.045	4.88	4.69
Totals	16	1,011	9680	11571	529	2000	2080	0.046	4.84	4.65

Ambient temperatures at the time of the application were in the 12 to 24 degree Celsius range, with humidity in the 45% range.
Photos showing the test application of RJSeal™ follow in figures 4.2 and 4.3. on the following pages.

The site was visited on November 6 around 10:20 pm. A screwdriver was used to dig two small holes in the asphalt pavement, to a depth of 3 centimetres, to determine the penetration of the RJSeal™. This was one to three days after the application of RJSeal™ and at these two locations the newly rejuvenated surface was evident, by the black resilient surface layer, which was now approximately 1 millimetre thick. Below that depth, the grey, oxidized layer of asphalt was evident. No carryover of the RJSeal™ was observed from vehicle tires at the end of the Application, so it can be presumed that the surface was dry when the site was vacated.

Figure 4.2 Typical Application Procedure.

Figure 4.3 Finished Surface.

Figure 4.4 Site Inspection

4.1 RJSeal™ Testing

To date the comparison of the asphalt treated with RJSeal™ has been compared on a very short period at the test site on Wei-Lai Expressway. The Shandong Highway Research Department will bring additional testing equipment, for comparison on a more disciplined, objective basis and to this end, the following tests will be undertaken.

- Sand Patch Test
- British Pendulum Test
- Water Infusion Test.

These will be reported separately in a report compiled by the Shandong Highway Research Department. See Figure 4.4 that follows, showing the testing equipment utilized by the Shandong Highway Research Department on the June 2002 RJSeal Demo.

Figure 4.5 British pendulum Test (top)
Sand Patch Test (lower left)
Water Infusion Test (lower right)

4.2 Water Dissipation

An "Outflow Meter" manufactured in the U.S.A. by Humble Equipment Company of Ruston, Louisiana and sold under the trademark "Outflow Meter" (see figure 4.5) will also be used to measure the asphalt pavement's capability to dissipate water, as concern has been expressed about hydroplaning on the RJSeal™ treated surface, versus the untreated surface. The Outflow Meter gives readings in seconds for the dissipation of a known quantity of water. It is suggested that any readings between 3 and 10 seconds are satisfactory results for an asphalt surface, if hydroplaning is to be minimized. Readings will be taken with this aforesaid Outflow Meter at several locations on the bridges that had RJSeal™ applied.

4.3 Fuel Resistance Comparison

Fuel Resistance Comparison will be undertaken on several sections of the untreated and RJSeal™ treated sections in close proximity to the Outflow meter tests in the near future. This comparison will consist of pouring about a cupful of diesel fuel onto the road surface and then later checking the penetration of the fuel. If the fuel readily penetrated the asphalt pavement surface, then resistance to this form of chemical attack was presumed to be lower than if the fuel pooled on the surface of the asphalt pavement and slowly evaporated.

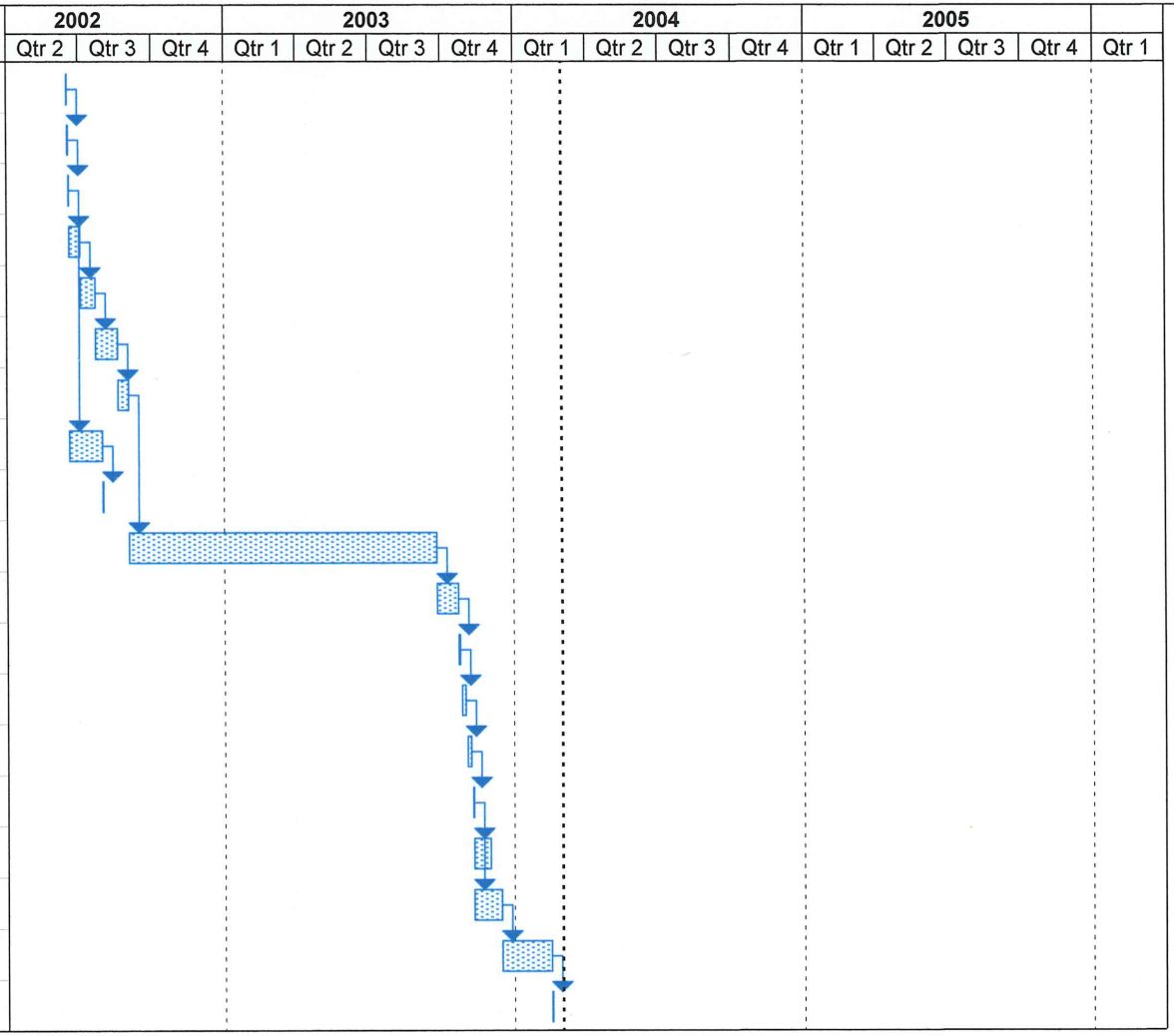
4.4 Elasticity/Ductility Testing

This aspect of the testing is beyond the capabilities of the field equipment available to both Crown Capital Enterprise Limited and RJSeal™ personnel and as such, external assistance has been sought from outside experts in the field of Asphalt Testing.

5.0 Test Completion Schedule

The team of technicians from the Hong Kong office will be dispatched to undertake further testing on the trial section in the near future. The projected completion of this testing is scheduled as shown in the following chart.

ID	Task Name	Duration
1	Travel to WeiFang	1d
2	Demonstration Section - Wei-LaiHighway	1d
3	Testing of Asphalt Surface on Wei-Lai Hwy	1d
4	Prepare draft report on RejuvaSeal Demo and Testing	10d
5	Hiatus	15d
6	Prepare final report	20d
7	Hiatus	10d
8	Shandong Highway Research Dept. work in progress	32d
9	Submittal of Research Dept report	1d
10	Hiatus	278d
11	Prepare Bid Document for Bridge Decks	19d
12	Award of Contract	2d
13	Mobilize Equipment	5d
14	Application of RJSeal on Bridge Decks (6)	5d
15	Demobilize	1d
16	Prepare report on Bridge Decks	15d
17	Hiatus	25d
18	Shandong Highway Research Dept. work in progress	45d
19	Submittal of Research Dept report	1d



Project: Wei-Lai Highway Bridges sch
Date: Mon 3/1/04

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

6.0 Qualifications

STATEMENT OF QUALIFICATIONS

I, Anthony G. Speed of Hong Kong in the Special Administrative Region of China, DO HEREBY CERTIFY.

I. THAT I am a Consulting Engineer, with offices at 2/F, 81 Po Wah Yuen, Lamma Island, Hong Kong

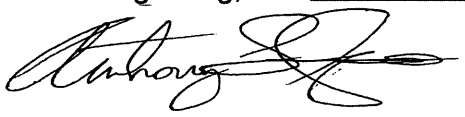
II. THAT I am a 1968 graduate of the University of Saskatchewan, Canada with a Bachelor of Science Degree in Mining Engineering.

III. THAT I am currently registered and in good standing as a Professional Engineer with the Association of Professional Engineers of Ontario, and New Brunswick, Canada

IV. THAT my 30 years of continuous experience in mining, major civil engineering works (earth moving, highway and mining construction) has exposed me to a broad knowledge of mining and heavy civil engineering construction and allowed considerable familiarization with road construction and asphalt pavement.

V. THAT this report is based on my visit on October 18 and 19, as well as November 1-7, 2003 to PingDu in ShanDong Province, China to view the test section, described in this report

Dated at Hong Kong, this _____day of December, 2003



_____

Anthony G. Speed, P.Eng. (Ontario and New Brunswick, Canada)

CROWN CAPITAL ENTERPRISE LIMITED

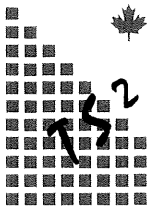
WANCHAI, HONG KONG

Application of RJSeal™
Wei-Lai Expressway, PingDu, ShanDong, Peoples Republic of China

November 2003

APPENDICES

No.	Description
A	RJSeal™ Descriptive Literature
B	Desco D200 Sprayer - Specifications



TS² Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Application of RJSeal™
Wei-Lai Expressway, PingDu, ShanDong, Peoples Republic of China

November 2003

Appendix A

RJSeal™ Descriptive Literature

TS^2 Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Application of RJSeal™
Wei-Lai Expressway, PingDu, ShanDong, Peoples Republic of China

November 2003

Appendix B

Desco D200 Sprayer Specifications

TS^2 Consulting Inc.
Lamma, Hong Kong