My Professional Career

Part 2 – (1972 - 1977) – South Africa

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Once again, this continuation of "what I did before coming to Canada" is dedicated to those who over the years, but particularly in Arizona, asked me to write it all down, and to those to whom the details of how work in various sub-disciplines of civil engineering was done, is not much known.

I believe to have succeeded to be "not too technical", "not too long-winded", "not too boring" and "not exulting my own work" in these pages. Many professionals could have written a similar and even more interesting yarn, on a different, more important and more financially rewarding career. The point is that they did and do not, and I do. So please enjoy the read.

MY PROFESSIONAL CAREER – Part 2 – (1972 - 1977) – South Africa.

INTRODUCTION AND ACKNOWLEDGEMENT (for Part 2).

It is perhaps fitting to start this "Part 2" quoting a **definition of engineering as a vocation**. I found the following recently in an enlightening (and quite funny) book called "Dow's Dictionary of Railway Quotations", by Andrew Dow, Head of the National Railway Museum in York (England) since 1992. The back of this softcover book shows ISBN-13: 978-0-8018-9272-1, and it was published in 2006 by The Johns Hopkins University Press, Baltimore Maryland, USA. Quotation 215.12, on page 59, states:

> **It would be well if engineering were less generally thought of, and even defined, as the art of constructing. In a certain important sense it is rather the art of not constructing, or, to define it rudely but not inaptly, it is the art of doing that well with one dollar, which any bungler can do with two after a fashion.**
>
> (*A M Wellington*, The Economic Theory of the Location of Railways, 1903.)

My reasons for showing this will be evident to you, dear reader, when understanding what happened after completing the first six years of my career. I became gradually and irreversibly involved (and then even responsible) for making decisions on "**alternative ways to get from A to B**", (not just about "road situations" but also about "utilities" and "methods of getting things done"), instead of just doing detail design of a route or system that had already been defined before, by others. This was challenging, and obviously leads to thinking about the topics of "transportation planning" vs. "transportation engineering". There is a link to the above quote in Chapter 3, which I realized as I typed these words. "Wellington" must have been a very good (text)book.

Chapter 1 – Continuing with Mackintosh, Bergh & Sturgess, Bloemfontein (1972-73).

Toward the end of "Part 1" of these work memoirs, I related how on completion of a road construction project, (P 30/1, Koppies to Sasolburg, OFS), I was to continue working for MB&S in Bloemfontein. I was allowed to spend March 1972 in the Pretoria office, for various reasons that all seemed to complement each other. I firmly believe that this situation worked out to the mutual benefit of our family and the firm. I was very busy preparing a set of "red-line" prints of all the drawings of the completed construction project. I had to prepare lists of all Variation Orders and Change Orders. The penultimate[1] payment certificate to D&M Padaanleg (Edms.) (Bpk.) had already been signed and sent off to Bloemfontein. Lydia and I, with three children, (Theo, Plonia, and three-week old Sara) vacated the D&M rented house at 19 Collins Crescent, Sasolburg, and I left Louis van Wyk and John Robertson in the office in the farmhouse just off the gravel road to Deneysville. Among the boxes of documentation, many other loose ends had to be sorted out and submitted to the OFS Provincial Roads Department in early April.

I was also asked to liaise with the Pretoria surveying firm that had almost completed the aerial mapping of the proposed road between the Tweeling and Reitz, in the eastern OFS, along an already approved alignment, based on the Route Location Study that had been prepared by Mr. John Woodcock in the Bloemfontein office. I was asked to bring all the air photos, mylars and field books of the ground control

[1] This was called the Completion Payment Certificate, of which the first page is included in "Part 1". Like all other construction projects in South Africa, there was a 12 months retention ("holdback) period of 2.5% of final payment; an amount of **R 47 471-21** was to be paid to D&M after investigations and completion of possible repair work. (I discovered later that in Arizona, no holdback clause exists; an Owner has no recourse after completion of "works".)

survey with me to Bloemfontein, and had an occasion or two to visit the survey firm on Du Toit Street, also seeing the ink plotting of the photogrammetry in action. In Bloemfontein, this would become my major design project. Another spin-off was that I met the Pretoria office staff, with some new colleagues. I already knew Mr. Adrian Bergh and Mr. Bert Jager in 1968 and 1969, from the Eloff's Cutting project. Bert, a Dutch HTS'er who had obtained PrEng status, was no longer working at MB&S in early 1972. I believe he then worked for VKE, supervising the freeway construction project to Witbank, together with Mr. Jack Fasken PrEng. I met Mike Burgess (about 3 years my senior), Colin Louw (a fairly new graduate from Tukkies) and also Henk Kaal and Hector McKay, both studying and perhaps in the same boat that I had been in 1964 and 1965. The latter was called Pikkie, and I guess some of these guys may have done vacation work at MB&S or had even had scholarships from the firm. Mr. Bergh was their mentor. I do not remember if Mr. C.S. Mackintosh was still active in the firm at that time, but prior to our move to Sasolburg, Lydia and I had met him during a Christmas party at Mr. Bergh's house. And if I am not mistaken, I also met Mr. Roy Redshaw in the office; I later liaised with him about the Lot 91 Roseville subdivision, while he was in the Cape Town office of the firm (which did not yet exist in 1972).

The office was in **City House**, a building above the arcade between the (E-W) Church Street and Pretorius Street and the (N-S) Andries Street and Van der Walt Street, above Uniewinkels (clothing, particularly school uniforms) and the Universitas bookstore. The downtown of Pretoria was full of such arcades: Stores on the ground floor and perhaps six or eight office floors above, quite unlike malls in North America, although the concept is used in European cities, and even in downtown Santiago, Chile. The offices faced north, in the middle of the street block. I knew this suite from my interview with Mr. Bergh and Mr. Sturgess in November 1969. I used an office that had been used for storage, but did not mind, as I was only there for a few weeks. I think that Mrs. Procos was already Mr. Bergh's secretary.

I also had an opportunity to visit the firm's Soils Lab, which was located in Pretoria-West (just like the one of B.S. Bergman and Partners where I had spent some time in early 1966). This laboratory was in an old house on ¼ of a "burgher-erf" at 23 Rose-Etta Street, west facing, close to the Pretoria Municipal Power Station. Construction of a 4-story office and lab building had just been started, with footings and columns on the side lot lines, so that the existing lab operations were not much affected, although somehow when columns would be built right inside the house. I recall the place as quite messy with all the canvas sample bags lying around in various rooms, with holes just outside the house where rebar stuck out. Structural design and project management was by Mike Burgess (= in-house), which I found cute.

Mr. Martin Bensch was in charge at the Soils Lab. I had heard about him from both Louis van Wyk and Basie Lombard. Martin was their actual supervisor, but they reported to Mr. Sturgess when in the OFS, where the firm did not have a soils lab. Prior to starting the firm, Mr. Mackintosh and Mr. Bergh had both been "material engineers" with the Transvaal Provincial Administration, and I would not be surprised to learn that Martin Bensch had also been a TPA employee. In order to be considered for a project, consulting engineering firms in Transvaal had to have their own soils lab, (there may already have been about ten such labs in Pretoria at the time), and the Provincial lab did mostly spot checks on work by consultants. The OFS had no such requirement at the time; it had a Provincial Soils Lab in Bloemfontein.

The distance from Lydia's parents' farm at Bokfontein, west of Hartebeespoort Dam, just south of the road to Rustenburg, was about 40 km, and I commuted daily with my truck that month. Johanna, a trusted Swazi woman (wife of John, Lydia's father's very tall Nyassa farm labourer) assisted Lydia with the housework, and also Liesbeth, their daughter. Their sons Samson and Wilson played with our Theo (3) and Plonia (2). This black family lived in a mud house near the original (east) farm entrance, where John had been doing business as a tailor when Lydia's parents bought the farm around 1957. Lydia's dad had closed off that driveway when opening one along the west property line, with a power line. The property contained 1200 citrus trees on the front part, and bush on the remainder. Only a few years later, it became

hazardous for white people, particularly women with children, to stay on a farm, but in 1972, we thought nothing strange of it. Lydia's parents sold the farm around 1975 to someone from Komatipoort, near the Moçambique border, who had sold his farm there when it was bought out by the Government for a (Swazi?) homeland. Not much later, many white people were killed on the farms all over the country.

By the end of March 1972, we moved from the farm to Bloemfontein with two vehicles, our black Mercedes 280S with Brits license plates, TAZ 15432[2] and our Mazda 1600 pick-up truck with Sasolburg licence plates, OIL 3515, carrying the fridge and all the paperwork for completed and proposed projects. Our belongings, from Transvaal Cartage's storage somewhere in Vereeniging, were taken to our house at 5 Clarens Street, Bayswater, Bloemfontein, where we moved in, and I started to work in the downtown.

The Bloemfontein office of MB&S was a corner suite on the southeast corner of St. Andrews Street and Aliwal Street, two blocks north of Bloemspruit, an east-west concrete channelized creek through the downtown from west to east, parallel to the street layout. Colonel Charles Warden had named the city after this stream in 1846, during the time of the Orange River Sovereignty. I cannot remember on what floor we were, but it was not as high as my former offices in Pretoria. When the windows were open, it was quite noisy and smelled like diesel smoke (from the street below), and there was no air conditioning, only electric heat. Mr. Sturgess occupied the corner office, and south of his was the reception area where Miss Flo van Heerden, the miniscule petite spinster lady who "ran the office" with an iron fist, reigned. She was receptionist, typist, office supply organizer, petty cash manager, payroll organizer, etc., etc., and knew almost everything about everybody's projects. South of her office was that of Theo Hoffmann, the civil and structural (bridge) engineer, and then Mr. John Woodcock's office. Next to that was the office of the clerk-of-works Mr. Ron Moodie[3], who supervised a variety of Public Works projects for improvements at school, hospital and jails sites, as well as the University of the Orange Free State (UOFS) or even work in municipalities outside Bloemfontein. A young draughtsman, Attie Badenhorst, was hired that year for those projects; he came from the SAR. The firm was clearly starting to diversify with "highway" and "municipal" divisions, just like the Pretoria office, though Mr. Sturgess had been a provincial roads engineer before he joined Mr. Mackintosh and Mr. Bergh (in a year that I do not know).[4]

East of Mr. Sturgess' corner office, connecting to Miss Flo's and the hallway, was a row of three interlinked offices; the first one was occupied by Melt Slabber, a SAR trained manual draughtsman, whose father, a retired SAR structural draughtsman[5], also worked for the firm on an occasional basis. Melt and his young family lived on a cul-de-sac, in the area directly south of the Bloemfontein White Horse on Naval Hill (Noordhoek). When we moved to Schoemansville less than a year and a half later, we met his older brother Johan Slabber there, who was a Research Scientist at Pelindaba, the South African Nuclear Research Institute and had studied in the USA and worked at Oak Ridge, TN. Melt was the "expert operator" on the Olivetti computer in the office; Theo Hoffmann had taught him. This Italian system (currently almost certainly an extremely obsolete dinosaur) supposedly worked with thin plastic cards, but it was quite cranky in dusty and dry weather (and we had a lot of that in Bloemfontein).

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[2] People asked: "Can't you count, Jacob: 12345?" Fifteen months later, we moved to Schoemansville, district Brits!

[3] He had already worked with Louis van Wyk, while supervising the Koppies railway overpass project in 1967/68.

[4] I later heard that one of the firm's first roads projects in the OFS had been the design (and construction supervision?) of the west side of Botha's Pass, then called S 16, between the Natal border and the Town of Memel. I do not know if this particular project had been designed in Bloemfontein or Pretoria (where the soils lab was.)

[5] Bloemfontein had an extensive SAR office complex. It was the hub for the OFS, and there were many railway workers, most of them in railway housing. This was once explained in a SAICE lunchtime presentation by a Senior Lecturer in Geography at UOVS, who discussed "The Historical Geography of the development of Bloemfontein", which was much influenced by e.g. the closure of a railway to the Tempe Military Base. That railway line had been the west city boundary. When the railway line closed down, its "right-of-way" was sold to the City, and lots were then developed. The rear property line of Mr. Moodie's house was actually that old railway line right of way limit.

In the next office was Willy Beerli (a Swiss technician/draughtsman) who hailed from a town that every engineer and land surveyor knew as the place where good equipment was made - WILD HEERBRUG was clearly spelled out on every level and theodolite. He was still learning Afrikaans, which sometimes lead to some hilarious discussions. From him, I heard the quaint saying "**The top of a bottle is always at the top.**" (about bureaucracy!) He was still required to do some military service in Switzerland, as Swiss citizens do not become exempt when leaving the country. A Mrs. Claus (a German immigrant lady) was also working with Willi for a while. Her father-in-law (and yes, I once asked if her husband's name might perhaps be Santa) had been an employee of Adam Opel AG during the late 1920's, receiving three General Motors shares when that US firm bought the German automobile company. His three children had later each inherited a single GM share. So even in South Africa, the Claus family regularly received GM dividends, plus a thick Quarterly Report every 3 month, being a complete catalogue, with details and colour photos of all current GM products, of all the various divisions and industries over the whole world! She was good in her work, as far as I could determine. To her, I once had to explain the difference between "**roads**" and "**streets**", seeing that the German noun "Strassen" does not distinguish between **urban streets** – with kerbs and gutters, to collect stormwater with catchbasins and pipes, - and **rural roads**, that have shoulders, from which stormwater runs down the sideslopes and crosses the road with culverts, restoring sheet flow conditions where possible. She was also draughting for the municipal and site work projects, and understood my explanation. In Arizona, the terms "urban, "fringe urban" and "rural" are normally used from a State Agency's point of view, but even then, there (and elsewhere) one may have "urban cross-sections" and "rural cross-sections" in both "urban" and "rural" environments.

TABLE 1

Relative costs of construction of some different types of surface treatment (in the Transvaal)

TYPE OF SURFACE TREATMENT			RELATIVE COST/ m²
Single surface treatment		150/200 pen bitumen + 13 mm stone	1.0
Double surface treatment	1	45/50* EVT tar + 19 mm stone + 150/200 pen bitumen + 10 mm stone	2.1
	2	45/50* EVT tar + 13 mm stone + 150/200 pen bitumen + 7 mm stone	1.7
	3	Same as 2, but with addition of bitumen emulsion fog spray	1.9
	4	45/50* EVT tar + 10 mm stone + 150/200 pen bitumen + sand	1.5
	5	bitumen emulsion + 13 mm stone + bitumen emulsion seal coat + one coat of slurry	2.4
Triple surface treatment	1	45/50* EVT tar + 19 mm stone + 45/50* EVT tar + 10 mm stone + 150/200 pen bitumen + 7 mm stone + bitumen emulsion fog spray	2.5
	2	45/50* EVT tar + 19 mm stone + bitumen emulsion seal coat + two coats of slurry	2.7

SUITABILITY FOR MAINTENANCE

All the types of surface treatment given above will normally lend themselves to simple maintenance techniques, such as resealing or slurry sealing. Treatments with a fine surface texture where the aggregate is beginning to ravel lend themselves to spraying with diluted bitumen emulsion* which can cost as little as 3 cents/m². If this is done before the surfacing starts to disintegrate, the life of the surfacing can be prolonged considerably.

* Usually stable mix grade 55 anionic bitumen emulsion diluted with 50 per cent water. The pH of the water used for dilution should lie between 4 and 8. At this pH range the water will not have a harmful effect on the stability of the emulsion by causing it to break prematurely.

Surface Treatments
TRH 3, Pretoria, South Africa, 1971 15

The room next to Willy's was mine; not much different than the one at BSB&P that I had vacated more than four years earlier, although with vinyl tile floors and windows that opened to the north (sunny) side. Across the hallway from my office was a storage room, with a large ammonia printer. This room was also the base of the black messenger who was our tea boy. I believe I had no draughting table like the fancy ones Melt and Willi used. When I drew road prisms by hand on the cross-sections, I used a table, a marine ruler and a pencil.

After my arrival and settling in, I took all the paperwork to the OFS Roads Department. I must now add something that I forgot in "Part 1". During 1971, the NIRR had completed the first two brochures in their series of "Technical Recommendations for Highways", namely TRH 1 "Guide on prime coats, tack coats and temporary surfacings for the protection of bases", and TRH 3 "Bituminous surface treatments for newly constructed rural roads". Page 15 (at **left**) of TRH 3 shows the surface treatment on OFS Contract No. 1/1968 as a **Triple Surface Treatment**. Mr. N. van der Walt PrEng was on the Steering Committee that had overseen both TRH 1 and TRH 3, on behalf of the Roads Department, OFS Provincial Administration. Rhodesia and South West Africa were also represented at that committee level.

Here follows a copy of part of the (blank) page 4 of the Payment Certificate for Contract No. 1/1968.

Item	Description	To Scheduled	Unit
7	Brought Forward		
7.	SHOULDERS :		
7.1	Borrow to shoulders	29,443	cu. yd.
7.2	Extra over 7.1 for stabilising with 114 lbs. per cu. yd. of road lime	2,700	cu. yd.
7.3	Overhaul on item 7.1 above	34,939	c.yd.mile
7.4	Extra over 7.1 for blasting (Provisional)		
7.5	Extra over item 7.1 for crushing (Provisional)		
7.6	Prime	750	galls.
7.7	Surfacing of shoulders	5,280	sq. yd.
8.	BASE COURSE :		
8.1	Crusher run base course (no overhaul will be paid on this item)	74,341	cu. yd.
8.2	Natural gravel base course	rate only	
8.3	Extra over item 8.2 for stabilising with 140 lbs. road lime per cu.yd. of base course	rate only	
8.4	Overhaul on item 8.2 above	rate only	
8.5	Variation in road lime stabilising agent	rate only	
8.6	Extra over item 8.2 for :		
	a) crushing (Prov)	rate only	
	b) blasting (Prov.)	rate only	
8.7	Alternative for item 8.3 using P.B.F.C. as stabilising agent	rate only	
8.8	Variation in P.B.F.C. stabilising agent	rate only	
9.	PRIMECOAT AS SPECIFIED :		
9.1	a) Using Road tar RTH 10/15 P	82,404	galls.
9.2	b) Alternative - using cutback bitumen MCO	rate only	
10.	BITUMINOUS SURFACE (See section 135)		
10.1	Using bitumen in first application	rate only	
10.2	Using road tar in first application	405,000	sq. yd.
10.3	Variation in binder material :		
	a) Prepared from asphaltic bitumen	rate only	
	b) Prepared from road tar	rate only	
10.4	Variation in aggregate :		
	a) -¾" + ⅜" chips	rate only	
	b) ½" nominal chips	rate only	
	c) -½" + 1/8" chips	rate only	
11.	TRAFFIC MARKINGS :		
11.1	a) 4" wide white	29,106	lin. yd.
	b) 4" wide yellow	3,600	lin. yd.
11.2	Painting kerbs, letters, numbers and/or figures :		
	a) white (Prov.)	500	sq. ft.
	b) yellow (Prov.)	rate only	
11.3	Repainting as specified :		
	a) 4" wide white	29,106	lin. yd.
	b) 4" wide yellow	3,600	lin. yd.
	Carried forward		

(The column with units is added because my scanner cannot scan the wide original.)

So Melt, Willy and I started designing the Tweeling-Reitz road.[6] Its actual starting point (north project limit) was about 5 kilometres north of the Village of Tweeling, where the alignment departed from an existing project that was already "under construction", starting at Frankfort, by a Provincial construction crew. MB&S's road location study had finalized continuing this route as a bypass east of Tweeling, in order to eliminate two existing level railway crossings, one in town and one just north of town, and to eliminate a number of Secondary and Tertiary roads. Tweeling would be served with one main access road: the east extension of 11th Street. The idea behind the road location study had been to find a route that would optimize the use of fuel for a certain "design volume", "design year" and "design speed", by a normal automobile, based on attainable grades and lengths along a few alternative routes. There had been some alternatives that used much more of the existing road system, but these **(1)** would have run straight through Tweeling, **(2)** would have kept the two level crossings in place (which was obviously not acceptable) and **(3)** would have followed a more westerly route, toward the Town of Reitz. Perhaps the idea of "better farm access and utilization" was also a parameter: This area had large cattle and sheep farms and also large tracts with maize and wheat. (The OFS Town of Bethlehem was named "house of bread" for a reason.) The south project limit was at an existing T-intersection, as follows:

Near the Town of Reitz, (a Magistrate Seat, more substantial than Tweeling), the route veered to the west, as a "western bypass" of town, until ending (as the south project limit) at the existing road south toward Bethlehem. Between Reitz and Bethlehem, most of the railway line was east of this highway, called P 9 (the same number as used for the Coalbrook-Heilbron road, because it was the same route). West of Reitz, this P 9 had been extended during the 1960's and relocated from where it ran straight into Reitz from the south. When I was in Bethlehem for vacation work in the summer of 1962/3, there had been a concept to construct a "grade separation" northwest of Reitz. I was on a survey crew for a week at that site, driving from and back to Bethlehem every day. But that idea seems to have been shelved, and a T-intersection was built northwest of town after the P 9 to Petrus Steyn had been completed. On our honeymoon in March 1967, Lydia and I drove through that intersection on the way to Golden Gate. So that area was somehow familiar to me. The road from Tweeling would join at that T-intersection, rendering it into a four-way intersection. The road north from downtown Reitz was to be "deproclaimed".

The construction of "bypasses" to rural towns has been much debated, since (in North America) they were built for the Military and Interstate System. Many towns and cities, in many States, were originally and on purpose left out of the picture when in the late 1950's and 1960's, long stretches of Interstate were built in rural areas, supposing that connections to existing towns was to be initiated at a later date. "The most miles within in the shortest period" was almost the principle by which the 48 states competed with each other for federal funding from the Eisenhower administration. When that dialogue with towns and cities was eventually started, all the problems surfaced, which were eventually resolved with varying results, not always satisfactory. It even caused a US Supreme Court decision (about **"fundamental justice"**) to stop one State designing their Interstate Highway straight through one City's "poor areas" just because the land was cheaper there, so that existing poor land owners (and slum lords) could be bought

[6] This work obviously coincided with the work on the Clocolan project, see below.

out easier, though the alignment would slice those existing neighbourhoods in two. After that decision, much more "public involvement" came about, and this obviously made things even more difficult (and expensive). But the downtown cores of many cities have suffered urban decay from a (perceived or real) "lack of access", and as a logical result, commercial development at the Interchange(s) to the Bypass then took over, with Walmart and Costco and the like.

Giving an example, about a decade ago, the City of Medford Oregon (after half a century) still questioned why I-5 runs on a few mile long viaduct structure, almost through the downtown, with a variety of malls adjacent to the interchanges at either end (a huge Fred Meyer store at the east end, and the Rogue River Mall and others at the west end.) I also noticed this in Arizona with Williams and Holbrook on I-40, and in Nevada with Wells and other places on I-80. Some downtowns have basically died after a bypass was constructed. To a lesser extent, this has also happened in Western Canada, perhaps because it occurred more recently, and perhaps because "City fathers" and "City mothers" were a bit more astute in dealing with Provincial "authorities". None of this was known to me (and most others) in the early seventies; and by the way, was that my concern at all? – I was only to do the design of a rural provincial highway, correct? Clearly, I was "not to question why", as one sentence runs in "The Charge of the Light Brigade".

Halfway between Tweeling and Reitz, the approved route needed to cross the existing Reitz-Frankfort railway line, by an overpass of course (see "Part 1"). This bridge was at a minor skew, not as much as it would have been on any another location, as there are railway curves directly to the east and directly to the east. The single-track railway only needed a three-span bridge, like the one at Frankfort. A unique feature of this proposed bridge site was that the property line between the two farms (one east and one west of the track) was along its centre line, even along the curves. This may have been the OFS Surveyor General's decision, many years ago, when the railway line was built, (assuming that this "subdividing" took place when the railway line was planned). The railway line itself had no "right-of-way" as such[7], as one would call it in North America, only an "easement" over both farms.[8] This was the first time that I saw a curvilinear property line: I had been lead to believe that a property line **always** had to be straight. Only in Canada and the USA did I later see many "curvilinear" property lines, of large (= highway) and small (= street corner) extents. These days, of course, even spirals (when properly defined) are allowed for describing land limits. This is what one would call "progress" in the use of applied mathematics.

On my original visit to Frankfort, during the day-long field trip of December 1962, mentioned in "Part 1" and above, I had also seen construction of the railway overpass on the Frankfort-Villiers road, currently Road R 34, directly east of Frankfort, directly opposite the (current) huge Agri Frankfort silos. On that project, (a three-span bridge, including jack spans) the "Post Office", (known to all as the HPK/GPO) responsible for all telephone lines, had relocated their wires parallel to the railway line (under the jack span), but the SAR had been tardy with relocation their wires on the same poles. The supervisor of the Provincial bridge crew, who did not want to be delayed any longer, then brought a backhoe, raised and lowered the bucket, (as if by accident), thereby ripping out the lifeline to farmers, everybody else and the SAR as well. Obviously, this directly brought an installation crew to the site, on the very day I was there with Mr. T. van Niekerk, Engineer from the Bethlehem District Office. (I do not remember the outcome!)

Drainage wise, we developed ideas for culvert and box culvert locations. On GoogleMaps, one can see a "joint" two barrel box culvert, built directly south of the intersection with Road R 57, shared for use by adjacent farmers, just like the one that I had "site-located" on P 30/1 between Lissagally and Coalbrook. This must have already been built much earlier, so that "my idea" was definitely somebody else's as well!

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[7] Somewhat unusual, as this meant that the SAR&H did not "own" the land on which their railway line existed.

[8] Much later (in 2008), I discovered that the railway line though White Rock, BC, exists under a "lease" that lapsed in 2007, but the line is still in operation. In 1976, the Provincial Legislature in Victoria last discussed the situation!

The challenge was therefore to provide plan-profile drawings for the most economical design of Tweeling-Reitz, based on a specific design speed. Note that this was my first "metric" design project. We, meaning Willy, Melt and I, did this for the first two months or so, producing plan-profile sheets after an original profile on a roll of paper, and manually drawing cross-sections and calculating quantities as we went along. This was definitely "rolling" terrain; there were some long and steep grades. I seem to remember that the "maximum allowable grade" was used often (and I guess it was 5% but not 6%), with appropriate vertical crest and sag curves and k-values. These plan-profile sheets were then presented to the Roads Department, located at the H.F. Verwoerd Building a few blocks west of our office. This high-rise office tower accommodated various provincial departmental offices, with the statue of the former Prime Minister in front of the building.[9] Obviously, everybody just walked there. The Roads Department occupied a few floors, and the Provincial Lab was in Bloemfontein South, close to the District Office.[10]

Naas Rademeyer, Hydraulics 4S lab.

Comments on the proposed vertical alignment came to us from a quite unexpected direction. Mr. Sturgess and I were invited to come and discuss some specifics with a group of civil servants. On arrival, I recognized Naas (I.L.) Rademeyer PrEng, one of my former classmates, with whom I had conducted many experiments at UP over the years (e.g. in Hydraulics 4S in 1965). We had both graduated in March 1966[11]; I had not seen him since the ceremony in the Tortoise Hall, but he was Resident Engineer for the Provincial construction crew in that area, based in Frankfort.

It appeared that Naas had some problems with two long vertical crest curves that were shown on our drawings for the top of fairly long 5% inclines, over two "hills" in the area east of Tweeling. He wanted reduced lengths of these vertical curves. Why? This would reduce excavation quantities, he said, because the material in those excavations could not be used for the embankments close by (north and south), where valleys were crossed with box culverts for drainage and cattle and/or equipment. Using lower k-values would allow the road elevations over these hillsides to be "just above the existing ground level, with almost no embankment and no excavation". Yes, we understand that, Mr. Sturgess (and I) countered, but by building shorter vertical curves on these hills, with lower k-values, the design would not meet the (minimum) design requirement for the "design speed" for the road – which I recollect, was 100 km/h.[12] Moreover, a normal automobile (and

[9] I always wondered what specific connection Dr. Verwoerd would have had with the Orange Free State (or with Bloemfontein in particular): He never lived there; he never worked there; he only became Leader of the National Party (and Prime Minister) in 1958, and was assassinated in 1967. It was perhaps because he had realized the long held wish of Free Staters to restore their former "Model Republic". This is now called the Fidel Castro Building (!)

[10] To my knowledge, there were only three Districts: Bloemfontein, Kroonstad and Bethlehem.

[11] **For the record**: The following 17 of us graduated on that day: C.J. Brown, J.A. de Raadt, L.C. Engelbrecht, L. S. Esterhuizen, G. Gillespie, M.M. Harris. D.J. le Roux. I.L. Rademeyer, J.J. Smit, C.W. Sonnekus, J. Spaan, C. Stapelberg, J.C. Stears, J.L. van den Heever, P.J. van der Walt, J.J. van Rooyen and J.P. Verster.

[12] The current posted speed on R 26 is 100 km/h, with an advisory sign for 80 km/h near Reitz. Current FWHA requirements state that the "**design speed**" ought to be (in US customary units) **10 miles per hour higher** than the "**posted speed**". I realize that this principle is not always adhered to, particularly when speed limits are raised on large portions of an existing highway system, for purely political reasons, as has fairly recently happened in British Columbia in 2015. The resulting 2017 sharp increase in vehicle crashes is most likely due to that type of political

note that the "average cars" in those days did not have today's turbo-charged fuel injection engines), driving at the "design speed", would perhaps have sight distance problems travelling over these crest curves, and would (alternatively) not be able to maintain their speed on these long uphill grades (and there were already in those days some specific studies to prove this). Reducing these vertical curve lengths would also somehow contradict the Department's formal approval of the Route Location Study. During our meeting, some of the provincial engineers strongly agreed with our point of view, but Naas won his case that day, because it was obvious (as understood by Mr. Sturgess as he told me as we walked back to the office) that Naas wanted his crew to complete as many kilometers as possible that year or the next. Competition between the few construction engineers was rampant; he had also been in that situation before, Mr. Sturgess said. (See the paragraph above, about competition.) Much later, I learnt the term for protectionism of one's own turf: "Job Preservation", not only for Naas himself, but actually for the whole OFS's "way of life" at the time. And I have no idea if I any of these people were even unionized or not.

So we just shortened those few vertical curve lengths, the cross sections for those affected lengths of road, and the calculated quantities for those two hillsides. There had been no negative comments on our design of the remainder of the route, and we started to understand that the construction crew from Frankfort would build this stretch of P 9, and not a Contractor. I do not know if Mr. Sturgess had considered that possibility when accepting the design project. I was not to question why. I see on GoogleMaps that there are a few rock outcrops beside the road that was built, so perhaps the actual vertical alignment was later re-revised by Naas. On this road, I also see a road sign with the words "Potholes Next 80 kilometres".

I do not remember whether we already had the centre line soils information for this project before the above "office incident". But I do remember conducting one field trip to the site in the fall of 1973. On one of the hills southeast of Tweeling, just within and to the west of the approved alignment, was an ancient human caused phenomenon, called a "rock circle". This was an archeological site, I thought (perhaps like Stonehenge?). A farming family surnamed Muller, told me about it that day. They lived on a farm along the old road; their relatives owned much land along the new alignment. They were all worried how they would need to travel to get to places both north and south, and had written a letter. There had supposedly been no "Compensation Meeting" or "S & T Road Adjustment Meeting" yet. This family belonged to the Reformed Church at Frankfort where a new minister, Rev. Arnold Mulder, the son of friends of my parents, had been installed a year or so before. (He died in 2017, in Krugersdorp.) So when leaving these farmers, having addressed their concerns, I drove to this site via Tweeling, (north along the old road, east at the village), and walking some distance south, picking up (and replacing) some of these rocks, about a cubic foot each, in a very visible circle among the short grass. I also took a few photos.

On my return to Bloemfontein, Mr. Sturgess asked me to write about this to the Archeological Division of Bloemfontein Museum, with the photos and a request to investigate the site. Mr. Sturgess and I had no idea if this "rock circle" was important or not.[13] I guess that such things were not automatically sorted out during a Route Location Study, as they are currently – at least, in North America. Just finding an arrowhead will stop any major project dead in its tracks, and there are archeological consultants, even for improving existing interchanges, like a particular one at Ida Road TI on I-10 in Tucson, AZ, doing lots of studies. A month or so later, a report came back from the Museum that yes, "we know about these rock circles, and they are not that uncommon. Thank you for your interest." I felt somewhat deflated when

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myopia. ICBC, the Insurance Corporation of British Columbia, the provincially mandated monopoly for third party automobile insurance, is actually part of the provincial Ministry of Transportation and Infrastructure.

[13] I have reason to believe (but no proof) that Mr. Sturgess was at one time a "construction engineer" in the western OFS, where many "salt pans" exist – and maybe no "rock circles". He once told me a story of a farmer coming to his site office with the words (in Afrikaans, of course): "Come quickly, Mr. Sturgess, you would not believe this, but really, the sheep are gobbling up the newly built road!"

reading that. We all knew that over the years, much of the original "pasture" in the eastern OFS had already been plowed over, and one can obviously not find any "rock circles" in fields of maize or sorghum or sunflower. So inevitably, through the decades, the number of remaining ones will diminish.

Theo Hoffmann was to design this railway overpass structure. Perhaps the Provincial crew did not build the bridge itself, and it was built "under contract", although I doubt it, because of its inaccessible location. The fear of inflation in construction contracts may have just scared provincial people stiff, sticking to "work by provincial construction crews" as long as possible. This Road R 26 is now the same route as the Road R 26 that runs south of Clocolan, the southern limit of my second design project in Bloemfontein, which completed a previously started design project, and took it through to tender documentation stage. This work therefore actually preceded or coincided with the work on the Tweeling-Reitz project.

The Clocolan "Road over Road and Rail Bridge" project, (on P17/1, now Road R 708) had likely been driven by traffic needs to and from the substantial co-op grain silo just east of the Clocolan Railway Station. By "traffic" I mean vehicular traffic and train traffic, because the existing level crossing to town contained two tracks, with two switches virtually within the crossing, one for a spur to the east and one for a spur to the west. Train switching had likely caused many long delays over the years, for vehicular traffic between the main road, (which was then called Road 13/6, now Road R 26) and the town, including silo bound trucks with grain. Clocolan was a typical Free State town, founded during the late 19th century. So when the railway line came to Clocolan, the station was located about 2 kilometers away from town, with the passenger side closest to town and the industrial on the other side of the track. This is typical of what my UP textbooks about urban planning had told me, (one by J.B. Floyd and one by Col. Bowling, written in the former's honour, as he called him "The father of Town Planning in South Africa" in the Preface). This was (and is) mostly untypical in western North America, where development came with the railway and not prior to it: Many settlements (large and small) started as railway stations, with specific built-in detrimental effects, difficult to address by way of over- and underpasses. But some of the younger South African towns also started at already existing railway stations.

Metric plan-profiles had already been prepared for this project, straight from the field books – the survey had not been prepared from aerial survey (due to its short length?). The project length was about 2½ kilometres, from the highway (the south project limit) to the town entrance, which as actually near the northeast end of town. Access roads to both sides of Clocolan Station were also to be designed, which meant one important visit to the municipal office, to enquire about the Town's views about this, as it would facilitate co-operation during construction and also enhance future residential or industrial development potential between the town centre and the station. (Eventually, more industries were built there, but the station building now sits empty, as there have not been any passenger trains for years.) I also went to determine the exact location of a pressure watermain that crossed the road but had somehow not been shown on the survey drawings. This obviously needed to be protected during construction. The Town of Clocolan had no drawings; the Town Clerk directed me to go there with the Works Foreman, who remembered laying this 6" dia. galvanized steel pipeline more than 20 years before, at a skew angle, without a registered "servitude" of any kind. This pipeline was the only water supply line for the town, from somewhere to the east, perhaps from a reservoir on the substantial rocky hill in this area. On GoogleMaps, one can see an (ugly) square water tank structure west of Road R 708.

A vertical alignment had already been pre-approved, which had a certain length of vertical curve over the railway lines, so that detailed bridge drawings could be developed. I needed to prepare all the detailed cross-sections, index drawings, detail drawings, and all calculations for the Schedule of Quantities, up to tender stage of the project. This was my second experience with detailed metric design drawings. While doing this, I discovered a strange 20 metre "gap" within the alignment. The road was actually 20 metres shorter than what was shown by the "stations", (although we did not call them that). There was a 20

metre gap (on the plan) between Sta. 1 + 020 and Sta. 1 + 060. This inconsistency[14] was just north off the bridge embankment, near the proposed intersections with access roads to the station. This matter could fairly simply be resolved by adjusting the grades, without affecting the approach grade to the overpass – as this would have affected the bridge deck elevations. The provincial engineer agreed with this suggestion, although I believe there was no formal "review process" in place. This exercise taught me that whenever some (minor) error is discovered, one must be able and willing to correct it with the least impact on design parameters close by. Pointing fingers does not help. (And we did not even have a Contractor waiting for an instant decision.) There was also a small bridge (concrete box culvert) north of this location, for a minor stream, and that needed to be widened on both sides. We designed these box culvert extensions and added the Provincial standard drawings for box culverts to the Project Drawings.

Once this design assignment was completed, all the documentation was delivered to the H. F. Verwoerd Building – a whole pile of "roneoed"[15] Tender Documents (with light pink printed covers, I remember) and a similar number of A1 size ammonia-printed sets of drawings. I still possess the book (Volume II)[16]:

Volume II

Orange Free State Provincial Administration

ROAD OVER ROAD AND RAIL BRIDGE, APPROACH RAMPS AND ROADS

Contract No. 5 of 1972

GENERAL SPECIFICATIONS
FOR

The construction of a Road over Road and Rail bridge plus approach ramps and roads as also the widening of a bridge over a stream including all earth works, subbase, base course, bituminous surfacing, drainage and supplementary works on Provincial Primary Road P17/1 at Railway chainage 103M. 05 Ch immediately East of Clocolan Station.

Mackintoch, Bergh & Sturgess,
Consulting Civil Engineers,
P.O. BOX 1056,
BLOEMFONTEIN.

The Director of Roads,
P.O. BOX 690,
BLOEMFONTEIN.

I returned to Pretoria before Tenders were received and do not know which Tenderer was selected. I never thought that a diamond traffic interchange would be built where the current Road R 708 joins Road R 26. This is on GoogleMaps, and it seems a logical solution because of grain silo traffic, as well as border traffic to Lesotho, via the Pekabrug border crossing at the Caledon River. I have no idea when this was built. These interchanges may once have been the preferred way of accessing towns, as I also see one at the Town of Petrusburg, and I also know that we surveyed a site for one, just northwest of Reitz.

The OFS Provincial Administration did not use printed set of Standard Conditions of Contract or even Contract Specifications at that time. As said before, the number of projects contracted out was not large. Miss Flo van Heerden was responsible for having sets of the most current provincial requirements printed

[14] This is called a "chainage equation" in Arizona, with "BK" (for "backward") and "FW" (for "forward") stations.
[15] "Roneo" was the American brand, while "Gestetner" was the German (or Swiss?) brand of copying machines.
[16] My copy has a rubber stamped number "4" on the top. We may have made 25 or 30 copies of everything…

out, in our office, and whenever Mr. Sturgess was alerted (by his former provincial colleagues) about any approved change, she typed and roneod new sets of Section 10, Section 14 or whatever was revised or new. There was also no actual standardization at the time, and using a Gestetner machine was always "messy". This was the same set-up of paperwork that I had experience with, from the Sasolburg-Koppies P 30/1 project. Thinking about it after so many years, it must have been quite frustrating for Mr. Sturgess when hearing that yet another "proposed contract" had just dissipated into "construction by provincial crews", (due to political, budgeting or labour situations)[17], but, to give him credit, he never showed it. See "Part 1" about the fee structure; MB&S probably received a percentage of the design fees if a project did not proceed to a "contract". The copy of Volume II that I have, starts with a blue page reading:

LIST OF CONTENTS.

VOLUME I.

1. List of Drawings (yellow)
2. General Conditions of Contract
3. Special Conditions of Contract and Special Clauses.
4. Summary of Amplifications and Additions to or Variation from the General Conditions of Contract
5. Further Conditions to be Observed When Tendering. (Blue.)
6. Alterations by Tenderer.
7. Schedule of Plant.
8. Schedule of Work Satisfactorily Carried out by the Tenderer.
9. Certificate of Tenderer's Visit to the Site.
10. Form of Tender. (Blue.)
11. Annexure A to Form of Tender.
12. Annexure B to Form of Tender.
13. Form of Agreement. (Blue.)
14. Form of Bond. (Blue.)
15. Schedule of Quantities. (Pink.)
16. Schedule of Daywork Rates. (Pink.)
17. Extract From Roads Ordinance.
18. Special Conditions Laid Down by S.A. Railways.
19. Detailed Description of Works. (Yellow.)
20. Key Plan.

VOLUME II.

1. Index of Specifications.
2. Specifications.

VOLUME III.

1. Borrow Pit Plans showing Locality of Borrow Pits and relevant Soil Data. (Included in Volume IV.)

VOLUME IV.

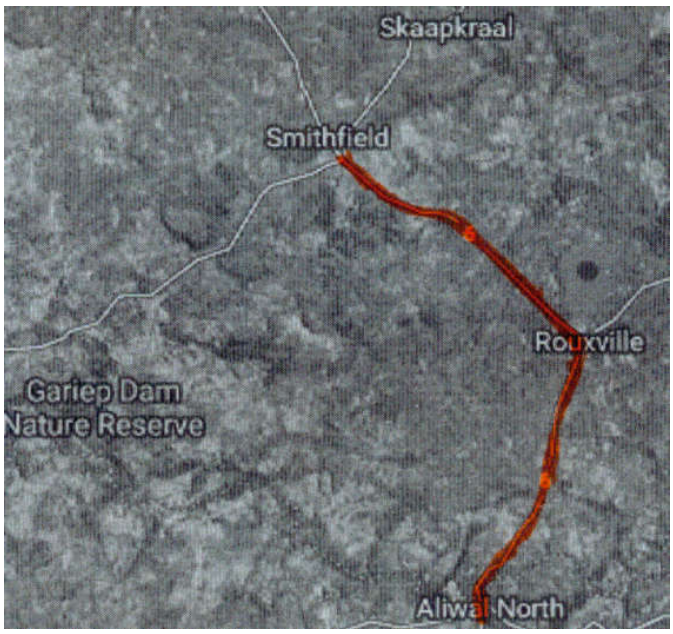
1. Index to Drawings.
2. Contract Drawings.

This level of documentation uncertainty was likely also experienced in the offices of the other consulting engineers in Bloemfontein, of which there were less than half a dozen. I remember that Van Niekerk,

[17] "Work reservation" was still practiced at the time, meaning that equipment operators had to be white – and male.

Kleyn & Edwards (VKE) had an office, headed by Mr. Piet van Zyl; B.S. Bergman & Partners (BSB&P) had an office, headed by Mr. P. Nicolayson; there were other firms[18], I remember the names of a Mr. Du Pisani and a Mr. Beneke. (His nickname was obviously "Bones".) This latter firm had prepared a study for the upgrading (refurbishing?) of a portion of National Road N 5, between Winburg and Senekal, similar to what I was next to do in Bloemfontein, and we received a copy of this firm's report. These were the very first "computer printed drawings" that I ever saw. Plan profiles with columns and elevations, all generated from as-built drawings, but not stencilled or hand printed. It looked very nice indeed. My next project was somewhat similar, but dealt with highway upgrading (refurbishing) in an entirely different way than Bones' project on N 5. Mr. Sturgess had mentioned it to me before we moved south. It was an investigation into "what to do with the portion of National Road N 6 between Smithfield and Aliwal North." The idea was similar, but the method was different; to my knowledge, this was the first LaCroix Deflectograph analysis in the OFS. There never was a proposal to develop new horizontal alignments for either of these National Roads. Traffic volumes just did not warrant it, then and even now.

For Smithfield-Rouxville-Aliwal North, a LaCroix Deflectograph study had been initiated and conducted, This truck mounted apparatus had likely been imported from abroad (either the USA or Denmark, where the technology had its origin) and was used by the NIRR of the CSIR for analyzing the structural road conditions of the existing system of National Roads, particularly the elastic deflection under a passing "design wheel load". The stated purpose of these analyses was to determine how to "fix" these roads, so that they could then be "taken over" by the four Provincial Administrations. The Department of Transport had been authorized by Parliament to build a new National Road system, with freeways – and some of them had already been built, even in the OFS, like the one that started somewhere north of Bloemfontein and had reached Winburg, bypassing Brandfort and running just north of Verkeerdevlei.



I do not know how many kilometres of roads in South Africa's four provinces underwent this analysis in those days. I never saw the machine in action, and only, when working at the NITRR, saw it parked. By that time, that particular generation of the technology was already outdated. There was also a long article about this LaCroix Deflectograph in one of the Annual Reports of the NITRR. The machine was yellow, and consisted of a set of moveable Benkelman beams attached to its undercarriage. When the vehicle travelled at a set speed which was only 10 km/h or even less, these two "beams" would move "up, forward and down", in an alternating fashion. When "down", an elastic road deflection would be measured directly between the tyres ("tires" in North American English) of the single rear axle on that side of the vehicle, which had a "design load" of 9 000 lbs (and the truck was loaded with that cargo) for an 18 000 lbs axle load. As there were two "beams", one on each side of the differential, lots of data was obtained, (I cannot remember the distance between individual measurements), and this was all recorded on its (rudimentary, compared to today's) computer system in the cabin. We at MB&S only received a series of long rolls of annotated printouts of the elastic deflections. As the machine moved one way (say going south) and then returned (say going north), there was a lot of information to base an assessment on.

[18] Jeffares and Green likely had an office in Bloemfontein when they designed the Clarens-Golden Gate road……

Analyzing the rolls, it was soon clear that there was quite some difference in the results between the Smithfield-Rouxville and Rouxville-Aliwal North sections. They were somehow like night and day, as if these were totally different roads. Why? The reason for this was unknown. Maybe the National Transport Commission (or whatever that department was called when the road was built) had changed the geotechnical specifications when construction had reached Rouxville (assuming from the south, knowing that Mr. M.C. Botha had supervised construction of a section in the Cape Province, south of Aliwal North around 1949); but perhaps it was only the difference in materials from the borrow pits along the route.

The project started at the south-west corner of the built-up area of Smithfield. Between Smithfield and Rouxville, the road was **awash** with "slurry seal", and this was much less evident on the section between Rouxville and Aliwal North. It was known that a slurry seal was normally added to an asphalt chip sealed road surface when it had become brittle – or to avoid it becoming brittle – as a maintenance operation, to extend the life of the chip seal. In 1966, COLAS advertisements in "The Civil Engineer in South Africa" had proudly quoted an 81 mile long slurry seal contract, with a photo and road sign showing "**SMITHFIELD – 31 miles**" by the side of the truck spreading the second width, and the photo at **left** must have been taken just outside Reddersburg. I do not know if this was bi- or tri-annual job, but the result was not good. Slurry adds no strength to the road, and after (say) two or more applications, the surface can become very slippery, particularly in hot weather. Moreover, it was known that summer traffic (during school vacations) was higher than winter traffic; some people told stories that they were often ploughing through a black mess. The LaCroix Deflectograph crew had made many hand written notes on the computer printouts with the elastic deflections, noting that the "beams" on occasion almost drowned in the black slurry. So we had to study these printouts carefully. The crew had also observed that where trees existed next to the road, within the road reserve, elastic deflections were much higher. The root system of the huge bluegum trees was suspected as the cause of this. These trees had been planted on both sides, at every milepost along the route, during construction (around 1950?). At every fifth marked concrete and whitewashed milepost was a concrete table plus two or three concrete chairs, as a picnic spot, in days when people did not always rush to their destination. "Blips" were obvious near every milepost, and this meant that either the roots themselves had become thick, (which would also cause permanent deflections), or that these roots affected the moisture content of the road structure down below. About a third of the way from Smithfield was the Caledon River Bridge.

Along the southern section of the project, between Rouxville and the Orange River Bridge at Aliwal North, these trees at mileposts and picnic spots also existed, but the elastic deflections were generally much higher than along the northern section, and there were no actual "blips". The LaCroix Deflectograph crew had already done their work, and it was up to us at MB&S to determine what would be the most appropriate solution to "fix" the problem. Down-proclamation of this highway meant that a solution had to be acceptable to both the OFS Provincial Administration and the NTC in Pretoria, who paid for it.

The solution was still being developed when I left Bloemfontein, (we had submitted a report), but I remember that the idea was based on the ESAL concept. For a certain **annual average** daily traffic volume

(and I know that the term AADT is also "reversed" as **average annual**[19] daily traffic volume – and by the way, that this letter sequence is part of my surname!), it is possible to estimate the total repetitions that a certain particular vehicle axle mass impacts the structural layers of a road. This impact is measured by the elastic deflection, the deflection from which the road surface "bounces back" after the axle has passed the point of measurement. A passenger car causes a minimum impact, a large truck causes a higher elastic deflection. So during a calendar year, a road will be impacted by "x" light axles, "y" medium axles and "z" heavy axles. In-road weighing (called WIM in North America, for "weigh-in-motion") and traffic classification was already possible in those days, and it was also possible to determine the total number of "Equivalent Single Axle Loads", because an 18 000 lbs. load was considered as 1 (ONE). Then, one can estimate the long term traffic growth rate along the road, from previous years' traffic counts, a specific economic growth rate (always tricky!), and even demographics. Dan van Vuuren, ahead of me at UP by two or three years, whom I later met at the NITRR of the CSIR, was at that time already becoming the expert on those things. He even wrote his doctoral thesis about it.

Now, if one establishes a certain number of equivalent single axle loads for which the proposed road "fix" has to last (say 5 000 000), one can determine how long (meaning: how many years) it will take till the built-in elastic deflection potential is "used up" (somewhat like metal fatigue) and increases dramatically, and permanent deflections also become more prevalent. This would then be the "design life" of the "fix".

I believe that a "Design ESAL" for roads like these (4 million?) had already been established by National Transport and the Provincial Administrations. We had to determine the "average" elastic deflections for this selection of N 6, and then determine what needed to be done, as far as structural reconstruction (based on geotechnical possibilities, borrow pits, etc.), geometric design[20] (not necessarily raising the profile or changing the vertical curve, but at least determine the proposed lane widths, shoulder width and sideslopes). We decided on two different approaches, and Smithfield-Rouxville would need a different solution than Rouxville-Aliwal North. All the "average elastic deflections" were drawn by pencil on the rolls of printout that we had, and we then showed these during a meeting with staff at the H.F. Verwoerd Building. This was in the winter of 1973, just before our family returned to Transvaal. From memory: Reconstruction was recommended for one section, and a (hot mix) asphalt overlay for the other section.

A "sideline" to this project is that we were yet to receive the "as-built drawings" for N 6 that we had requested. We had already received a set of prints of all the contour lines within the road reserve – either the site survey that had been done prior to the design, or something else as a partial "as-built" effort. But around Rouxville, a wide swath of land had also been surveyed. This was shown on three long prints, at a scale of 1" = 100 ft. On reviewing this, Mr. Sturgess suggested that a small "study" be prepared for what would be called the "Rouxville Bypass". This request was granted by the Provincial Administration. It appeared that a road realignment[21] with a single long curve could be built, with a single four-way intersection serving the town (Church Street) and Secondary Road S 311 to Goedemoed (along the Orange River, east of the Hendrik Verwoerd Dam). Not having a set of sophisticated tools or even the possibility of calculating this horizontal curve radius, I decided to go back to "first principles". Willi and I taped the three extended prints (larger than A0 because they predated metrication by a few decades) to the floor of my office, making sure that the overlaps and directions of the alignment matched, based on the coordinates[22]. It ran through the doorway between Willy's office and mine, but it also allowed me to go even more back to basics: The plastic circular draughting curves that we had (a larger boxed set than the one I had used at BSB&P) could obviously not be used, but what about a tape measure, a large plastic 90-45-45

[19] Much later, in Arizona, I was reminded that my surname has the letters **AADT** in it……..!
[20] In the United States, the term "Design Criteria" is normally used to describe all those parameters of design.
[21] In South Africa, the word "deviation" is normally used, particularly for railway improvements; not devious at all.
[22] Yes, coordinates had already been in use in those days, meaning the late 1940's.

degree square and a 1.8 metres long steel straightedge that was actually seldom used? So I pencilled in the two tangents of National Road N 6 (meaning road centre line ℄) and from there, using the square, established a line on which the horizontal points of intersection would be located – for **any** radius. (It just fit through the doorway the first time, so that I did not need to loosen and retape the prints on the floor!) I was then able to establish the logical and most appropriate radius for this single curve, 7 000 ft., (2 334.6 metres)[23] which strangely, perfectly fit the centre of the surveyed area – as if someone else, about twenty years earlier, had had **the very same idea** of constructing a bypass to the Town of Rouxville!

A dreaded question (one that every engineer may sometimes have, I sincerely hope) was mine at that time: "**Am I only trying to re-invent the wheel, with an idea that has already been rejected?**" Perhaps I did, not knowing it. In any case, nobody in the H.F. Verwoerd Building had known about it; it may well have been a pipe dream of a certain National Roads engineer who designed and built the original N 6 in the 19-fifties. Besides the advantage of a single four-way intersection (see above), two other advantages of this proposed "Rouxville Bypass" were outlined in the small report of this exercise in A4 format, together with a very preliminary cost estimate:

(1) This bypass would enable and allow some appropriate "spatial separation" between the road (north side, west of town) and the existing "old location",[24] which was very close to the existing N 6, as well as an aesthetical eyesore. A single access to N 6 (toward its very west end) would be possible.[25] (The former "old location" has now long been demolished, as one can see on GoogleMaps.)

(2) Construction of this bypass, once approved and designed, might coincide and be merged with construction of a single span railway overpass, at the existing railway crossing just south of the south project limit. A single larger project normally has some cost advantage over two separate and smaller projects. Economy of Scale? (GoogleMaps shows that in 2010, the railway crossing had already been abandoned. I have no idea when trains stopped running.)

The report included a marked up copy of a portion of the 1:18,000 Topographic mapping around Rouxville, showing all the proposal details. The text also included a preliminary profile of the bypass and railway overpass, shown as a single span with jack spans, and approach grades of 5%. I do not remember the value in the cost estimate; the whole report contained only about fifteen pages, and I had to get the 10 Xeroxed (better than roneod, and on glossy paper), collated and "bound" with plastic Cerlox bindings, at a print shop on St. Andrews Street. This was (I guess) the first time that I printed my own report, using those fancy machines. Until then, everything had been stapled and bound with a thick plastic tape "back".

I was also asked to complete the design of a minor railway siding (my first) for a proposed frozen fish warehouse. Irvin & Johnstone (at that time, and even now, still South Africa's main fish company) was in the process of building (or expanding?) its Bloemfontein depot in the Industrial area directly southeast of the Bloemfontein station, and the loading dock (actually "unloading dock", because fish came from the coast by rail and was then distributed by road) for a single full-size railway cars. This dock was shown on the site survey drawings as "existing"; how that was possible, I do not know; there had likely been a previous building, and there was obviously a City of Bloemfontein building permit. I only had to finalize

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[23] By that time, South Africa had been completely metricated. "From January 1, 1970, all geodetic and cadastral surveys in South Africa will be in SI units", a Notice in "The Civil Engineer in South Africa" had stated in November 1969, and "Existing tapes may be used up to the end of 1972, but tapes graduated in SI units will have to be used for the pegging of new townships from the beginning of 1970. The Surveyors General will not undertake the standardization of English and Cape Foot tapes after January 1." Mr. John Woodcock found this a bit difficult.

[24] A "location" in South Africa was a black (or Indian or Coloured) residential area.

[25] A possible "disadvantage", namely locating a four-way intersection on the inside of a horizontal curve, (as this might perhaps decrease sight distance), was discounted due to the proposed radius of 7,000 feet. (On GoogleMaps, I do not see this Secondary Road intersection at all. It must have been abandoned.)

this siding's design drawing, for SAR approval, from the local District Engineer, a Mr. Jonas who was Jewish, as Mr. Sturgess told me. His office was in the huge SAR building down St. Andrews Street. So I just designed this siding and somehow showed a 7 minute horizontal kink[26] on it, quite near to the loading dock itself. I had the necessary number of prints made and took them to the building near the station. A few days later, Mr. Sturgess came to me and said that he had received a phone call from Mr. Jonas with a request that the drawing be revised to show the **details** of a horizontal curve with a 7 minute deflection angle! Now Mr. Sturgess agreed with me that this would really be "splitting hairs", because nobody would actually build such a (very short) horizontal curve at the terminal of a railway siding: Any construction foreman would tell his platelayer (or whatever the railway terminology is for that particular job) to "just eye ball it in". But we had to just revise the plan, to satisfy the bureaucrat(s) down the street.

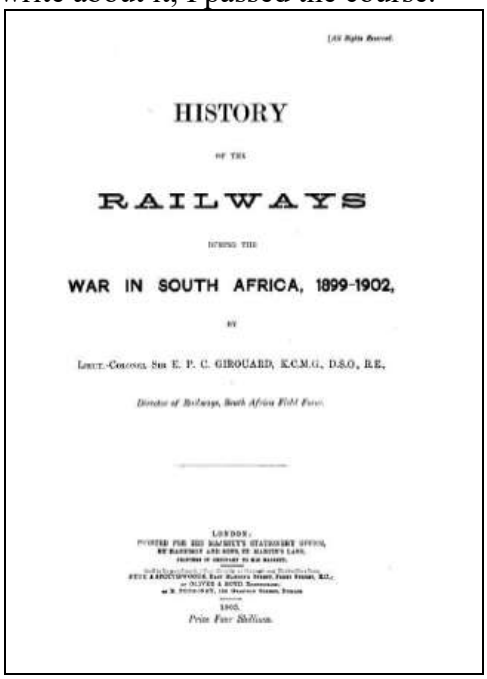
In those days, downtown Bloemfontein, although a provincial capital and seat of the South African Supreme Court, was quite dirty, being the last remaining city in the country where **"steam reigned"**. As C.P. Lewis & A.A. Jorgensen's book "The Great Steam Trek" (1978) explained it:

> "Six through routes are served by Bloemfontein's marshalling yards: Kroonstad (for the Witwatersrand), Bethlehem (for Natal), Aliwal North (for Burgersdorp), Burgersdorp (for the Eastern Cape), Noupoort (for the Cape Midlands and Mossel Bay) and Kimberley (for the Western Cape). In addition, the Maseru branch off the Bethlehem line serves Lesotho. The Kroonstad line is the busiest, and during the last year of full steam operation an average of 100 trains moved over 100 000 tons per day over this route. The record gross tonnage moved by steam in one 24-hour period was 138 000 tons – remarkable for a line which is inclined at 1 in 100 for a considerable part of its length.
>
> The end came in three stages. First to go were the Burgersdorp turns when East London diesels began to work through to Bloemfontein early in 1971. There was a period of mixed working for about a year, but by early 1972 Bloemfontein engines no longer locked couplers with their colleagues at Burgersdorp shed. During that year Midland diesels started to infiltrate the Noupoort line, which succumbed totally on 31 March 1973. Of the main lines, only the Kroonstad turns were still steam-operated.
>
> For another three glorious years, the Kroonstad route continued under billowing exhausts, but in December 1975 the catenary into Bloemfontein yards was energised and most freight workings went electric. When the station tracks were energised in March 1976, 85 years of main-line steam operations in the Orange Free State came to an end.

On this topic, I recall an SAICE Branch meeting in Bloemfontein, about the climatological importance of smoke that had caused specific impacts on the downtown, over these many years – the deterioration of historic sandstone buildings. The expert who addressed us, said that during late after midnight winter nights in Bloemfontein, a very slight breeze from the east normally blows all the smoke from the shunting yards (where steam locomotives worked all night) into the downtown. By the late 1960's, various sandstone buildings from the previous century, and even newer ones, had shown signs of serious deterioration, causing costly repairs. The original quarries where the sandstone had originated, were no longer in operation, and "better" or "similar" sources of sandstone had to be found for this restoration work. This particular speaker was glad to hear (from a railway engineer, during the question period!!) that steam was actually "on the way out". I was glad that we lived in Bayswater, separated from train noise and soot by the substantial Naval Hill, with an Observatory. Theo and Plonia called it a "balhuisie" (ball house)!

[26] Much later, in 2006, preparing the Design Concept Report for the SR 202 HOV lane project between SR 101 and Gilbert Road, I showed a 30 minute horizontal kink on the centre line, just west of Gilbert Road. The term "kink" was then unknown in US highway parlance. I stuck to my guns, but modified the term into "horizontal deflection". Why express a detail with twenty letters when a good four-letter word suffices?

Railway engineering has always held my special interest, from the days of my youth in Alphen a/d Rijn[27], Kroonstad[28] and Potchefstroom[29]. In 1965, for the course Civil Engineering Practice 4S, students in our class had to prepare a short biography on a "famous South African engineer" of the past. I happened to choose a Canadian, Lieut. Colonel Sir É.P.C. (Percy) Girouard, the British soldier who had taken over all the railways in South Africa during the "War in South Africa, 1899-1902". His title was "Director of Imperial Military Railways", and he had actually written a book about it in 1903. I remember going to the SAR library and archives in Johannesburg for reading up on what he had accomplished. All railways in the Oranje Vrijstaat (which had taken over all railways within its borders in January 1897, and operated them as the Orange Free State Railways) and the Zuid-Afrikaansche Republiek (NZASM, including the Pretoria-Pietersburg Railway and the proposed and partly constructed Selati Railway) had of course been taken over as the British forces went north, but there had also been major repairs to blown up bridges in the Cape Colony and Natal, all kinds of rehabilitation to locomotives and rolling stock, and the difficult negotiations with the NZASM and Portuguese authorities. I did not see Girouard's actual book, but an additional book about the topic, with lot of photos. It was exciting to write about it, I passed the course. Remembering that I had seen the information about Girouard and his book with photos[30] at the time, I cannot even find his name in the 1972 edition of Encyclopædia Brittanica! Hurrah for the internet and Wikipedia! Strange that in our 41+ years in Canada, Lydia and I have never been on an actual passenger train, except that I was once on the GO train between Toronto and Burlington. Ontario.[31]


HISTORY

OF THE

RAILWAYS

DURING THE

WAR IN SOUTH AFRICA, 1899-1902,

BY

LIEUT.-COLONEL SIR E. P. C. GIROUARD, K.C.M.G., D.S.O., R.E.

LONDON:

1903.

Price Four Shillings.

Municipal street design was also being done in the Bloemfontein office, under Mr. Woodcock who had joined the firm during 1971. I was asked to comment on the design (done by Mr. Moodie) of a project to pave the first east-west downtown street of Petrusburg, the first town directly west of Bloemfontein, at the end of what we all knew to be the longest dead straight road (39 miles) in the province. The vicinity of this town is quite flat, and there seemed to be no room for storm drainage, (suggested by looking at the 1:18,000 topographic map, proven when a site survey was completed.) Moreover, in the downtown area (12 blocks long) there were existing houses, some businesses and two churches along this street. But this does not mean that it was densely built up like downtown Bloemfontein or downtown Pretoria; these were houses with gardens. A large park existed directly west of the "town proper", and it was possible to design an even grade on Voortrekkers Street without kerb and gutter, so that minor swales could lead water to the west. The western third of the OFS is a sandy area and rainfall is less than in Bloemfontein, perhaps in the order of 10-15 inches per year. (I had learnt that detail in Standard 3, at the Sentrale Volkskool in Kroonstad, in 1953.) In those days, the road from Bloemfontein ran straight into Voortrekkers Street; although the main road to the west (a bypass to the downtown) existed, there was no

[27] I remember trips to Bilthoven (via Utrecht), Gouda and 'sGravenhage (continuing by the "Blauwe Tram" from Leiden), and even to Amsterdam on a school trip. Also a trip to Rotterdam "Maasstation", before it was torn down.
[28] I remember the trip from Cape Town to Bethlehem in August 1952, and trips between Kroonstad and Bethlehem, and we lived for 8 months very close to the steep section of railway (later abandoned), close to Featherstone halt.
[29] A trip from Edenburg to Potchefstroom, a trip to Krugersdorp in 1955, and some commuting when a UP student.
[30] This was at the Railway Museum and Archives in Johannesburg; I still have a copy of my tightly typed 3-page folio report. From that, I note that in 1900, the Wolwehoek-Heilbron railway had already been built (See "Part 1").
[31] In the mid-1990's, Mr. Ian Mott, a client of Grassroots Consulting Services, asked me to accompany him in the front cab of a CN freight train, from North Surrey to Chilliwack. He wanted to convince the "powers that be" to build a truck route corridor parallel to the track, in order to relieve the very congested Highway 1, without success.

diamond interchange as is shown on current GoogleMaps imaging. Similar work for other municipalities like Luckhoff had already come into the Bloemfontein office when I left.

Mr. Woodcock had some strange ideas. One of them was his insistence of "circular vertical curves", because everybody in the office knew that these are "parabolic", and it would have been disastrous to allow the provincial civil servants to discover such rarity. It was difficult for me to address this particular concern, when addressed to me by one of the technicians; I was able to divert it to Mr. Moodie. I would need to add that (in my view) Mr. Sturgess did not seem to have a very high regard of his partner's skills; at Dover (mid-1972) he had already mentioned to me (in jest?) that he thought Mr. Woodcock had a "melted brain" due to his time at Abu Dabhi, in the hot Arabian peninsula. His specialty was in the design of sanitary sewer systems, which he had done in Malaysia for a decade. It's very hot there, too. In review, the partnership needed his money.

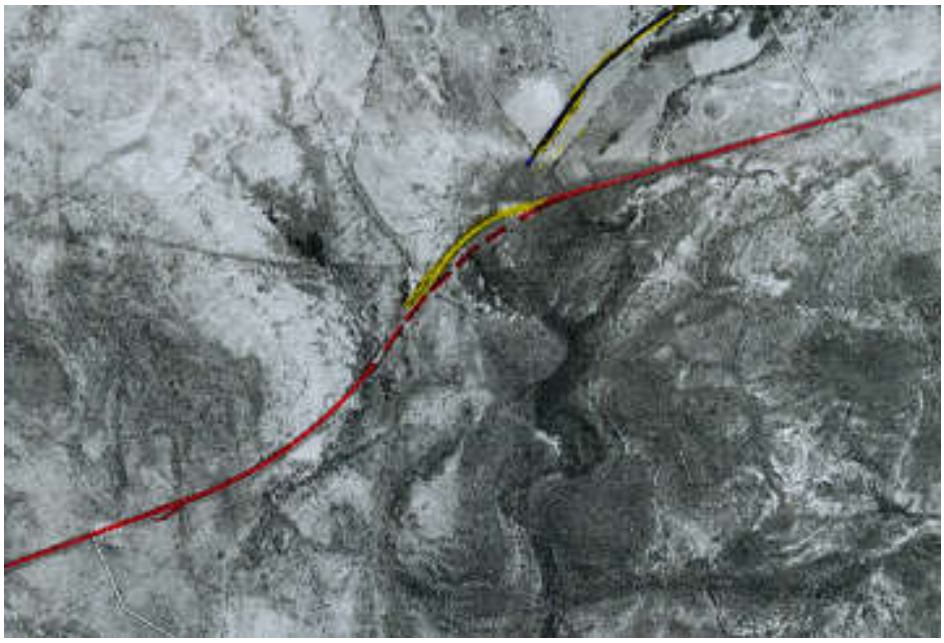
Some more details about urban planning in the OFS come back to me, based on my university textbook for a portion of Civil Engineering Practice 4S. This town planning textbook had been written by Col. Bowling, a partner of Mr. T.B. Floyd, whose textbook was by 1965 "out of print" so that a newer book was used. (These classes were given by either Mr. D.G.S. Wolmarans or a lecturer from the Land Surveying Department.) The textbook described the historical context of town planning in every province of South Africa. In the Republic of the Orange Free State, one of its early laws stipulated that no new town could be established within 20 miles of any pre-existing town. Perhaps this common sense approach was based on a vague perceived threat that too many towns, too close to each other, would be established, which would not be viable in the agricultural economy of the late 1850's[32]. At the time of that law, only a few towns existed: Winburg, Bloemfontein, Smithfield and Harrismith[33]. Moreover, only the government could establish a township; the possibility of a "private town" did not exist, and it was "before railways".

This policy was strictly adhered to at that time, and one can see this by looking at any old OFS Road Map. Many of the older towns are between 21 and 25 miles away from the other towns, but in other cases, these distances are longer, particularly in the less densely populated areas like the southwest (sheep farming only, dry land) and the northeast (cattle and sheep farming, higher rainfall). It is clear that "agricultural potential" of any "market town" was considered in the Model Republic! It was only in the early 1870's that this rule was broken when Parys, a private "resort" town, was condoned[34], on the Vaal River but only 6 miles from the existing town of Vredefort. No wonder that Parys grew over time, while Vredefort did not: more recently it became known because of a geological phenomenon, the Vredefort Dome.

In every OFS town, the Republic's surveyors surveyed the lots, and the town received a substantial area of Dorpsgronden around it, (= "Commonage", land to be used by all residents, initially mostly for grazing of their animals). In fact, every town was established ("proclaimed" would be the term used in Transvaal) on a farm with a name like "Dorpsgronden van Petrusburg" and the like. Obviously this prevented any private development for many years in the future. Even in 1973, the City of Bloemfontein auctioned off some newly developed lots in various suburbs of the City, as a way to increase its revenue for the next few years. I attended one auction, out of curiosity, and there were a few lots in the south (Suidheuwels and/or Monumentpark), some lots in the west (Universitas and Fichardt Park) and some lots in the northwest (Dan Pienaar and Tempe). These lots were all between lots with existing houses. The Commonage was not full yet! Many single residence lots were owned by the SAR, for railway workers.

[32] The date is my guess, because I do not have the book any more. The six Presidents of the OFS since 1854 were Boshof (1 year), Hoffmann, Brand, Pretorius, Reitz and Steyn. The legislation was likely from the Hoffmann days.
[33] Both named by and after Sir Harry Smith, Governor of the Cape of Good Hope, a Crown Colony at the time.
[34] I believe the reason of its approval was that various "important people" had already invested in the syndicate!

The GoogleMaps image at left shows a small design problem that came to the office: The review of an already designed portion of the Bethulie-Rouxville road, in the very southern OFS. This project was to include a new bridge across the Caledon River, at the east end of a reach of the Hendrik Verwoerd Dam. A single (influential) farmer had complained to his local Member of the Executive Committee, a Mr. A.C. van Wyk, that the new road would be "too close for comfort" to his house and other buildings. This request resulted in that I did some calculations and drew an alternative alignment with a smaller radius, (see the **yellow line** on the GoogleMaps image) on a route that would provide more separation from the buildings than the **dotted red line** that had already been surveyed. This was close to Slykspruit, east of which the road would start to veer to the south, the Caledon River crossing and Goedemoed. Satisfied with my effort, Mr. Sturgess then took one print to a meeting with Mr. van Wyk (and maybe the Objector also attended) and the matter was settled. As mentioned in "Part 1", this was the only South African case in which I knew that a member of the public influenced a road location. But in retrospect, the **± 230 metres radius of the yellow curve** is close to the absolute minimum allowable, while the **± 700 metres radius of the red curve(s)** is/was more commonly used for rural roads with this classification and design speed. This yellow curve sticks out like a sore thumb, even on GoogleMaps! Did I, or did MB&S, perhaps give wrong advice? GoogleMaps shows that the east part of the road link to Goedemoed was not built as a Provincial Road. It provides access to, and runs through the 22 000 hectares of the **Tussen-die-Riviere** (meaning "between the rivers") **Nature Reserve** – between the Orange River and the Caledon River.



It was perhaps this small "**political success**" that lead to another project for MB&S, from another OFS Administration Department. One day, during a coffee break, Mr. Sturgess broke the news to us: The day before, he had lunched with Mr. van Wyk, MEC, and another Member of the Executive Committee, who headed another portfolio (Tourism, Environment, whatever?)[35] During their lunch, this gentleman casually asked (in Afrikaans, of course): "Frank, what do you know about fish?" (Note that these people knew each other well, as Mr. Sturgess had been a well-respected District Engineer before joining those two ex-TPA engineers from Pretoria, called Mackintosh and Bergh.) So Mr. Sturgess answered honestly: "Nothing, particularly; I only know fish as an item on a menu." To his utter surprise, he received the following response: "Then you, Frank, are exactly the man I need ----- someone who does not have a vested interest or an agenda in what is being proposed for my Department."

Fish Hatchery near Oviston, OFS.

[35] Every South African province had 4 MCE's, handling provincial portfolios, like Provincial Ministers in Canada.

And this is how a brand new major project came to our office, from the OFS Provincial Works Department: The complete Fish Hatchery near Norvalspont, at the first bridge across the Orange River below the Hendrik Verwoerd Dam. Over the next few weeks, we all **oohed and aahed** about it, (particularly those who were anglers). If memory serves me well, this hatchery had to be designed for four different types of fish, and there were to be about 20 different open ponds of different sizes, with all the piping of water (from the dam), the access roads from a Provincial Highway and the buildings sites, retaining walls, storm and sanitary sewerage systems, even a long water pipeline from the dam, as a complete "turn-key" project. While I was not involved in any design, and while this whole project became Mr. John Woodcock's "baby", we were glad of this kind of "diversification" in the office, augmenting the "municipal" section.

During 1972, I continued my MBA studies. Classes were held at the main campus of the PU for CHE at Potchefstroom, every second Saturday. This meant leaving home at 4 a.m., sharing the driving sometimes with Pieter Venter from Bloemfontein (whom I had not known in Sasolburg). Using my Mercedes 280S and driving with a speed of 120 km/h, we always were on time for the first class. A particular interesting road feature stands out from those trips: A horizontal curve with a huge radius – along the road between Stilfontein and Orkney, Transvaal. It has a horizontal deflection angle of (what seemed to be) close to 35 or 40 degrees, on level terrain, and one can see any approaching vehicle from a very long distance. This alignment may perhaps have assumed a future mine dump for one of the gold mines in that area. And these gold mines, now? All worked out and abandoned.[36]

One particular course taken that year stands out – **Labour Law**. The lecturer was Willie Coetzee, who had been two years my junior in High School, a classmate of my brother Arie. His father had been or still was the Latin professor at the PU for CHE, and his mother had been a teacher at Gimmies; we called her "seekoei" (hippopotamus) for obvious reasons. With Willie, we went through the basics of labour law, which seemed to tie in with what I had understood from Prof. Hamman 9 years earlier in Business Law at UP, quoting the same text book – De Wet & Yeats. When we got to the importance of the government in labour relations since the abolition of slavery in 1834, like the Miners' Strike on the Witwatersrand, as well as recent laws, many in our class had our eyes opened. But we could not change history, could we?

Between classes, I sometimes had a short lunch with my father, who had re-married in April 1971 while Lydia and I lived in Sasolburg. Their daughter Gea (my half-sister) had been born in April 1972, six weeks after our daughter Sara had been born in Sasolburg just before we left there. But after our classes ended around 4.00 p.m., Pieter Venter and I rushed home, getting back after dark. The distance from Bloemfontein to Potchefstroom is about 333km. My father, stepmother and half-sister visited us twice in Bloemfontein, the second time during the winter vacation. And Lydia and the three children once went with me to Potchefstroom, returning very late that evening. I wrote my little thesis that year. (See "Part 1".) In November 1972, I passed my exams in Potchefstroom, and received my MBA degree on the 28th of April, 1973, at the Olen Park Stadium opposite the Potchefstroom railway station.

I normally used the City of Bloemfontein bus system to commute to work. These were (old) dark olive green "Guy" buses, (with bilingual warning signs: "Do not spit in the bus!"), and the bus stop was just behind our house at 5 Clarens Road, on Wilcocks Road. On St. Andrews Street, all westbound routes had a bus stop directly below my office window; there was a whole row of bus stops and signs for all the routes. In January 1973, Theo started a half-day playschool in downtown, so I used my pick-up truck in the morning, dropping Theo off just south of Bloemspruit (and parking very close to it) and then walking two blocks north to the office. I would then pick him up just after 1 p.m. for drive home for a short lunch.

[36] In December 1953, a friend of my parents took our family on a first trip to Klerksdorp. We saw rock dumped from the shaft of Stilfontein Mine, the very first gold mine in the area, just south of the existing National Road.

At 1:45 p.m., I was back at the bus stop on Wilcocks Road. The bus system was well used, Bloemfontein was mainly a "government town", with public service employees making up the bulk of people. This included the SAR and the GPO and the Provincial and other para-government organizations.

The Sturgess family (Frank and Flo had five children) lived on Whites Road, a quiet north-south street that veered at a very acute angle from Milner Road, the north extension of Aliwal Street, the arterial road north from the downtown. At the north end of Milner Road, a small traffic circle existed (could one call it a "proto-roundabout"?), with a corner store close by. "Never buy at those places," Mr. Sturgess once warned me, "they overcharge you on everything." So we did our shopping in the downtown; wholesalers (like Costco in North America) did not exist in those days. Late one afternoon, Mr. Sturgess called me at home: "Jacob, on my road trip today, somebody gave me a road kill springbok; it is in the boot of my car; would you like to have it?" Looking to Lydia over my shoulder, I responded: "Yes, please, Mr. Sturgess. Thank you." "So, will you please come to fetch it?" And that's what I did next. Arriving back home, Plonia (who was just about 3 years old), dragged herself up on the rear bumper of the Mazda pick-up, staring straight into the glazed over eyes of this dead antelope! This situation obviously needed some explaining and comforting. The next day, we had the beast skinned and processed at the closest butcher east of us, on Andries Pretorius Street (the old National Road leading to Brandfort), keeping the hide for many years, till our dog Buffy ruined it in Whitehorse, Yukon, Canada. A long-lasting fringe benefit?

During 1972 already, Mr. John Woodcock bought a very rare and newly-created "panhandle lot" in the middle of a large street block in an older neighbourhood, east of Milner Road, very close to the west end of Naval Hill Park. When invited, I once went to look at the construction of his new house. He had allowed for the installation of a safe, to be built into one of the outside brick walls, with reinforcing steel bars in the masonry. His wife Elizabeth had just had a son (and I believe his name was Jonathan.)

At that time, Mike Sturgess was in training for the hospitality industry, at the Holiday Inn on Milner Road. One workday, Mr. Sturgess sent me there, so that Mike could send a work-related photo to Johannesburg (to SAICE perhaps?), by making a phone call with a fancy little machine; nobody else had one of these gadgets at the time. One first had to wrap the (black and white) photo around a little roll, clip it in tight and then lock the gadget with a plastic cover. One then dialed the desired phone number. The roll would start spinning rapidly, and one could see a little electronic eye that "read the photo", passing over it as it moved from left to right. On completion it would shut off by itself. This was the first "scanner" as we would call it now! Later, Mike was transferred to Johannesburg, and he probably made a career within the Holiday Inn organization.

The three younger Sturgess children were still attending (English medium) schools in those days, Charles (who had picked up the Mazda 1300 pick-up at Sasolburg) was doing army duty. We met them all at the firm's Christmas Party of 1972, held at Mazelspoort, the City of Bloemfontein's well-known resort at the dam on the Modder River, northeast of the City. It was a great afternoon party, with almost everybody attending, also some non-MB&S guests and "casual employees" like Mr. Ken Harpur, the former Director of the OFS Roads Department. It was a very good and casual affair, very unlike North American parties we attended much later. Many children, many adults, lots of food, wonderful weather, and we went swimming in the Southern Hemisphere's largest freshwater swimming pool, with a length of 444 feet.

We had the custom to take a formal family photo when every one of our four children became nine months old. On the **next page** is what Lydia and I received after a visit to a downtown Bloemfontein studio in November 1972, when Sara became 9 months old, and Theo and Plonia both enjoyed the "Siembamba" radio program every week-day morning. Starting in January 1973, when Theo attended a playschool in downtown during the mornings, Lydia had to record the programs about "Liewe Heksie" and "Oompie Otter" on our Philips reel-to-reel tape recorder, so that he could listen during the afternoons.

Bloemfontein, 10 November 1972.

Lydia's father visited us twice in Bloemfontein in the line of duty, regarding the planning of new industrial areas at Bloemfontein and Thaba Nchu. My parents-in-law also visited us once together, by plane. My father and stepmother, with Gea, also came one weekend.

Our property at 5 Clarens Street, Bayswater, had an area of about 1 700m^2 and a frontage of 33m. The front yard was lawn with a large Canadian Ash, whose seeds had nasty spikes; our two oldest barefoot children could not walk there. We fertilized the lawn with sludge from the City's sewage treatment plant, "free" but one had to get it from the southern City limit, so I drove to get a Mazda pick-up truck full. A few weeks later, the whole front garden was full of tiny tomato plants – because tomato seeds go right through the treatment process! The back yard had a low dilapidated rock wall (which we restored, with a load of sand on my pick-up), and a set of high heavy duty steel posts for a swing. We also restored that swing[37]. There were some large fig trees in the southwest corner of the lot, as well as peach trees. The 3-bedroom house was "OK" for us, (both cold and hot), but we made one particular improvement: On top of the ceilings, creeping through the roof trusses and missing the porcelain bobbins for the electrical wires, I installed a few rolls of fibreglass insulation – quite thin if compared with Canadian insulation standards. I almost suffocated there from the heat under the galvanized corrugated steel roof with minimum clearance. We had a young South Sotho maid named Elsie, born and bred near Sannaspos, east of the City, who lived in the outbuilding behind the single garage. She was excellent with our children, and in early November 1972, we took her along on a week-long vacation at Kei Mouth, on the Indian Ocean east of East London, in a vacation rental (part of a house) right on the beach. We also visited East London, South Africa's main wool export harbour, and drove into Transkei, up to Butterworth. During that vacation, I completed my last assignment for a course in South African Labour Law, digesting and summarizing a book about the 1921/22 Miners' Strike. This conflict had started out as a right-wing labour dispute, but it "changed direction" halfway by Communists, almost taking over Johannesburg (and the whole country), until Prime Minister Jan Smuts sent the South African Air Force to bomb the miners out of the trenches all around the City. A fascinating history, which later lead to specific labour legislation, and even the fall of the Smuts government in the 1923 General Election. (Something similar had occurred in Canada, called the 1919 Winnipeg General Strike, but I only discovered that in 2018 when reading a book about that conflict.)

But we felt somewhat lonely in Bloemfontein, and did not make many friends, except at church and with some distant relatives. One second cousin of Lydia lived in Noordhoek, a "cousin of a cousin" lived in Dan Pienaar, and Lydia's aunt Lydia (du Plooy) dropped in a few times, when on a shopping trip from their sheep farm halfway between Bethulie and Trompsburg. We enjoyed the preaching and company of our pastor, dr. G.P.L. van der Linde, who later became professor at the Theological School at Potchef-stroom. Our neighbours at no. 3 were an elderly couple, and this Mrs. Grant said that she had been born in Revelstoke, British Columbia, Canada. She had gone to England during WW1 to help in the war effort, and met her beloved there, who first agreed to accompany her west, and later to South Africa. Our daughter Plonia sometimes played with a girl her age at no. 7, and this family once had a lady visitor from Transvaal. On hearing our daughter's (uncommon) name, this visitor said that she had only once heard the name before, from a lady in Brakpan - our daughter's grandmother! On Sunday mornings, I lead the congregation in singing some restored Psalm melodies, together with the organist, from the organ gallery.

[37] On GoogleMaps, this house is now a day care. I wonder if the same sturdy steel swing might still be in use!

It was in the fall or early winter of 1973, (meaning May) that I was asked to visit a construction site that I had known about since coming to Bloemfontein. I think this was while Mr. Sturgess was on vacation, and I also went to Tweeling that time (see above). A new railway overpass was under construction just west of Bethlehem, on National Road Route N 5 from Senekal, and it was already close to completion. The Resident Engineer was a young Greek immigrant with the name Apostolos Fafitis; the Contractor was Roberts Construction Ltd. I had met this colleague already in the Bloemfontein office a few times; I knew that he had studied at the University of Saloniki, (the Biblical Thessalonica), and that he had already worked in Greece for a consulting firm, before coming to South Africa for this his first job and project. He was single, and boarded in a hotel or motel in Bethlehem. Apostolos used the same Mazda 1300 pick-up truck that I had used for two years on the P 30/1 project, so I drove to Bethlehem (with my own Mazda 1600 pick-up truck) and had a very nice site meeting discussion with him. The small Mazda was on its last legs, he said; it just did not have any power left. While on site, a (steam) train came from Bethlehem and travelled right under the brand new bridge, toward Fouriesburg, with smoke and steam billowing all over the headwalls: it was quite a sight.

CURRICULUM VITAE **May, 2012**

FAFITIS, Apostolos, PhD, PE, F.ASCE, Associate Professor, Arizona State University
Ira A. Fulton School of Engineering, Department of Civil and Environmental Engineering
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EDUCATION

PhD	August, 1984	Northwestern University, Evanston, IL
MS	December, 1980	South Dakota School of Mines and Technology, Rapid City, SD
BS	1967	Aristotelion University of Thessaloniki, Greece

POSITIONS HELD

1984 - present	Arizona State University, Civil Engineering Department
1976 - 1979	Senior Structural Engineer, Design Department; Roberts Construction, Johannesburg, S. Africa
1974 - 1975	Senior Structural Engineer; Oscar Faber, Pokorny and Partners, Consulting Engineers, Johannesburg, S. Africa
1973 - 1974	Structural Engineer, Liebenberg and Stander, Consulting Engineers, Cape Town, S. Africa
1972 - 1973	**Resident Engineer, Mackintosh, Bergh and Sturgess, Consulting Engineers, Bloemfontein, S. Africa**
1967 - 1972	Fafitis and Paskalidis, Consulting Engineers, Thessaloniki, Greece

PROFESSIONAL REGISTRATIONS
Registered Professional Engineer, European Union
Registered Professional Engineer, S. Africa
Registered Professional Structural Engineer, Arizona, USA

MEMBERSHIPS

American Society of Civil Engineers (Fellow)
American Academy of Mechanics
American Concrete Institute
Masonry Society
Structural Engineers Association of Arizona
South African Institute of Civil Engineers
Greek Chamber of Technology
Chi Epsilon

TECHNICAL COMMITTEES
ASCE Computational Mechanics Committee, Member
PTI Education Committee, Member
AzSCE Bridge Technical Committee, Member
ASCE-ACI Committee 343 (Concrete Bridge Design), Associate Member
ACI Committee 363 (High-Strength concrete), Associate Member
ASME Structural Dynamics and Vibration, past member
Council on Tall Buildings and Urban Habitat (Committee 21-D Cast-in-Place Concrete), past member
ASCE-ACI Committee 423 (Prestressed Concrete), Associate Member

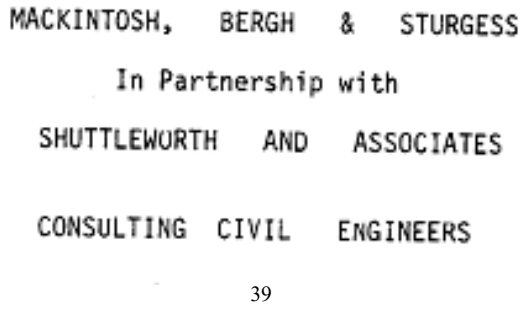
Obviously, Theo Hoffmann had also designed the Clocolan and Bethlehem bridges, but I wondered what Mr. Grodsky had felt when Mr. Sturgess presented him with this newly arrived employee, after the Roads Department's earlier experience with the Greek resident engineer near Clarens (see "Part 1"). I never heard of Apostolos Fafitis again, until the end of January, 2018, when I googled in the words "Mackintosh, Bergh & Sturgess". Way down, on page 3 or 4, I found him, and what he did in his career! **Above** is the beginning of the curriculum vitae (= résumé) of my former short time colleague, and is followed with 7 pages of "publications, books and papers", starting in 1981, and all about reinforced concrete! From this, I can only be sad, because when I worked for ADOT in Phoenix, Arizona (2002-

2008), I never had an opportunity to shake hands with him again. But since 2018, we have had some telephone and e-mail contact (though not at the above phone number).

The "c.v." was likely written (in May 2012) when prof. Fafitis' "tenure" at SFU ended when he became 70 years old. That is (as far as I know) common practice in worldwide "academia". On the other hand, Arizona is a "freedom to work" state, and there is no age discrimination or compulsory retirement age. Perhaps he wanted to leave ASU and join a consulting engineering firm. This case shows that while the world is big, it can also be small, and that every professional follows a different career, in which others are met for a short period and never again, while similar professional relationships may endure for years.

On my way back to Bloemfontein that day, I also did a visual check of two of the microwave tower access road sites that MB&S had just been awarded as a design project for the General Post Office, to serve a system of telephone (or TV or FM?) antennae (called repeaters) from the Witwatersrand to Bloemfontein. Our section was between Bethlehem and Bloemfontein. These towers were proposed on high mountains south of the National Road; the antennae had to be within sight distance of each for the longest possible distance. In the office, we had already reviewed some preliminary road locations and design parameters like maximum grade, acceptable roadway width (for a one-lane road) and minimum curve radius, from the available 1:50,000 topographic mapping. I did not yet have anything specific to do on this project, but looking at the high mountain range, I thought that I realized the challenge.

When making this above trip, I was already aware that I was going to be transferred back to the Pretoria office, where the new building had just been built at 23 Rose-Etta Street, Pretoria West. This occurred as MB&S was merging with a (smaller) firm Shuttleworth & Associates, of which the principal was Mr. G.V.G. (George) Shuttleworth, with two associates[38] named Martin Gouws and Hans Labuschagne. This firm had already had existed since 1967, specializing in railway engineering; Mr. Shuttleworth had worked as a railway engineer for the SAR; two office suites in downtown Pretoria were to be vacated. It was never satisfactorily divulged why this merger occurred, but it dawned on me recently that among the various advantages evaluated by the decision makes, "economy of scale" and the financing of "Inflo House" might have been two of the reasons. In any case, it was none of my business; but during initial merger discussions, it had supposedly become clear to the partners that the work load in Pretoria needed an additional body, while (as can be deduced from the above), the work load in Bloemfontein remained "problematic" due to (what I had already noticed as) political wishi-washiness about the provincial road construction work. But I must add that while Mr. Sturgess sometimes mentioned the situation, he did not mention it when asking how Lydia and I would respond to his (or the partners'?) suggestion that I be transferred back to Pretoria. He knew that we were from there and had roots there. And I later appreciated it if during his occasional visits to Pretoria, he always came to greet me.


MACKINTOSH, BERGH & STURGESS
In Partnership with
SHUTTLEWORTH AND ASSOCIATES
CONSULTING CIVIL ENGINEERS

39

On hearing of this proposal, Lydia and I liked it, agreed to it both looked forward to this move, which included a good salary increase as well. My father and stepmother, and particularly Lydia's parents, liked

[38] A technician or technologist could not be a "partner" in a South African consulting engineering firm at the time; that is why the term "associate" was used. It is just as with Walmart today. No shareholders of a limited company. Both Martin and Hans had likely been SAR employees before joining Mr. Shuttleworth's consulting firm.

[39] An excerpt from the cover of a MB&S Promotional Brochure dated July 1973. Quite soon afterwards, the words "In Partnership with" was changed to "In Association with". That situation did not last long either – see below.

the idea; we would be closer by to all of them. My in-laws had sold their house at 946 Pretoria Street, Hatfield, "semi-retiring" to their citrus farm west of Hartebeespoort Dam; this made the idea of "where to live" somewhat easier for us. Why? Houses in the eastern suburbs of Pretoria were at that time already becoming quite pricey, more than those west of Church Square or north of the downtown. There were a multitude of (mostly uncoordinated!) traffic signals, the road system was very busy, particularly during peak hours, and commuting right through the downtown area on a daily basis was not something to my liking. The price of petrol was rising at that time, and we would shortly have rationing and very strict speed limits, in both urban and rural areas. What should we do?

With work in Pretoria-West, we therefore decided to look **west**, finding various houses under construction in Schoemansville Township, (proclaimed in 1925), on the east side of Hartebeespoort Dam, skirting the road that runs through the tunnel and over the dam wall – where the Latin words "Sine Aqua, Agricultura Non Est" explains the original purpose of that facility. The distance from Schoemansville to 23 Rose-Etta Street was about 32km, and guess what? I would only have to negotiate through three traffic signals each way: One at Church Street West and Danville Road, one at Church Street West and Buitenkant Street, and one at Buitenkant Street and Mitchell Street. None of the access roads to Atteridgeville, Kwaggasrand, West Park and Proclamation Hill, (in that order from west) were signalized at that time! Hard to imagine, check GoogleMaps now. (Note: There is now a freeway paralleling Church Street West extension.) The number of traffic signals between Rose-Etta Street and any residential area east of the downtown would likely have been more than twenty in 1973. So while my daily commuting distance from Schoemansville would be longer, it was most likely shorter in time, and more economical for gas. Experience later proved my guess as correct – and I honestly enjoyed the half-hour or so of rural driving, crossing over the Daspoort Range at Saartjies Neck, which has now been entirely changed with a new freeway!

One house seemed to meet our expectations in terms of size, price, locality and availability: 45 Hertzog Street, on a 100 Cape feet wide x 150 Cape feet deep lot, (1 487 square metres) almost at the front entrance to the Village (under PUHB control) and still under construction by a Mr. van Vuuren who lived on the corner of Kuyper Street across the street. South of Kuyper Street was Generaal Hendrik Schoemanskool, an Afrikaans elementary school, as if "**just in time**" for Theo and Plonia! So we purchased this incomplete house, receiving (and believing) a completion date for moving in, and were then successful in selling our house in Bloemfontein with a small profit (after having lived there less than 18 months). Our move was toward the end of June (mid-winter). The timing was important as Lydia was expecting our fourth child, Joss, toward the end of September. Once again, MB&S paid Transvaal Cartage, and on a Monday morning in early July, I drove my Mazda 1600 pick-up truck to Pretoria West, starting a three-year period with lots of expectations, which after much reflection, were not disappointed.

In retrospect: Our three and a half years in the Orange Free State have never been regretted by Lydia or me. It was a time during which I gained a certain level of confidence and independence in thinking, and a realization that I was appreciated. Just like before, I was able to "multi-task" and none of the projects shown above were really done chronologically or in isolation. Lydia gained a level of self-sufficiency that would not have been possible if we had remained in Pretoria. For me, this was assisted by Mr. Sturgess typical way and level of supervision, but also (in Bloemfontein) by the way that the OFS Administration assisted its professional staff, including their consultants, by providing free learning opportunities. Regular lunchtime movies were screened in an auditorium at the Hendrik Verwoerd Building, and two presentations there (with discussions afterwards) **stand out**: One was about **"Traffic For Towns"**, i.e. the British Ministry of Transport's "Buchanan Report", and the other one was about **"Forgiving Highways"**, a system of highway safety feature design that had been developed in the State of Oregon, USA. Later in my career, having knowledge of both these things proved very valuable; but of course, I did not know that in mid-1973.

Chapter 2 – Continuing with Mackintosh, Bergh & Sturgess, Pretoria (1973-76).

The H-shaped concrete frame building at 23 Rose-Etta Street was virtually complete; here and there, vinyl floor tiles and wall corners were still being glued, and the place was full of cardboard boxes and desks and chairs, as people were moving in just as I was doing with my books and paraphernalia. I was assigned an office in the middle of the rear of the third of four floors. There was no actual "first floor", only an entrance hallway with stairs and an incomplete elevator, on the north side. In my office, a large bench below the full width east facing windows had not been built; when I noticed what was being built in the adjacent office, I asked Mike Burgess if it would be possible to have my workspace built "higher" than those being installed. That request was granted by a colleague whom I had just met, and I enjoyed this "customised" feature for three years. The building filled the width of the property, but had setbacks from the front lot line and the rear lot line. It was "indented" on both north and south sides, which allowed light on the third and fourth floors, while the second floor was not an H but almost square. The street entrance was in the middle of the frontage, and on ground level, there were parking stalls both north and south (soon to be paved) and one could also drive through to the back yard, which was the storage place for all the bags of soils and concrete cubes. The second floor (with a higher than normal ceiling) was the Soils Laboratory, and the materials were to be hoisted up from the back yard to the first floor – this hoist (on the flat roof) was actually directly in front of my office. Louis van Wyk had his office on the north side of the Soils Laboratory, with glass windows (because there was no actual front window).

Inflo House, 23 Rose-Etta Street, Pretoria West, around 1974.

On the third floor, two "wings" existed, (like the legs of an H): In the front wing, five west facing offices toward the street, and other offices off the north-south hallway. In the rear wing, four east facing offices with (on the south side) another hallway leading to an outside steel emergency staircase.[40] This also led to the flat roof, and I often used it as a "short cut" to the fourth floor, instead of using the staircase

[40] Much later, we (meaning Jens, Colin and I) joked that the "partners" had their offices facing the street, and the "associates" had their offices facing the back yard. From south to north, occupation of the front row was Bergh, Fasken, Meijer, Burgess and Shuttleworth, and of the rear wing was Louw, Kaal, de Raadt and Frehse. Mike Meijer was not there in July 1973, and I had not met Jens Frehse before. I do not remember where others like Alf van Onselen, a technician, had his office. On the fourth floor, there were some more individual offices.

adjacent to the elevator in the front wing. The rear wing of the fourth floor contained the large draughting office and a few individual offices; the front wing of the fourth floor was mostly left undeveloped in 1973; I remember that we used it for coffee room (so there must have been a kitchen), there was a table tennis table, and Mr. Nagel, the accountant, had a desk there, somewhat forlorn in the huge "open space".

Perusing the August 1973 Promotional Brochure (in 2018) reminded me of the other staff members at that time. Darrell Beeton, P.L. Cloete, Melvin Kaplan, D.J. Pretorius, A. Roosendaal, L.C. Stewart, Mike Hughes, H.C. Thompson, Mrs. I. Krofta and Mrs. E. van Vuuren. Over the three years, some others came and left again, most stayed. After a secretary whose name started with an "E" had left, another lady whose name started with an "E" came and left, and then a third one came whose name also started with an "E". I could not help but asking: "How long do you intend to work here? Do you know that one of your predecessors left because she retired, and the one who just left a month or so ago, did so because she is expecting a baby." (This new lady was Mrs. Estelle Steenkamp, a widow who attended the (small) Afrikaanse Baptistekerk, so she just laughed at this, and was still there when I left.) But unfortunately, I do not remember specifics about who of the technical staff worked with and for me, and on what project.

On arrival, I discovered that the firm handled three types of projects, based on the series of file numbers. I found this "separation of the files" quite interesting. The **1000 series** (meaning projects like 1013, 1018, 1027 and the like) were TPA Roads Department assignments; the **4000 series** (meaning projects like 4008 and 4019) were the other "government and para-government" assignments, like City of Pretoria and Bantu Investment Corporation; the **7000 series** (meaning projects like 7013 and 7036) were all "private sector" assignments, and these obviously varied in size from very small to substantial. They could be for a soils investigation for a small proposed Township (with twenty residential lots) or a railway siding for a large hog abattoir at Estcourt Natal. I do not know how the partners had merged the two predecessor firms' file numbers. In Bloemfontein, I had not been involved in dealing with project files, but during the next three years, I definitely became involved.

Another interesting thing that I remember from those days is the specific "method of filing" of correspondence items in a file. Mr. Bergh told me once that this had been Mr. C. S. Mackintosh's idea: "**A project file should be read like a book.**" This meant that all letters and documents on file had to be hole punched at the left side of the pages, and then inserted in the front cover of the file. Any newer page(s) would be added **to the rear**. Much later, in my other fields of employment (both public and private) I tried to emulate this most logic system – with somewhat less than acceptable success. Only when I started Grassroots Consulting Services in late 1992, I decided to implement this fully. In between, I had to deal with the old fashioned "red tape" style files, with all papers hole punched at the top and added to the top of the file – which was obviously quite awkward when reviewing something from perhaps even a few month before. So much for standardization! Mr. Mackintosh should have patented his idea.

It also appeared that I would actually work for three bosses or supervisors. (We did not use those words at that time.) Over the next three years, I was made responsible for projects in the **1000 series**, the **4000 series** and the **7000 series**. The style of "supervision" (if one could call it that) was loose but good. I was given the opportunity to handle many things almost by myself, but knew that I needed to discuss any important or possibly controversial thing with those in the "front wing" on a regular basis. This was not seen as problematic in 1973; my colleagues likely did the same thing in slightly different ways. On retrospective thinking (in 2018), there was obviously a difference in how Mr. Bergh wanted to have things done, how Mr. Shuttleworth wanted to have things done and how Mr. Fasken wanted to have things done. They had each had their different years of training and experience, for much longer than my 7½ years at that time. I handled projects for all three of them, and only around 1976, I sometimes needed to justify why I had given more attention to e.g. completing a project for the one and not really doing much on a project for another. At one time in late 1973, before Mike Meijer came, Colin Louw was asked (by the

partners) to get us (meaning the engineers, plus Louis van Wyk, Martin Gouws and Hans Labuschagne) together for a progress update meeting, taking an hour or so. These meetings were first on a monthly basis and later on a biweekly basis, and were unfortunately not attended by the partners, as far as I can remember. These meetings were held in the middle front office that Mike Meijer later occupied. (See below about the "Schedule of anticipated engagement" document of October 1975.)

For Mr. Adrian Bergh, I mostly handled some **1000 series** Basic Design projects for the Transvaal Roads Department. There were several of these over the years. I also handled the development of Lot 91 Roseville project under his supervision. For Mr. Jack Fasken, (who was new to me in July 1973), I handled several large street and storm sewer design / construction projects for the City of Pretoria, and later, also the preparation of Soil Investigation Reports for proposed private townships around Pretoria, for which Louis van Wyk obviously handled the drilling and testing. These projects fell into the lap of MB&S from a local survey firm Fehrsen & Douglas, in Bureau Lane. (I had known Mr. Douglas and Mr. Newham, his sidekick, from my days at BSB&P.) For Mr. George Shuttleworth, I handled a variety of smaller projects (that he had brought into MB&S with the merger), some of them TPA projects and others private sector or SAR projects. But interaction also existed; any project with a railway component obviously received input from Mr. Shuttleworth; anything with a geotechnical component needed Mr. Bergh's input.

Most of the TPA assignments I handled were to develop "Basic Planning" design drawings (and cost estimates) for "Conventional Double Carriageway Provincial Roads"; as the term explains, these were not freeways, but were for divided sets of two traffic lanes; one would call them "expressways" these days. This was not unlike the Bryanston project (for which I had done detail design in 1966), but in a more rural setting. It meant developing drawings for "twinning"[41] of an existing highway. The first one of these was for a section of the Road P 73-1, the Golden Highway, **Project 1001 – Grasmere - Vanderbijlpark**. The south project limit was near the intersection of the Vereeniging-Potchefstroom Road P 24-1 - that would cross the new N 1, which was not yet being designed at that time. A road map from the 1980's shows that the Golden Highway was indeed twinned and that (as Route 54) it became the "Temporary National Road" until the N 1 would be completed. The north project limit was at Grasmere Township; Strydom, Newmark & Anthony's similar assignment for the TPA Roads Department continued further north, and there was at first some confusion about the actual project limit between "us" and "them".

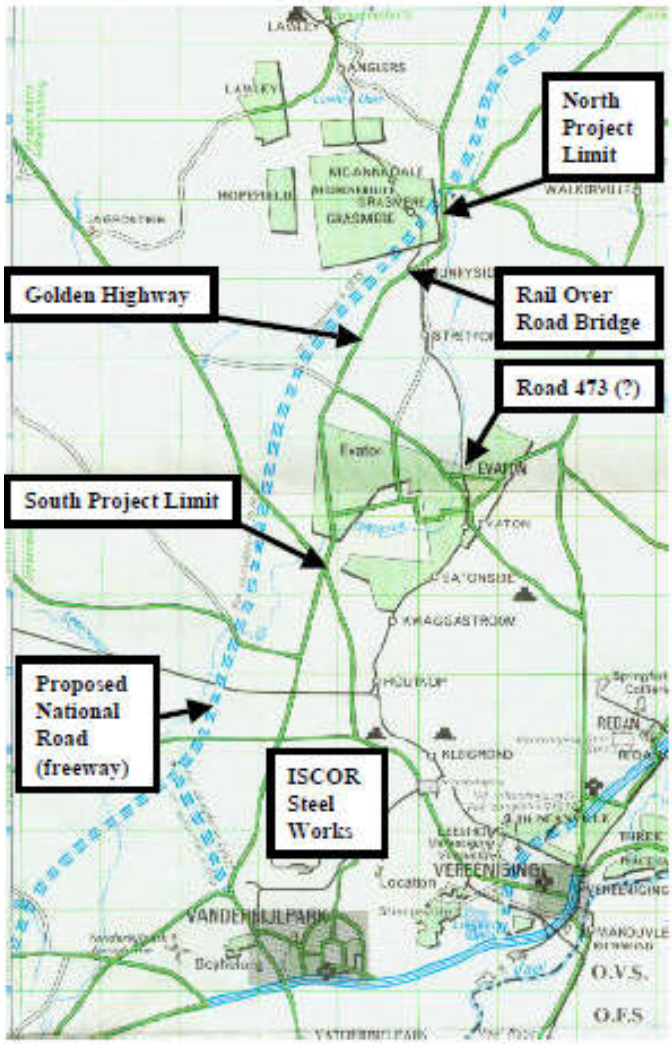
This highway skirted by a large black residential township called Evaton, which at that time was only built up west of the Golden Highway, and passed under a high railway bridge near Sunnyside station. This bridge had been designed with future road twinning in mind, and all we needed to do was to check its as-built drawings to confirm that the TPA required distance between the two carriage-ways would fit. (See the photo on the next page.) The geometric alignment was not problematic, the horizontal curves were mild and there was one particular ridge north of Evaton Township. This ridge was traversed with a long vertical curve to meet the design speed. The proposed vertical alignment was not much different from the vertical alignment of the existing road. The current **eastern (southbound) carriageway** is the new one. (What was built, is shown on GoogleMaps: Housing now abuts the Golden Highway; on the east side is a long retaining wall; there are many pedestrians on sidewalks! This assignment was completed in two stages: the southern 2/3 in June 1974 and the northern 1/3 in June 1975[42], with excellent cooperation from the draughting office directly above mine. Hans Labuschagne was actually in charge of all the people there, and one had to regularly keep him in the picture regarding priorities – I did not have

[41] I later heard that the term "twinning" is used in Canada, (e.g. Hwy 401 in Ontario) but not in the United States.

[42] Access challenges had to be resolved at the Grasmere end: Access to an existing commercial property, accesses for a proposed subdivision at Road 2150 and Second Avenue, Ellerslie Township, and later a proposed access road near the rail-over road bridge. After all drawings for the south half had already been submitted in July 1974, with all the compensation diagrams, MB&S asked for an extension for the north half to June 1975, which was granted.

people "designated" to any of my projects. TPA needed an additional set of mylars, on which proposed "access control" measures had to be shown. An extension to the south was also given (see next page).

All land north and west of Evaton consisted of (mostly vacant) agricultural holdings. The TPA wanted proof that the integrity of the highway, after twinning, would be maintained. The minimum at-grade road intersections separation on the Golden Highway was specified as 800 metres[43]; there would be absolutely no direct access for any individual property, even at these intersections; access for all properties adjacent to the Golden Highway had to be diverted to (existing or proposed) local roads, which would all be connected to the approved intersections; there were no "frontage roads" parallel to the highway. Note that we did not design any of these local roads, we only had to indicate where future "road servitudes"[44] would be needed for this level of "access control" (which we now call "access management").



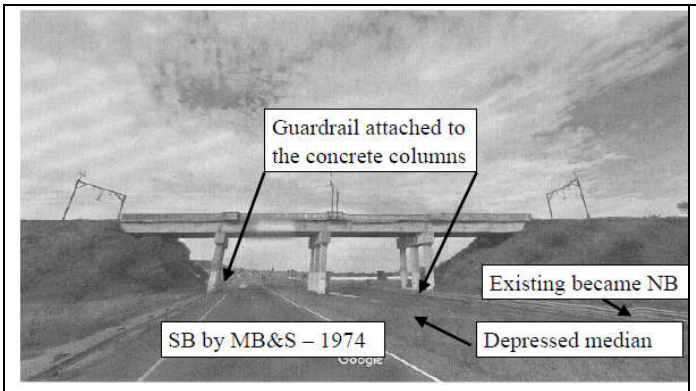
Copied from a 1974 AA RSA "Reef Through-route Map."

All these "future local access roads" were shown as dotted lines (with a width of 10 metres), invariably along the boundaries of existing properties. On approval of the Basic Planning, a copy of this set of mylars would be filed with the Surveyor-General, so that any property owner who considered developing his land near Grasmere, would be told "up-front" what he had to do (at his own cost?) as a prerequisite. I guess that this method may well have stalled land speculation, but I found this a wonderful way to protect the future viability and integrity of the highway system. In retrospect, however, I need to say that all this was done without any public input. Implementing a system like that (meaning in BC in 2018) would just be unthinkable. January 2015 GoogleMaps images show that traffic signals and four-way stop signs now exist along the Golden Highway, with signs "Intersection 500 metres ahead" and some effective (?) access management, and even sidewalks (!), but that fortunately, no direct property accesses exist.

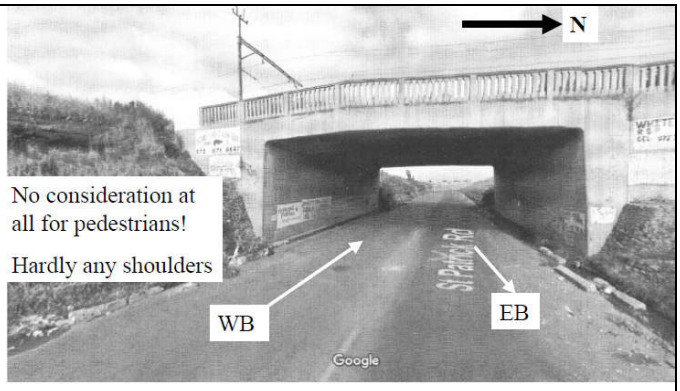
Road 473 was a road improvement project close to and east of the Golden Highway; it included a proposed railway overpass near its east project limit. This had been a Shuttleworth & Associates project before the merger, and was smaller than P 73-1. The TPA Roads Department had three different panels for consulting engineering services[45]: An "A" Panel (for larger projects like freeways), a "B" Panel (for medium projects), and a "C" Panel (for small projects). The latter panel could perhaps include electrical engineering services for traffic signals (called "robots" in South Africa since 1929). Before the merger, Mackintosh, Bergh &

[43] TPA likely followed the "half-a-mile" AASHO Blue Book guideline for expressways. By that time, the AASHO Red Book (for Urban Highways) had been developed. I cannot remember if that was used in South Africa.
[44] In North America, one would call them "right-of-ways".
[45] As explained in my "Part 1", Requests for Proposals or other types of solicitations for getting work did not exist.

Sturgess had been on a different TPA panel than GVG Shuttleworth & Associates. (I cannot recall if these were "A & B" or "B & C".) The really large projects in those days were of course not those of the TPA but of the National Transport Commission, Ministry of Transport. This situation continued into the "Toll Road era"; Mr. Ivor Evans (of BSB&P) once e-mailed me that these were the "very lucrative years".



Bridge spans (with guardrails on the sides, but not in the median) do not meet current design criteria.



St. Patrick Road railway overpass on former Road No. 473 (?). Bridge No. 3123 constructed in 1976.

It was likely in the spring of 1973 that I was asked to accompany Mr. Shuttleworth for a meeting with Mr. Christo Kuun PrEng of the TPA Roads Department. I was only vaguely aware of Road 473, but I knew Mr. Christo Kuun already; I had met him once or twice when I was employed at BSB&P, and we had also met sometimes at Pretoria District meetings of the SAICE. I had visited him a few weeks earlier about the Golden Highway project, but Mr. Shuttleworth was unaware of that. So I was quite amazed when, at the beginning of the meeting, Mr. Shuttleworth introduced me to Mr. Kuun with the words: "**This is Mr. Jacob de Raadt, who now works for me.**" I directly realized that on hearing this, Mr. Kuun felt a bit awkward. On my return to Rose-Etta Street, I only mentioned this to Mr. Bergh, not giving it any more thought for quite some time. See below for more. I believe that this was the kernel of problems later on.

On GoogleMaps of March 2010 I see a railway underpass on "St. Patrick Road" for Bridge No 3123. I think this is the one on **former** Road 473, but as I had no specific responsibilities for that, and as I cannot remember any of my colleagues handling the detail design, could it be that this "conflict between panels" was noticed, and that the TPA Roads Department engaged another consulting engineering firm for the project? If so, that would explain what happened starting around 1975 between the partners – see below.

An extension to the project on Road P 73-1 became our **Project 1029**, and this was for similar Basic Planning between the Vereeniging-Potchefstroom Road P 24-1 (which had been the former south project limit) and Delfos Boulevard at km 10.5 (measured from the Vaal River). This Basic Planning work was completed and submitted to the TPA on the 29th of August 1975. The Pretoria firm Opmetingsdienste did aerial mapping for both sections of P 73-1. One item that stands out on that project was the crossing of Bridge No. 1240 for the ISCOR works' wastewater disposal furrow, to be widened / replaced for a twinned highway. The area east of this section of P 73-1 was a huge ugly dumpsite for slag and what not from the steel factory, and we experienced some problems getting ISCOR's comments about certain things, after asking them three things in June 1975:

(a) The expected design wastewater flow of your canal, for which these bridges need to be designed (with an additional note: "The bridge deck needs to be replaced in any case").

(b) The provision (if any) of normal stormwater flow crossing this road between the canal and AJS filling station;[46]
(c) The positions (if any) of driveways to your property from P 73-1 for the same distance as in (b).

That same month, there was also an issue about a proposed water supply line to Parksig Elementary School that would cross P 73-1 south of Iscor's ditch. At that time, detail design of one carriageway[47], as well as right-of-way acquisition for 62m wide right-of-way, was already being done by Strydom, Newmark & Anthony. My response to TPA was (as summed up): "So Mr. Herbst, would you please ask them for comments? We return the paper print that you sent us. And by the way, this proposed water supply line also crosses Road P 155-1, which is likewise being designed by Messrs. Strydom, Newmark & Anthony." Was I perhaps shooting too straight? But due to this, we had to ask for an extension of time, which was granted. It is very sad to note that GoogleMaps shows that this section of the (former) Golden Highway was never twinned, and that the Iscor Vanderbijlpark works are also no more.

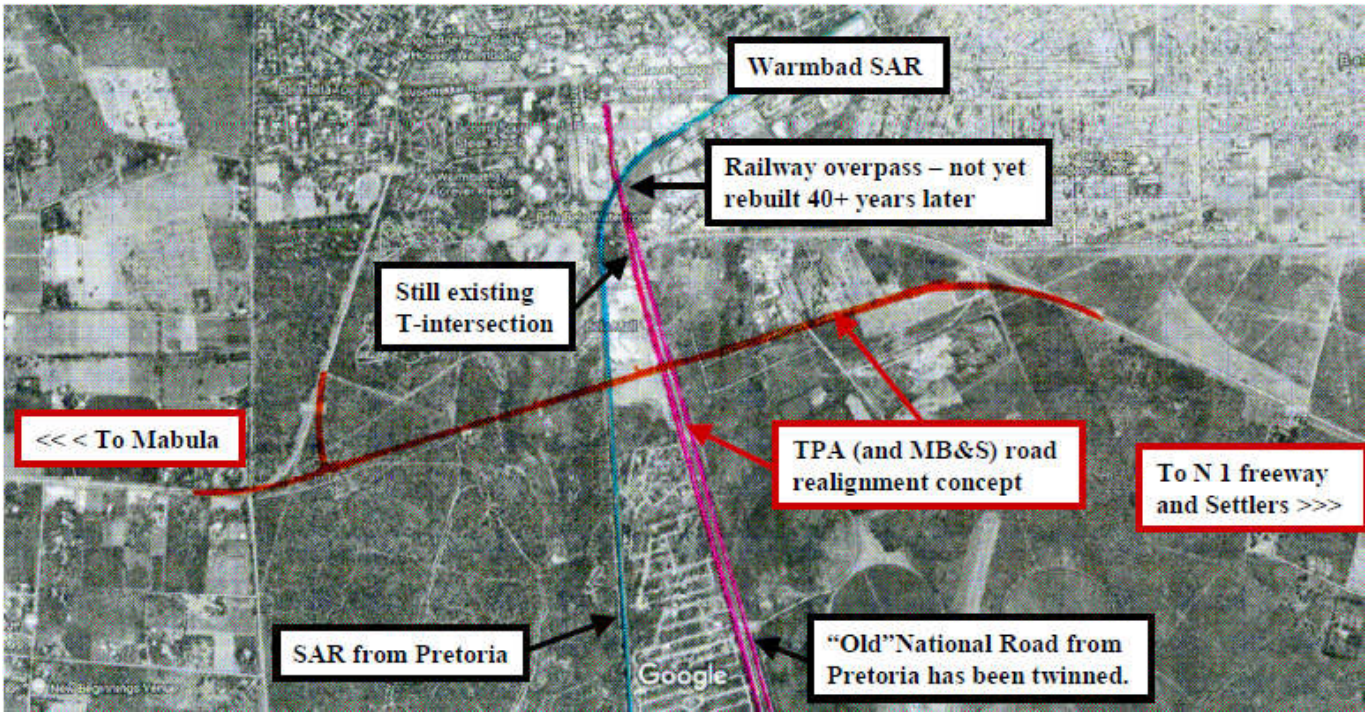
Our **Project 1002** was a similar Basic Planning project for Conventional Double Carriageway Provincial Roads. Its detailed name was "**Basic Planning of Roads P 1-3, P 20-1 and P 85-1, District Warmbad.**" Internally, we called it the South Warmbad Access Project. The existing National Road P 1-3 (coming from Pretoria) intersected with the Warmbad-Settlers road **P 85-1** at a point directly south of an existing railway overpass on P 1-3 south of town. The design concept was to twin both P 1-3 (the "old" National Road) and a short section of P 85-1, which was later extended to its proposed interchange with the "new" National Road N 1 (which was already being designed as a freeway bypassing Warmbad). This P 85-1 would be relocated close to town, crossing P 1-3 with a signalized intersection and then continuing west over the railway line (with a set of overpasses) and a west project limit about a kilometre west of the railway line, joining the Warmbad-Mabula road P 20-1. The advantage of such system would be that through traffic (in town, around the warm baths, a very popular and busy tourist attraction), would be decreased. The existing National Road P 1-3 was already downgraded to Provincial Road status, and would be twinned for a short section, even into town, which would mean widening or replacement of the existing railway overpass (Bridge No. 1226) – because that structure, built around 1938[48] (1) was very narrow, (2) ran over a sharp single track railway curve close to the Warmbad railway station, and (3) this road had a vertical curve with a low k-value – although the design speed on the north side (in town) was obviously lower than "out-of-town". Double tracking was also anticipated (as wishful thinking?) by the SAR, and I do not know if they had already committed to contribute to the project.[49].

For the Golden Highway project, aerial mapping had already been completed by July 1973, although I remember requesting the survey firm to provide additional cadastral information on the edges of some of the mylars, to show the "roadway servitudes" mentioned above. For the South Warmbad Access project, MB&S had to organize the aerial mapping for the strips of land for the project. This area is quite flat, and it was therefore possible to arrange low-level flying and mapping, as well as ground control that showed benchmarks with accurate elevations, to three decimals. In May 1974, we requested quotations from the four aerial survey firms in Pretoria and one in Johannesburg, and accepted one from the Pretoria firm Fotogramensura, that had (I think) its office on Du Toit Street, east of the downtown. They produced all the mylars to TPA specifications, and a very thick field control data book, which I then took for checking

[46] I do not know if this was a normal gas station or a "card lock" operation. It might even have been an ISCOR owned facility. I visited this plant site (= the computer room) while studying in 1970 or 1971.
[47] I can only assume that this was the additional carriageway. From the context, it appears that it was never built.
[48] At TPA, I saw the original documents for construction of this overpass, and its price in 1938, £ 38,000. The civil servant who showed me the papers, agreed with me that demolition in 1975 would cost about R 200,000. Building a new bridge would obviously also need to consider "Accommodation of Traffic" at this location. (Detour route?)
[49] Shared funding for this type of reconstruction projects is typical in Canada and the USA.

to the surveyors at the Survey Division of the TPA Roads Department. We paid them, but could only claim an amount from TPA based on certain set rates for Contour Survey Class D (per km) and Detail Survey Class D (per ha). The TPA Survey Division was in the north block of the Provincial Building, overlooking Church Street West – while the Surveyor-General's Office (dealing with legal survey plans) was across the street from them. Over three years, I built a good relationship with these gentlemen.

When knowing on which side of the existing carriageway(s) the twinning(s) had to take place, which had already been "pre-determined" by TPA for all of the (old) National Road north of Pretoria, the project was straightforward – both roads were straight and a single long swooping curve close to the intersection was all that was needed. Obviously, a substantial electrical sub-station had to be "missed"; access to a proposed new Township (Warmbad Ext. 6) had to be agreed to, and questions from the Towoomba Agricultural Research Station[50] had to be answered: This facility was not within our project limits, so we told them that, suggesting that they ask TPA when basic planning for that section would be anticipated.



The location of the intersection allowed gentle grades and appropriate vertical crest curves for both proposed railway overpasses. The entrance into the Town of Warmbad was at one time discussed with the Town Clerk, as the north project limit was established at an existing traffic signal at Market Street and Potgieter Road, where everybody turned right on N1 to Naboomspruit and beyond. This was not a difficult project, and it was completed – meaning the Basic Planning Drawings and the General Arrangement Drawings for three bridges. This meant Bridge Nos. 3801A and 3801B – railway over-passes directly west of P 1-3 – and Bridge No. 3802 as a complete replacement of Bridge No. 1226 on the sharp railway curve which was (by the way) very close to the west limits of Warmbad Railway Station. These drawings had already been approved by a lower level SAR official, and were submitted in August 1974, with a request when we could proceed with Compensation Diagrams. We also reminded the TPA that an agreement for detail design already existed with a number 71-72/68 D. Our single "Invoice No. 1 (final): for this work was submitted for R 11 688,16, and this included the aerial survey (R 3 651,70) and drilling of boreholes, including travel (R 1 161,70). I do not know how much MB&S paid the aerial survey firm!

[50] (1) Are culverts proposed for cattle? (2) Would widening affect long-term pasture tests number VB1 & T-TW2?

The extension to the SE was then assigned to us, and this was submitted in September 1975, and paid. But it seems that the Agreement for doing the detailed design was never put into place; nothing was built.

We all knew in those days that this new National Road N 1 to Pietersburg was a priority for the National Transport Commission, and that it was partially being built for "military purposes".[51] I remember hearing numbers of the anticipated traffic volume on this road (near Warmbad) in the order of 4,000 vehicles per day – and did not know if this number was "high" or "low", or for which "design year" this traffic volume had been estimated. Most likely, I also was also already aware that any freeway could be built in stages. There are three typical types of this "Stage Construction":[52] In "**Case 1**", one would build both carriageways and delay construction of the interchanges. In "**Case 2**", one would build one carriageway plus the interchanges for a twinned system, but delay construction of the second carriageway. In "**Case 3**", one would do some of the one and some of the other. For the National Road to Eastern Transvaal, the idea of "**Case 2**" was followed – as Lydia and I noticed in 1991 when we travelled to the Kruger National Park on my only visit to South Africa after 1977. On Vancouver Island, with the Inner Island Highway project between Qualicum Beach and Menzies Bay (130 km) for which I had participated in completion of the Preliminary Design Study (while working for Crippen Consultants in 1990), the idea of "**Case 1**" was followed.[53] A "**Case 3**" scenario existed when the Trans-Canada Highway was built through the Lower Mainland. When we arrived in British Columbia in the summer of 1989, I started to work for Central Valley Engineering in Abbotsford. At that time, the BC Ministry of Transportation was planning the last three interchanges (at Whatcom Road, Yale Road West and Annis Road) and one overpass (at Gibson Road), while twinning near Herrling Island Road (further east of Chilliwack) was just being completed.

Looking at GoogleMaps, I am saddened that the Warmbad-Settlers road was not relocated and still has a T-intersection at the former "old" National Road just south of the railway overpass – which is the same structure from the late 1930's, with one railway track. Major land development straddles this Warmbad-Stettler Road. There is still no easy way to go to Mabula. However, I am even more saddened to note that Market Street is now called Marx Street…

A third highway project, the **Ogies Bypass, Project 1003**, was a relocation of Provincial Road P 29-1. This was not per se for a "Conventional Double Carriageway Provincial Road" but for a normal two-lane single carriageway road, originally a GVGS&A assignment. Ogies was (and is) a small town and railway station where three railways meet, one from the west (from Germiston), and two from the east (one from Witbank and one from Volksrust, i.e. Natal). Coal exports through the Port of Richards Bay had resulted in the SAR's major upgrading ideas of the latter railway line, with the underlying idea that all coal trains from the Witbank area would be re-assembled at Ogies into super-long "unit trains", in a substantial railway yard. The Provincial road system ran south of Ogies Station. For the east end of Ogies, the existing railway overpass (over the tracks to Volksrust) would need to be replaced with an overpass over four railway tracks. A road bypass north of Ogies Station was also envisaged. So we (meaning MB&S, including me) agreed with what TPA had already considered as the most logical location, and submitted our Route Location Study in February 1974.
This was not, as would be the current and appropriate way of approaching a project like this, based on an extensive multi-disciplinary study and lots of public input. We had the aerial mapping prepared by Pretoria Opmetings (Pty.) Ltd. As stated above, we asked for quotations from survey firms and then we

[51] Other projects (of all levels of government, and all over the world) could also be seen as "military" in purpose. The official name of the United States' Interstate System is an example. Hey, Eisenhower was its President!
[52] In October 1963, in a paper to the SAICE Convention, Mr. P.A. de Villiers, Chief Engineer, National Roads Division, Department of Transport, had covered this topic and the principle: "Freeways must be New Highways".
[53] I took many years during the 1990's to complete, and is a beautiful route. With the diminishing population in the entire northern part of Vancouver Island, it is questionable if the interchanges will ever be considered necessary.

liaised with the successful firm – until we received their "completed project": a set of mylars, a thick book of field control data and a box full of pretty low-level aerial photos. It was all ready to be digested and get cracking with Basic Planning. We prepared preliminary planning drawings, (plans and profiles) of a long sweeping curved alignment around Ogies, with a "General Arrangement Plan" of the huge railway overpass, and all the appropriate links to existing roads in the area.

But then I somehow noticed a number of small dashed line squares on some of the mylars, complete with numbers. These 10m x 10m areas were obviously "servitudes" on the land, directly northeast of Ogies Station. This was a mixture of pasture and cultivated lands (which was farmland although owned by a mining house), and there were two worked out and abandoned shafts of an underground coal mine in the area, with some very unsafe and rusted out fences around them. I directly checked the thick book to see what these "servitudes" might mean, and found an interesting clue # 1. The surveyor did not know; he had only written a note that these were indeed servitudes, but he had not been able to establish the details, with a suggestion to contact the Office of the Surveyor-General! When I mentioned this "abnormality" to Mr. Bergh, we got the ball rolling, but only in stages. Mr. Bergh phoned somebody at the Office of the Surveyor-General[54], and received a response. This gentleman (obviously a legal surveyor himself) did not know, but he graciously gave the phone number of someone who would know, at a specialty consulting engineering firm in Braamfontein, Johannesburg, with the name Fenix & Scisson. (This firm had likely applied for registering the "servitude" on behalf of their client, with survey plans prepared by a legal surveyor, of course.) By phoning that phone number, Mr. Bergh was then able to arrange a meeting with these men in a week or so. We went together in his blue Citroen DS 19, with the licence plate TP 952.[55]

The information resulting from our meeting in Braamfontein with two friendly Texans can be summarized as follows: Fenix & Scisson was an American firm that had been retained by an undercover strategic government organization with the name "**SFF Association"** (= Strategic Fuel Fund Association?) that fell under the auspices of SASOL, the South African Oil and Gas Company. Their assignment, as **petroleum engineers**, was to develop quite detailed plans to store huge quantities of crude oil in a number of worked out coal mines in South Africa, most of them in Transvaal, and to then also implement this plan and operate this concept **in secret**. This crude oil was supposed to be imported by the joint venture between SASOL and the National Iranian Oil Company (NIOC), the same company that had already built the NATREF refinery at Sasolburg. Crude oil would come from the Port of Richards Bay by way of the pipeline that crosses P 30/1 just south of Kragbron,[56] in the OFS. The reason for this storage of crude oil was of course the then already perceived idea that international sanctions and boycotts of South Africa might occur at some unknown time in the future. "**National Security**". The idea of crude oil in coal mines is based on the principle that crude oil is slightly lighter than water. Oil would be pumped into a mine and would sit on top of the ground water that normally seeps in from all sides of a mine into its bottom. (The particular mine near Ogies was less than 200 metres deep; water stood in the shaft at a depth of about 30 metres when I once dared to look down.) After first pumping out the water and cleaning out the old mines with rock moving equipment, specific low points (or sumps) in the floor of the mine could be "built". From each of these sumps, water could then be pumped out by a vertical pipe, and one would be able to check the result of pumping out water by seeing the level of oil dropping when looking down the shaft. In this way, the content of the "oil reservoir" could be regulated. The 10m x 10m "servitudes"

[54] If I had phoned the Office of the Surveyor-General by myself, I would clearly have been unsuccessful. Mr. Bergh, a former TPA and VKE employee, Past President of the SAACE, with more years of consulting experience than I, was perhaps one of the few to whom this information could be divulged. I felt privileged to work for him.
[55] Mrs. Pam Procos, his secretary in those days already (and much longer after I left the firm), sometimes used to joke: "His car has the wrong licence plate number; it should be 529, because that's when he arrives at the office!" It was known that on his way to work, he always picked up the mail at the downtown P.O. Box.
[56] See my "Part 1" book about details of the culvert that was built over this pipeline in 1970/71.

around the mine were not for pump stations or vertical pipes, but only perimeter holes and ventilation holes for **monitoring standpipes** to establish the effectiveness of the "as required" water pumping.

A secondary result of our meeting in Braamfontein was that Fenix & Scisson had no specific objections to the proposed location of the Ogies Bypass. We would only need to ensure that none of the already registered "servitudes" fell within the proposed "road reserve". In September 1974, I wrote to Messrs. Blore and Eve at the SFF Association, submitting a print of the preliminary layout plan, showing that we had missed all the "squares".

In January 1975, we asked the TPA for an extension of time to complete the Basic Planning. My letter stated that the scope of the work had been greatly increased since October 1973 when the project was assigned; there were now (= at that time) two proposed railway overpasses, and much planning of future railway realignments was (at that time) being done on behalf of the SAR, (as we had already mentioned to the TPA in November 1974). I wrote that though we give priority to hand in the Basic Planning project, we yet asked for an extension to complete project, until December 1976. This was indeed a mushrooming project (pun intended, see above), and I do not think that I completed the project during my days at MB&S. In mid-October 1975, Mr. James of the TPA gave permission for the extra additional survey, and toward the end of March 1976, with my letter to Mr. Szucs of the TPA, the survey sheets were submitted.

At the east end of Ogies, an interesting detail warrants special mention. There were a number of railway worker's houses, likely originally built for (white) track maintenance staff, just like the thousands all over the country, at almost every railway station, based on the unwritten "six-mile rule" of track maintenance, which in turn was based on the length a crew could be expected to maintain, established when men walked to and from work – long before scooters were developed. In February 1976, we heard of a number of **flies in the apothecary's ointment**, to make our Basic Planning project more challenging, namely:

(1) The SAR was proposing a larger SAR "housing scheme" at Ogies;
(2) The OTK (Eastern Transvaal Co-Operative) – a huge organization with grain silos at many rail-way stations – also had already had some ideas of developing their own housing scheme at Ogies;
(3) The OTK had plans for a substantial new grain silo at Ogies;
(4) A proposed Indian Township, at the south end of Strydom Street, by the Department of Planning.

So we had to "review the situation" (like Fagan did in the movie "Oliver", while rolling his eyes), conducting various discussions with the TPA Planning Engineer and with someone at (the former) "Peri-Urban", receiving their agreement, and then drawing a suggested road layout to accommodate these four proposals. These were not "applications" as such to the TPA Department of Local Government, but a bit vague and pie-in-the-sky, but we were able to ensure adequate access to the provincial highway network (which was our primary or even sole responsibility.) We even suggested a "common access point" for the two "housing schemes" in (1) and (2) above. And there was agreement by TPA staff as well. We also needed to respond to an enquiry by Scott & De Waal, the consulting engineering firm that was designing (or supervising construction of?) a road (and the number was P 33-1?) south of Ogies.

When checking details of the specific alignment during a site visit, when I also looked down a few of the abandoned mine shafts, I met the principal of the black elementary school that was located close to where these 10m x 10m "servitudes" had been surveyed. (Northeast of Ogies, just north of the railway lines to Witbank.) I had a very nice discussion with him, during playtime. He told me that the (raw brick) school building was owned by the Mining House that owned much of the land, that his students walked in from all directions, obviously crossing whatever railway line they needed to cross, and that he had no qualms about the future demolition of this particular building. They would likely receive another building from "the Government", meaning the Bantu Department of Education, (which was not "provincial" but

"national"). We agreed that it would take some years before construction of all these roads would start; our work was only a "study".

Until fairly recently, (before GoogleMaps), I always thought that this project had long been constructed. I knew that South Africa exported a lot of coal, and heard (while in Canada) that much oil had gone down into the abandoned coal mines, as a "Strategic Oil Reserve". But I also realized that the cooperation with the NIOC likely stopped when the Shah of Iran was deposed, and that economic sanctions on South Africa got worse over time, after having started in the early 1980's. When I now look at GoogleMaps, however, I note that the Ogies Bypass was not built after all. The current GoogleMaps (2015?) shows the reconstruction of the old road through Ogies, south of the station, and that an entirely concept was developed and built for the rail link east of Ogies – **a double tracked rail bypass**! This allows coal to come from Witbank and go straight to the Port of Richards Bay. A shunting yard must have been designed and built somewhere else. A new road overpass is actually shown "under construction" over this rail bypass, with a partially demolished bridge (with blue headwalls). The outlines of the foundation of the former black elementary school are also vaguely visible.

Project 1004 in the office files was for a proposed railway overpass at **Wonderfontein station**. I once had to write a letter to the TPA about it, with a print of an already previously approved drawing. I do not know if and when that project proceeded. Due to the nature of the project, it was a GVGS&A project; my letter mentioned that Hans Labuschagne was the contact person. I doubt if there was any project progress.

Another "TPA" project, one that I was privileged to take almost "**from cradle to grave**", was relatively small, but it was **not in the 1000 series** (see below): It was for the design and construction of two major box culverts and the relocation of Stinkspruit, within the Town of Swartruggens. This **Project 4008** started out as the result of one or two separate GVGS&A projects in Swartruggens, namely

(1) **Project 1005** – to re-build **Bridge 144 over the Elands River** on Provincial Road P 2-3. In the spring of 1975, I wrote a letter to the TPA, asking them to allow reduced corner splays (from 15 metres to 10 metres) at the intersections of Highway P 2-3 with Kort Street and Barron Street, checking on vertical and horizontal sight distance and quoting the geometric design standard in the 1965 AASHO Book. The TPA Roads Department approved the Basic Planning for Project 1005 in December 1975, including land acquisition near the site of Bridge 144.

(2) **Project 1014** – for the eventual raising and realignment ("deviation" is the railway engineering term) of the West-rand-Mafeking railway line directly east of Swartruggens station. This huge project included a very high rail-over-river-and-road crossing the Elands River and Provincial Road P47-3, south of P2-2 to the south end of the station and beyond, as well as a local street underpass east of the Elands River. Relocating an ESCOM high voltage transmission line was also part of that project; it needed a letter in Afrikaans to Mr. Nel of Messrs. Ian Drewitt & Partners, electrical consulting engineers for ESCOM, about needed relocation of a substation on Lot 587, suggesting an alternative site. A seismic survey was also needed.

I did not do much on these projects; more on Project 1005 than on Project 1014. But during the initial phase of the review of these two projects, the Town had complained to the TPA Roads Department that storm drainage from the station area crossed the main east-west road (Provincial Highway P 2-2, a.k.a. Sarel Celliers Street)[57] through the "downtown", and regularly caused major flood damage to private and town property, even further downstream, on the Provincial highway to Lindleyspoort, called Road P 124-1, a.k.a. Bosveld Street. Stinkspruit (= **stinking creek**) was its name, and the Town had asked GVGS&A for advice on how to deal with this problem; hence the project number in MB&S's 4000 series. Crossing Provincial Highway P 2-2, the existing drainage structure consisted of three skew concrete pipes (were

[57] At the Elands River bridge, in downtown Swartruggens, the highway number changed from P 2-2 to P 2-3.

they 3 x 24"dia.?) covered by a concrete slab, located in a very minor dip of the road. A rickety two-span concrete (or wood/steel?) pedestrian bridge with flimsy pipe railings existed on the north side of the highway, and a lot of decomposed plant life, to show that this system was likely flooding more than once per rainy season. On Provincial Highway P 124-1 was an inadequately sized concrete box culvert in the wrong location. As a result, addressing this situation was seen as entirely separate from the railway realignment issue and the Elands River Bridge rebuilding issue. So we first wrote a Feasibility Study to the Municipality on how to address Stinkspruit, with a "Scheme A" for a 1:50-year flood condition and a "Scheme B" for a 1:25-year flood condition, depending on what the TPA might want to see built and fund. These were their highways! After the Town Council had approved the Feasibility Study in May 1974, we presented a report, suggesting **four alternatives methods to implement these improvements**:

1. Your municipal contract for the excavation of the channel alone, and construction of the bridges later by the TPA Roads Department, at their expense.
2. Your municipal contract for the excavation of the channel plus the construction of the bridges, in which case the Town can claim the cost of the bridges from the TPA.
3. A TPA contract for Bridge 144 across the Elands River, two bridges over Stinkspruit, and the excavation of the channel, according to which the Town pays the cost of the channel to the TPA.
4. A SAR contract for the relocation of the railway line plus new bridges, the TPA's bridge 144, the bridges over Stinkspruit and the excavation of the channel, according to which the Town pays the cost of the channel to the SAR.

To this, we added our recommendation:

Both alternatives (3) and (4) are not possible within the foreseeable future. The SAR has not yet made available the money, and the TPA has not yet placed the rebuilding of Bridge 144 on a program.

Alternatively (1) is not a good solution, because the TPA cannot build the bridges within a few years departmentally, or with the future contract for Bridge 144.

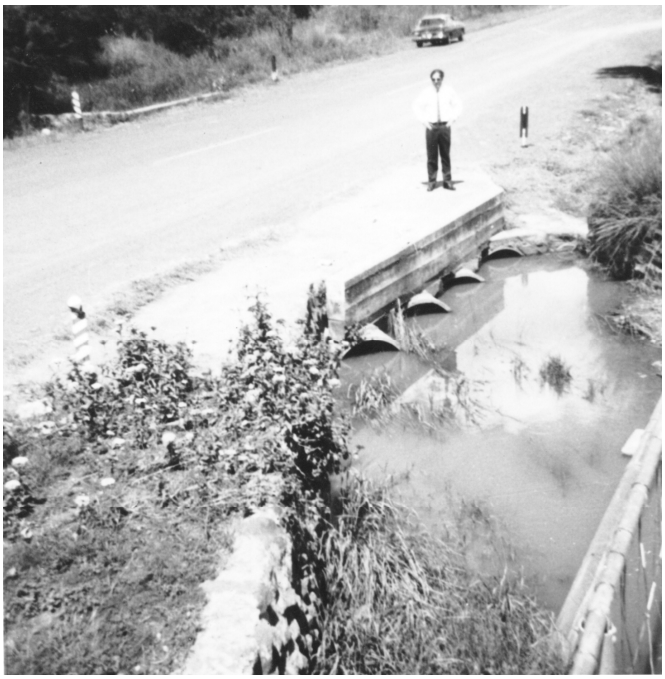
In the meantime, floods and sedimentation, especially at Sarel Cilliers Street, can still take place even though Stinkspruit is pushed open. Option (2) seems to be the best solution. We can do the design of the bridges and obtain approval from the TPA. These will then be included in the contract for the channel, and we may probably get the project advertised by the end of September. You must then apply to the TPA for the 100% grant as promised in a letter to you. According to what their Regional Officer has said, you must report the cost estimate to him in October.

The design of the channel is progressing well, and the design of the bridges has begun. We trust that this proposal will meet with your agreement.

Mr. Göbel, the TPA Regional Officer in Rustenburg, had alerted the Town of available funding fort the bridges. Perhaps this was "Roads Department" funding (more likely) but perhaps it was "Local Government" funding (less likely) or another "joint funding" project, as I saw much later, to serve a common cause. The "urban" situation on Highway P 2-2, meant that a four lane road section was approved, with two normal pavements ("sidewalks" in North American parlance) and bridge railings. At that time, I was unaware of those things; the Municipality asked me to visit Mr. Kamstra at the TPA.

Kamstra is a typical Frisian surname, ending with the letter "a"; many immigrants to South Africa had come from that northern province of the Netherlands. A Mr. Kamstra owned an organ and piano shop on the curve where Esselen Street joins Du Toit Street, near the Apies River. I had once had our French reed organ (inherited from my parents) serviced / repaired by him. My father had died in Potchefstroom Hospital in September 1973, only two months after Lydia and I had moved from Bloemfontein to Schoemansville. A year or so later, my stepmother allowed us to come and take the old "Seraphine" harmonium that had been my parents' wedding present from my father's parents. This instrument needed new felt pads and a major "check-up" of the air insulating system and mechanics. It is still in our family pos-

session, here in Western Canada. But this Mr. Kamstra at TPA was the financial guru who "orchestrated" the kind of project we had at Swartruggens, with a different instrument. He was a dwarf; the first one I had ever met, and though I first felt a bit uncomfortable during our meetings, (and we had several), he just sat on top of his desk, having more eye contact with visitors to his office than anybody in a chair behind a desk can even have! I never asked him if he was related to the organ repairman. I may have met him three times; he later received all the claims from the Town of Swartruggens – and paid. We were glad when the TPA (and the Town?) approved our preliminary design and layout[58] of the creek relocation.



Outlet of Stinkspruit pipes, and Mike Burgess.

The existing pedestrian bridge over Stinkspruit.

Soil Investigation with the Toyota Land Cruiser.

Auguring near the old box culvert north of town.

Our "Scheme A" was approved for a 1:50-year flood condition. From there on, things went smoothly. We surveyed the proposed creek alignment, with cross-sections, just like a road. MB&S did not have an

[58] A proper "report" (as would be required today) was not needed, but only a number of lines on a marked up layout of the affected properties in town, plus a cost estimate. The 1:18,000 series of Topographic Maps was also used. The TPA Bridge Engineer at that time was Mr. Orczy. It was much different from what one would do today!

"in-house" survey crew; we used Fehrsen & Douglas regularly. But we did have the equipment to do soil testing for both structures, so we did that. The creek, which meandered and was clogged up by vegetation in some places, was "straightened out" by a new alignment that missed all private properties. It had two major curves, but then followed a straight line, crossing P 124-1 at a minor skew angle and then another curve for a short distance beyond, near where Stinkspruit joins the Elands River. We received approval to remove official level knobs from the Director General of Surveys in Mowbray, Cape Town. Mike Burgess designed the structures (with pre-designated TPA bridge numbers). He accompanied me on a site visit before design had even started. Without delay, this project was designed, approved and tendered. We printed 20 sets of Tender Documents, and were amazed that 17 Contractors purchased them – so that we did not have a set for Mr. Göbel in Rustenburg. When 11 tenders were received on 24 October 1975, we had the sets of drawings returned (a specific requirement in some jurisdictions) and sent him a set.

The lowest tender came from a Johannesburg firm owned by a Yugoslav immigrant who was called "Mr. Milo". His initials were PAM, and he was also known by that name, as his surname was Pavlicevic. He had adequate (but older) equipment and proposed to get the work done, using his Portuguese immigrant carpenters for the concrete work. The company name was the reverse of his initials.

Our tender review report (on the lowest 6 contractors) and recommendation, we noted amazement that there was hardly a difference in tender prices for Schedules A, B and D between tenders #1 through #6. **PAM Construction (Pty.) Ltd**.'s tendered amount was low on Schedule C because of a low unit price. We met Mr. Milo and he satisfied us that he had not made an error – which is normally suspected of the lowest tenderer. This was a well-run business; we checked the balance sheets and references, and were told that because Mr. Milo would personally be in charge, the project would be successful. The second lowest tenderer was a brand new business called Forge Construction (Pty.) Ltd., formed by three Grinaker employees (Mr. Nutter, PrEng, and two foremen - van Heerden and van Staden) plus a Mr. de Jager, known in the equipment rental business. All four of them would (supposedly) invest R 10 000,00 in this venture, and personal references were quite positive; this might well become a good team, but..... So we recommended PAM Construction (Pty.) Ltd. and confirmed the details of the cost sharing agreement, as per the following table (based on the lowest tender amount):

Contract Items	TPA	Municipality	Total
Schedule A (Preliminary & General)	R 3 699,66	R 1 600,34	R 5 300,00
Schedule B (Bridges 3956 and 3957)	R 70 804,20	-	R 30 804,20
Schedule C (Stinkspruit excavation)	-	R 30 800,50	R 30 800,50
Schedule D (Contingencies on Sch. C)	R 400,00	-	R 400,00
Contract Total Tendered (PAM Constr.)	R 74 903,86	R 32 400,84	R 107 304,70
	69,8%	30,2%	100%

Another table went to the Municipality that included the total financial responsibilities of both parties, and this included MB&S's normal professional fees, additional concrete work, documentation and estimated site supervision costs. The Grand Total came to **TPA = R 85 132,04**; Swartruggens = **R 34 791,41** equalling **R 121 128,64**. This is what the Town Council and the TPA agreed to, and the Town Council soon awarded the construction contract to PAM Construction, during their 11 November 1975 meeting.

The waterway was to be excavated with a flat bottom and sloped edges, all at a specific design grade. In the downtown, the structure needed a larger skew angle than the pipes; the stream came from the railway station and could not be changed, and on the outlet end, there were private properties on both sides. Both structures were designed as concrete box culverts, long enough to allow pavements (= sidewalks) and with the TPA standard typical concrete headwalls and nine galvanized steel handrail units. Due to lack of grade, the culvert on the main highway was shallow and needed three spans. A 3 x 10'w x 3'h profile

was selected as cross-section; and on the northwest quadrant, a small concrete retaining wall was built to protect the Shell service station. The other culvert size was 2 x 10'w x 5'h, but I could be mistaken. Guardrails were not even considered, shoulders widths were provided.[59] Environmental concerns (as we would call them today) were not even mentioned – this was a project to address a serious **drainage** issue!

Construction of both culverts was to be done "under existing traffic conditions" and this meant that 60% of the full length was supposed to be constructed first, while existing traffic was accommodated by a single lane. After concrete curing and with some minor backfill over the new concrete, single lane traffic was then diverted and allowed over the new it, so that the remaining 40% of the length could then be excavated and constructed. However this is not what happened – see the photos on the next page. I am not sure how this was handled; it must have had TPA approval from the Rustenburg District Office, and municipal sanctioning. But no problems arose. It am quite amazed by the amount of money spent these days (in North America) on "traffic control measures" during construction, without any common sense.

Mr. Milo hardly knew any Afrikaans, the project language. So a bilingual arrangement had to be struck: All project correspondence was in Afrikaans, including progress certificates and the Town's "claim" from TPA of their 100% refund on the bridges, but all correspondence with the contractor was in English. I never experienced something similar. We (in Pretoria) even had to draft "letters to the Contractor" in English, to be signed by the Town Clerk of Swartruggens (where English was also a "foreign language", like in the rural OFS, see "Part 1"). But excavation of Stinkspruit (with an old cable-operated Bucyrus-Erie machine) proceeded on schedule, irrespective if the language. On 1976-03-19 and 20, however, a major storm flooded the newly excavated streambed and washed in lots of material. Obviously, the Contractor was responsible to repair (= redo) the work. But then Mr. Liebenberg read the small print and it surfaced that prior to tendering, PAM Construction (Pty.) Ltd. had "waived" a "deductible" on their project insurance policy. (This was actually somehow allowed in the TPA's Conditions of Contract.) So while at first, the Town of Swartruggens had almost panicked, it was possible to divert a messy situation by confirming to Mr. Liebenberg that Mr. Milo had actually had discussions with a Mr. Botha of Volkskas Insurance Brokers about this "waiver", **before** inserting a specific amount at point A.2 of the tender, and also **after** the award of the contract to PAM Construction (Pty.) Ltd. After that storm had passed (pun intended), we obviously reminded the Contractor of his obligations to repair the excavation, and he did. But another letter went to the SAR, reminding them of a letter that Mr. Shuttleworth had already written them about the very same situation on **1972-02-01**, and then continuing:

> The construction of the Spruit, as well as that of a new bridge, is currently underway on a contract that is handled by this firm on behalf of the municipality of Swartruggens, while the TPA subsidizes the bridge for 100%.
>
> With the excavation of the channel a substantial amount of ballast and ash was found in the course in the Spruit. Flooding of the railway box culvert, west of the station, a few weeks ago, has caused that new material has flowed in, both from the ballast at the box culvert and from the embankment a little distance further to the west, where a ditch exists beside the embankment, as well as a long row of steel sleepers to support the embankment.
>
> We are concerned about the possibility that, although the channel has now been nicely excavated for a 1:50 year flood, just like the bridge, regular inflows of ballast and ash can reduce the efficiency of the channel considerably, which can create a large maintenance burden for our clients.
>
> We would like to ask you whether it is possible to curb or prevent or future inflows of such material in one way or another, so that the problem can be overcome.

[59] When I did this design, I was already aware of specific pedestrian and vehicular safety needs. Did I use my skill?

Mr. Milo told me that soon after WWII, he had started his career on pipeline construction in the Middle East, which I understood to be the pipeline from Iraq to Lebanon. He told me horror stories about partisan situations in Yugoslavia during WWII, and that Tito was not the original man with that name but another person. The original Tito had supposedly been assassinated. Is this a "conspiracy theory" or not?

Mike Burgess also accompanied me on my last site visit, close to project completion, when I had already given notice to leave MB&S and join the NITRR. This was on the 21st of July, 1976, according to my photos. For site visits there, I had an advantage of living at Schoemansville, so that I did not need to drive to Pretoria. Mike likely took over the finalization of the project with TPA and the Town of Swartruggens, where I had dealt solely with the Town Clerk and his deputy. But I never even heard about (or saw) any formal Town Council decision or Councillor!

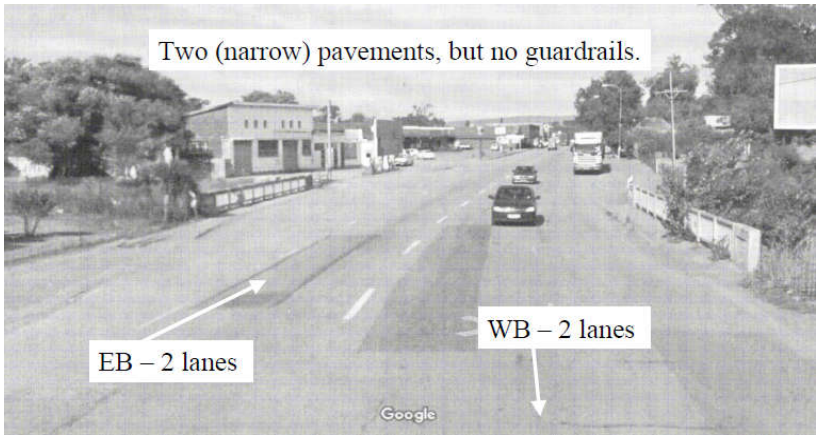
At this site on P 2-2, we did not even have a proper detour! This photo looks east, at the downtown.

But on P 124-1, north of Swartruggens we had one. This photo looks east, toward the completed ditch.

New structure (left) and old box culvert (right) on the road to Lindleyspoort. This photo looks east.

Installation of steel reinforcing for the deck of the 3 x 10'w x 3'h box culvert in Swartruggens.

GoogleMaps shows Street Views of November 2010, with the structure north of Swartruggens clearly marked as **number 3957**, and the highway is still called Boshoff Streeet. The other structure number **3956**, on the current east-west Highway N4 (Sarel Celliers Street) is not visible. The huge railway bridge crossing the Elands River directly east of Swartruggens Station (a major improvement to railway access of Botswana, via Mafeking). has also been built, and near it, a huge concrete grain silo (called an elevator in Canada). Not to confuse North American readers who might question nomenclature on the annotation



The service station was still there (Nov. 2010 GoogleMaps.)

←on this line of the photo, note that in South Africa (as well as in Great Britain and many other countries), a **pavement** is where a people are supposed to walk, unlike North American nomenclature in which the **sidewalk** is where pedestrians walk.

Five months later, on one of the very last days of **December 1976**, I met the Town Clerk under very different circumstances: We were on our way back from Paarl in the Cape Province, where we had visited my uncle and aunt that a process to emigrate from South Africa to Canada had started. We had left that morning from where we had stopped the previous night at a gas station near Beaufort West that was (like all others) closed at night, so all six of us just slept in the Mercedes-Benz. It opened at 6 a.m. and there was a long queue. I have no idea why we had taken such a different route that day, perhaps realizing that it might be the very last time to see that part of South Africa but we drove through Swart-ruggens from west to east – and I must have exceeded the speed limit through the urban area, right over a gatsometer (with hoses). Who stopped us but a man in uniform and handed me a speeding ticket, but Mr. Liebenberg, the Town Clerk and after-hours part-time traffic officer of Swartruggens![60] Like all tickets for this kind of infraction, it allowed me to pay the fine within a month or so, or alternatively to appear in Court in Swartruggens if I wanted to dispute the violation and/or the fine. Long after arriving home that night, perhaps even when at work (at the NITRR) soon after this, I realized that the Court date was shown as a date in March, 1976. It took me some time to digest the impossibility of driving west on this requested date. So I just ignored the ticket and never heard the outcome.

For the file for **Project 1013** in the office, I once wrote a letter to TPA about an application to install a 11kV overhead powerline along and over Road 567, District Bronkhorstspruit. My letter confirmed that Basic Planning of Road 567 had not been completed, that certain prints provided to ESCOM were not yet approved, and therefore preliminary drawings, particularly regarding the intersection of Road 567 with Road 25 at the Sybrandskraal depot of the Eastern Transvaal Cooperative (OTK in Afrikaans) were in limbo. As this letter was in Afrikaans, I can only assumed that I wrote the letter on behalf of Mr. Shuttleworth…. I fail to remember anything else about that project.

As mentioned before, MB&S had municipal projects in the **4000 series**. During my three years, I handled three design and construction supervision for street and storm drainage construction projects for the City of Pretoria. These were in two specific wards of the "New Pretoria", areas that had been taken over from the PUHB in 1964. These wards were in Valhalla/Erasmia (southwest of the downtown) and in Monument Park/Waterkloof Extensions (east of the downtown). Before my return to Pretoria, Colin Louw had handled this work, but because of my earlier City experience (I guess), I was asked to take over this type of work. These were quite interesting and challenging projects, particularly because they were in partly built-up residential areas and meant adjusting the street design to existing driveways and the like, as well as allowing "future driveways" and even once requesting the City Building Department to defer issuing building permits for certain lots until completion of the street. Other liaison was also needed. Occasionally, blasting was expected, and the City required pre-blasting and post-blasting reports. As I

[60] He was also an elder in the Gereformeerde Kerk van Swartruggens, while I was organist in the congregation in Schoemansville / Remhoogte, called Die Moot. I played the electric organ in Remhoogte, every second Sunday.

knew since 1968/69, in the newer townships, the Developer was responsible for street maintenance until 40% of lots on any specific street block had been "built up"; then the City took over road maintenance, and eventually, this street was placed on the City's Road Construction Program for a specific fiscal year.[61] My work dealt with contracts for which the City did the tendering process, and I dealt extensively with Mr. Tidswell (my successor at the Roads Department?), Mr. Wannenburg, (a clerk or technician) who was his sidekick, and Mr. Wilken (about payment certificates). Note that these three projects contained various shorter or longer street sections that had not yet been built. Initially, as partly described in my "Part 1", these "Townships" had been laid out, and houses had been built (both before 1964 and after 1964) with only the minimum of "servicing" as we would call it today. The original Developers had installed and paid for a water reticulation system, overhead electric services (on the City of Pretoria grid) and telephone services (by the General Post Office). The houses were invariably on septic systems, (already causing some sinkholes in dolomite areas) and there was hardly a stormsewer, sidewalk or asphalt (meaning chip seal) road surface in these areas, except the Provincial Roads. This needed to be addressed after the City took over, by way of an annual program (based on discussions between Mr. Gie, the Ward Councillors and the Ratepayers' Associations). Some streets first, then some other streets, and then some more streets toward the end of the program, almost like the City's sidewalk construction program mentioned in "Part 1". These last ones were obviously in the least built-up areas of these Townships.

Project 4013 was for streets and storm drainage in **five** different townships (Ashley Gardens, Waterkloof Ridge, Waterkloof Park, Valhalla and Erasmia). Its design had started before I returned to Pretoria. This was the City's **Contract 78/51869**; the City's cost codings on roads and stormsewers had to be broken up by Township on every month's Progress Claim from Bramley Earthworks (Pty.) Ltd. We submitted all the details after checking the Contractor's claim, and certified/recommended payment to Mr. Tidswell, to which we also forwarded invoices for our professional services. Jan Basson was the Clerk-of-Works while the three City Clerks-of-Works (Messrs. Durrheim, Erasmus and Marais) drove around regularly. My administrative duties meant writing all kinds of responses to City enquiries. Before the contract had even been awarded, two questions needed to be addressed. (1) "**Where to start the work: east or west?**" and (2) **"Can the structural design perhaps be revised to make use of tar?"**

(1) Roads in the eastern suburbs were supposedly more urgently needed than in Erasmia and Valhalla. Why? The City had sent us three letters, and we commented on them; we did not make up the arguments: (**a**) A proposed Bus Route on Neptune Street (between Orion and Aquila) – in the east – needed an asphalt road; (**b**) the British Ambassador's new house on Matroosberg Road – in the east – could not really be built on a poor gravel road, couldn't it? - and (**c**) watermain installations in Erasmia – in the west – (on Geustyn, Forsyth & Joubert's project, which had not even started) had to be completed before the roads; . Mr. Tidswell gladly agreed with our suggestion letter: Work started on the east side – which caused some problems later.

(2) About the possible use of tar, I was asked to write the following letter to Bramley Earthworks:

Messrs. Bramley Earthworks (Pty.) Ltd., P.O. Box 234, 2012 Bergvlei. Attention: Mr. Garlick.

Dear Sir, **Re: Contract 78/51869 – Pretoria City Council.**

With reference to your recent tender for the above contract, which is still under the City Council's consideration, we would like to obtain from you the following additional rates:

(1) A rate per m² for a tar premix black base, 31mm thick, according to the attached specification, to be constructed in lieu of the bitumen premix black base as specified for items G.4.1, H.4.1, I.4.1, J.4.1 and K.4.1.

(2) A rate per m² for a bitumen premix wearing course, 25mm minimum thick, instead of the 16mm

[61] More recently, after Developers had become responsible to install "all services", everything had been changed.

thickness specified for items G.6.1, H.6.1, I.6.1, J.6.1 and K.6.1, to be laid on top of the tar premix black base in (1) above.

(3) A rate per m² for a tar premix black base as in (1) above with thickness of 40mm, to be constructed in lieu of the bitumen premix black base. In this case we assume that you price for bitumen premix wearing course, 16mm minimum thick, which will stay as tendered.

(4) A variation rate per tonne for the tar binder.

We understand that Iscor produces the tar needed for the black base, probably called "base tar".

Yours faithfully, JAdR for MB&S.

(to which was attached)

Contract 78/51869 – Specification for tar premix black base.

The specification is generally the same as in the contract document, Section 15, except that the black base is constructed of tar premix to the following properties:

Grading analysis of nominal 25mm max. size stones:

Sieve size	Cumulative per cent passing
38.0mm	100
25.0mm	90 – 100
19.0mm	71 – 95
13.2mm	56 – 80
6.7mm	45 – 61
3.35mm	30 – 46
1.18mm	20 – 34
0,300mm	7 – 21
0.025mm	2 – 88

1. Binder content of mix, by mass: Aggregate 95.25%; Tar 4.75%
2. Specifications for base course:

Specific gravity 25°C / 25° C	1,20 – 1,25
Water by mass	0,5% max.
Naphtalene by mass	1,0% max.
Anthracene in fraction distilling between 270°C - 340°C by mass	3,0% max.
Matter insoluble in toluene	21,0% max.
<u>Distillation oils</u>	
Up to 200°C	0,5% max.
200°C - 270°C	4,0% max.
270°C - 300°C	6,0% max.
300°C - 340°C	12,0% max.
Total to 340°C	16,0% max.
Softening point of distillation residue at 340°C (r & b) °C	65,0% max.
Evt °C	60 (min.) – 65 (max.)

3. Mixing temperature: 120°C ±5°C.
4. Compaction temperature: 70°C - 80°C.
5. General: The tar temperatures must be kept down as much as possible. Protective goggles and masks should preferably be worn at mixing plant and laying plant, if the temperature starts to creep up from the given ranges.

Now why was this change of structural design investigated? South Africa is not oil-rich; all bitumen was made from imported crude oil. Iscor and Highveld, the two South African steel producers, had four

plants: Iscor had its Pretoria, Vanderbijlpark and Newcastle coke ovens; Highveld had its new Witbank operation. There was probably a glut of tar, a waste product from coke ovens, and this was the City's attempt (based on research by e.g. Mr. I.L. Jamieson at the NIRR of the CSIR) to save money, in a time of inflation, even after tenders had been received. The specification above clearly indicates an awareness of the dangers of tar, a carcinogeous substance. On the next City projects, we were also asked to provide one of these alternatives as a "structural design". I do not remember if one of these three alternatives was successful, and perhaps became the norm, even when, during the 1980's, major toll freeways were built in South Africa. But the changes also dealt with **another reality** – that had not existed a few months before:

This Contract **78/51869** had first been **advertised** in February 1974[62]. Soon after tenders were received, it was learnt that the Government now required a "**Price Escalation Clause**" in each Contract, based on the Consumer Price Index – for three of its components: **(a) labour**, **(b) plant** and **(c) materials**. The project was not awarded but had to be **re-advertised** in April 1974. At the suggestion of Mr. Gie, the Contingency Amount of R 15 000 was then raised substantially, to R 50 000, expecting that this amount would be adequate to cover the price adjustments during the anticipated 18-month construction period. **Well, it was not even close.** This was due to inflation. South Africa had a high inflation rate in those days, and the construction industry had requested that their members be compensated for the risk of doing business. These indeces changed by the month, each and every time; calculations went to nine decimals. For each payment certificate, a new calculation was needed, and this ate up the contingency amount in an unexpected way. That is why the City (and we at MB&S) devised methods to reduce costs, as described.

see [63]	Pretoria private (Garsfontein X 8) land development project	Pretoria City Engineering Roads Department. (78/51869)	Later version of Pretoria Engineering Roads Department	TPA Roads Dept. (for urban projects, like e.g. P73/1)
(a)	0.35	0.35	0.35	0.21
(b)	0.15	0.30	0.25	0.45
(c)	0.50	0.35	0.40	0.24

The copied (<u>not translated</u>) calculations on the next page show how I dealt with this for Payment Certificate No. 5 for January 1975. The Price Change amount was already R 16 520,04 (= 33% of the Contingency Amount) after only 7 months of a 18 months construction period! On this contract alone, I had to ask Mr. Tidswell **twice** to increase the Contingency Amount. On 1975-03-27, after Payment Certificate No. 6, I predicted an anticipated total amount of Price Change of R 74 000, and that R 39 000 more would be required. In July 1975, after Payment Certificate No. 10, I mentioned that additional funding of R 50 000 might be needed, quoting a statistical estimate of "f" for December 1975, (between 0,2438 and 0,2899) based on numbers available up to June 1975. At that time, Contract 78/51869 was the longest running City Contract. This was somewhat of a nightmare that I (and many other colleagues, as well as those in municipal and provincial governments) had to deal with. In the end, Contract 78/51869, that had been awarded in the amount of **R 783 997,64**[64] in **April 1974**, ended up in **April 1976** (in Progress Claim 16, releasing all retention money) at a Total Amount of **R 907 680,42 –** i.e. an overrun of 15.78%.

[62] I had not done documentation on this project at first; I had a lot of work on my plate with other projects. I was asked to change the documentation because just before leaving Bloemfontein in early 1973, (see above) I had inserted this clause for the Clocolan project

[63] On two occasions, Mr. Bergh asked me to write to Mr. Ferreira in the Cape Town office, about various ways in which the factors "**a**", "**b**" and "**c**" had been established by municipalities and provincial governments. There was no unanimity or consistency on this; there was even a proposal to separate between "urban" and "rural" projects.

[64] This amount was **R 115 044,20 less** than what Bramley Earthworks' tender price had been in **February 1974(!)**

18

STADSRAAD VAN PRETORIA

KONTRAK 73/51869

Berekening van prysveranderings vir die tydperk Augustus 1974 tot

1. Formule: $f = (1 - x)\left(a\frac{Lt}{L_0} + b\frac{Pt}{P_0} + c\frac{Mt}{M_0} - 1\right)$

waar $x = 0,15$; $a = 0,35$; $b = 0,30$ en $c = 0,35$.
Tenderdatum was 26 April 1974, dus is
$L_0 = 135,80$; $P_0 = 139,15$ en $M_0 = 137,30$

$$f = (1 - 0,15)\left[\left(\frac{0,35 \times Lt}{135,80}\right) + \left(\frac{0,30 \times Pt}{139,15}\right) + \left(\frac{0,35 \times Mt}{137,30}\right) - 1\right]$$

$$= 0,85\left(0,00257732\,Lt + 0,00215594\,Pt + 0,00254916\,Mt - 1\right)$$

2. Vir Sert no. 1 – Augustus 1974
$Lt = 143,4$; $Pt = 151,00$ en $Mt = 150,90$.

$f = 0,85(0,369587688 + 0,325547997 + 0,384668545 - 1)$
$= 0,067833595$.
Waarde van Sert. 1 = R 17209,50.
∴ Prysverandering = R 1167,38 →

19

3.) Vir Sert no 2 – September 1974.
$Lt = 145,50$; $Pt = 151,00$ en $Mt = 150,90$
$f = 0,85(0,375000006 + 0,325547997 + 0,384668545 - 1)$
$= 0,072434111$
Waarde van Sert 2 = R57243,95 – R17209,50
= R40 034,45.
∴ Prysverandering = R 2899,86 →

4) Vir Sert no 3 – Oktober 1974
$Lt = 147,60$; $Pt = 151,00$ en $Mt = 152,20$.
$f = 0,85(0,380412432 + 0,325547997 + 0,387982456 - 1)$
$= 0,079851452$
Waarde van Sert. 3 = R 117421,00 – R57243,95
= R60 177,05
∴ Prysverandering = R 4805,22 →

5.) Vir Sert. no 4 – November 1974.
$Lt = 148,80$; $Pt = 156,55$ en $Mt = 155,20$
$f = 0,85(0,383505216 + 0,337513502 + 0,395629942 - 1)$
$= 0,099151361$
Waarde van Sert. 4 = R 155 861,30 – R117421,00
= R3 8440,30
∴ Prysverandering = R3811,41

6.) Vir Sert no. 5 – Januarie 1975.
$Lt = 151,80$; $Pt = 164,10$ en $Mt = 161,80$
$f = 0,85(0,391237176 + 0,353790902 + 0,412454411 - 1)$
$= 0,133860115$
Waarde van Sert no. 5 = R184 519,32 – R155861,30
= R28658,02
∴ Prysverandering = R3836,17.

7.) Opsommings

Sert. no	Maand	Waarde	Prysverandering	Totaal
1	Aug 1974	17209,50	1167,38	1167,38
2	Sept	40034,45	2899,86	4067,24
3	Okt	60177,05	4805,22	8872,46
4	Nov	38440,30	3811,41	12683,87
5	Jan 1975	28658,02	3836,17	16520,04
5 Sert.	7 maande	184519,32		

7/18 = 39% of contract period — 25% van kontrakbedrag minus gebeurlikhede — 33⅓% van gebeurlikhede

Total Price Changes were more than R 100 000,00.

In the calculations on these pages, note that "**x**" was assumed to be a constant of 0.15, so that only 85% of the actual Consumer Price Index was subject to these "windfall" price changes for contractors. So it did not affect a Contractor's original "profit margin". The numbers for $\mathbf{L_0}$, $\mathbf{P_0}$ and $\mathbf{M_0}$ came straight from the Government Bureau of Statistics's published numbers, as **givens** for the project, for the specific month in which the project had been tendered. The numbers for $\mathbf{L_1}$, $\mathbf{L_2}$, $\mathbf{P_2}$, $\mathbf{P_3}$, $\mathbf{M_3}$ and $\mathbf{M_4}$ etc., (each for the month of a specific payment certificate) had to be based on numbers for that month, as soon as they were published by the Bureau of Statistics. This system had been supposedly developed by the C.E.I.J.C.C. (Civil Engineering Industry Joint Construction Council?) but there had also been input from the SAACE. Mr. Bergh, however, was not in favour of it – see below.

I do not know, but people like Barry Hemsley (then at Kenton-on-Sea, Cape Provinve, now in Langley, B.C., Canada) may remember, how long this practice of "Price Changes" continued in South Africa, as inflation kept on increasing and feeding on upon itself. Can you, dear reader, really imagine what the

"As Constructed" value might be for a project with a (say) R 48 million tender value and a (say) 36 month construction period, with much of the higher priced and high asphalt containing pay items to be used during the later (rather than the earlier) months of the contract period? Can you imagine what a situation like this might do to the provincial and municipal budgeting process for all new projects, and to the agony to civil servants (like Mr. Grodsky) who had already been worried about this very thing a few years earlier (see Chapter 3 of "Part 1")?

Work in Erasmia Township was a challenge by itself: This private Township had been developed in the late 1940's, when water pipes and valves had been in very short supply in South Africa (due to the aftermath of WWII), and the developer had installed "whatever he could get hold of". During the design phase of the road construction project, the surveyors needed to show us all existing "infrastructure"[65], like water valves – obviously so that they could be avoided by road construction equipment. Our design drawings were reviewed by the City Water Engineer, the same Mr. McFadzean that I had often consulted in 1968 and 1969 about any watermain related issue. He was close to retirement, but warned me that nothing could be believed on the paper print that his office had of watermains in Erasmia Township – not marked "approved design" or "as-built drawing", just a single paper print.[66] So we (and later Bramley Earthworks) were forewarned and forearmed. On one particular street in Erasmia, it happened that the truth came out: The watermain consisted of a short piece of 4" dia. galvanized pipe, connected to a long piece of 2" dia. ungalvanized pipe, connected to a short piece of 3" galvanized pipe. There was also a real paucity of valves in the area: Some valve boxes contained no valves, and some of the valves that actually existed, were not inside valve boxes.[67] And they were not where shown on a drawing. Note two things:

(1) Unlike in North America, where watermains normally run **within the asphalt covered area**, water-mains in South Africa normally run **within the boulevards**, meaning "close to the lot line".

(2) Erasmia is in "**dolomite country**", where rock can be very hard but can also be subject to sink-holes. We once found a section of watermain that had been laid on top of the bedrock, only one foot below ground level, and it had been "bent in place" to follow the underground rock line. The only thing that could be believed was that "something had been constructed". It was no wonder that people in Erasmia complained about the lack of water, as well as the lack of water pressure!

With the good cooperation from City of Pretoria staff, all these various deficiencies were corrected during street construction. The right-of-ways of some streets had quite a natural crossfall from one side to the other, so that some houses were above the street and others below the street. Adapting the design to existing driveways (and not the other way around) was a challenge. I remember that most of the streets were south-east of the main road through Erasmia, (Welbekend Road) which was a Provincial Highway.

On the northwest side of Erasmia Township was another substantial township with only vacant lots, about which a story is added. It was likely Christoburg, and not what is now called Ansaar Estate. Mr. C.J. Wessels once told our class in 1965 that he had become involved with this development. Professors and

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[65] This is yet another word that we did not know about in those days! It was first discovered by US troops in France in WWI, as a French military term, but was very seldom used until the 1960's – and always "within parentheses".

[66] I think that this Developer had actually been bankrupted, and this had before 1964 caused many headaches at the PUHB, and after the 1964 expansion of City limits, also at the City of Pretoria.

[67] In those days, a consulting engineering firm from Johannesburg designed and supervised construction of all the "civil services" in an Industrial Township just west of (and within) the Town of Bronkhorstspruit. Shortly after construction had been "completed" and the Contractor had already received his 5% holdback, it was discovered that **no watermains at all** had been installed; the Contractor had only installed very nicely painted hydrants at all the appropriate locations. This obviously ended up as a court case and the rolling of some heads at the Town office, and at the South African Council for Professional Engineers, one (or more) partners lost the right to practice, and the firm disbanded and had to declare bankruptcy and close in disgrace. I remember a surname "**Oosthuizen**", but may perhaps be wrong about that. Lydia and I once drove by the site on our vacation to the Kruger National Park.

lecturers at academic institutions like the University of Pretoria were normally allowed to do a minor bit of consulting work, to keep their brains active, I guess – four or five hours per week or so. Supposedly, ownership of this township had gone through more than one bankruptcy. The original Developer had retained a consulting engineer (say **firm "A"**) to prepare plans for servicing their township. They had already been paid for their design work when the Developer gone broke, but nothing had been built. The company that purchased the land from the bankrupt estate, did not know about consulting engineer firm "A". They retained another consulting engineer (say **firm "B"**) to prepare plans for servicing this development. That firm "B" discovered that there had been an earlier design, and they were able to copy most of it on their own drawings, which they then faked as being their own design effort. They were also paid, but then the second Developer also foundered in bankruptcy court. A third Developer picked up the land (with a registered or perhaps even an unregistered legal plan) and wanted to retain a consulting engineer, (say **firm "C"**) who lo and behold, happened to be a partnership of lecturers at UP, (van Rooyen, van Huyssteen & Wessels) who were aware of the original (and also the second?) design efforts, and then were able to expose the whole thing! I do not know the outcome of this situation, Mr. Wessels, who had (I later discovered) earlier worked for my father-in-law at the City of Germiston, did not tell us.

Individual street sections in the huge Valhalla Township were not in one particular area; they were all over the place. Valhalla had no watermain problems like Erasmia, perhaps because of Scott & De Waal's original involvement, or a Developer that had stayed solvent. However, dolomite was a particular challenge in Valhalla; some streets had very hard dolomite rock that needed to be taken out without blasting. The reason was that blasting might perhaps trigger a sinkhole: I remember visiting one of them, and was glad that it was not related to Bramley Earthworks' activities. When blasting was anticipated for any City of Pretoria contract, pre- and post-blasting reports were required through a firm of Insurance Adjusters.

We had several challenges in Valhalla: **(1)** The City's Contractor for Contract 21723 to install sanitary sewers (called Marken Konstruksie – perhaps with Dutch immigrant directors?), as designed by van Wyk and Louw, had stopped work on Gota Road, and our Contract 78/51869 had assumed completion of those sanitary sewers prior to construction of the road. Four alternatives existed to resolve the situation, and in the end, a solution was found. **(2)** A specific necessary design change stands out in Valhalla. In the area of Hans Road, Imatra Road, Freya Road and Lambert Road, we were asked to do something else than what had been shown on the Contract drawings. It deal with assumptions made (by Colin Louw, I guess) that were invalidated by changes in that same City sanitary sewer contract. After I had developed five different storm sewer layout alternatives (each with its own set of challenges), the "Alternative #4" was selected during a meeting on 29 August 1974 with Mr. Tidswell and Mr. Weilbach (Deputy City Engineer). This system ran over three private properties, of which two had existing buildings. I was able to prove that this system (within easements) would actually not cost more than what had been designed. Bramley Earthworks soon received revised drawings and was not held up.

For the City's Road Construction Program 1974/75, we first received an additional commission that became **Project 4035 (**Contract 78/51915) and a few months later, more work that became **Project 4037** (Contract 78/51933). Both contracts had "odd numbers" and were in English. These contracts were to be advertised two weeks apart – Contract 78/51915 on Friday, 21 February 1975, and Contract 78/51933 on Friday 7 March 1975. (We prepared the Tender Documents, inserting the formal Tender Notice that we asked Mr. Tidswell to provide to us on the day before it was to be published in the newspapers. Obviously, no electronic downloading from the internet in those days!) Due to the financing problems already foreseen with contracts of a long duration (as already stated above), these two contracts were also planned for shorter durations. They therefore did not use the soon-to-be-infamous "Price Escalation Clause" as their "estimated project values" were purposely "less than R 500 000". Mr. Tidswell had initially requested the clause for Project 4035, but when the additional work in Project 4037 came, in a different ward of "New Pretoria", as well as Lemnos Road (see below), Mr. Bergh was able to persuade

Mr. Tidswell (and Mr. Gie)[68] to save some money and remove it for both contracts. He had an adequately high public profile with the City, and (by the way) MB&S was already assisting the City to get through one such nightmare. We also specified both projects with the "alternative structural design".

Our **Project 4035** was for streets and storm drainage in Erasmia and Valhalla (in the City's Ward 3), together with Lemnos Road in Valhalla under an "endowment funding" coding. **Project 4037** was for streets and storm drainage in Constantia Park and Waterkloof Glen (in the City's Ward 17.) For Contract 78/51915 (on Project 4035), I had to write a "Notice to Tenderers" after the pretender meeting, outlining **(a)** which existing driveways (concrete, slate, or brick) had to be repaired after street construction, **(b)** sites where "spoil" was to be placed (one for Valhalla and one for Erasmia) and **(c)** that "borrow" material was available at Iscor's Mooiplaas Dolomite Quarry. "The material must be loaded by the Contractor at the quarry (west of Erasmia) and must enter an agreement with Iscor for payment of 20c/m^3, which rate may increase after August 1975." This became an Addendum, to be submitted with a Tender. But as Bramley Earthworks (Pty.) Ltd. had two construction crews, that firm was successful with both tenders. We then saved the City about R 3 500,00 because very soon, Bramley Earthworks requested that same "change in specification" to Contract 78/51869 as well, so that the Valhalla and Erasmia streets, yet to be constructed under that contract, would also be built with a premix wearing course, instead of a chipseal wearing course. The City (and the Ratepayers' Associations) must have been quite pleased with that. Having one Contractor on three City projects also enabled us to "shuffle" work from the "Price Escalation Contract" to the "non-Price Escalation Contracts"; Bramley Earthworks was quite amenable to that. And obviously, we also saved the City some site supervision costs, but kept Jan Basson hopping.

Lemnos Road, Valhalla, built with "**endowment funding**", had separate items and codes; one set for road construction, the other set for storm drainage. This was money that the City had held for umpteen years, after having been paid by the Developer of Valhalla Township. The Tender document for Contract 78/51915 specified that work had to start with Lemnos Road. It was only in 1999 that my firm Grassroots Consulting Services had a similar (but almost reversed) situation – where City of Surrey "Development Cost Charges" (that had been paid to the City by an earlier land developer on 158A Street north of 108th Avenue) was **added** to a contract for what my client was supposed to build for his two-lot subdivision. It entailed some length of "curb" on the opposite (east) side of the street, fronting two earlier created lots.

The waste material ("spoil") site for Erasmia was just west of the undeveloped Christoburg Township, and for Valhalla, the huge Montague Kneen Park was used "as directed by the Clerk of Works." The latter situation had been a long standing agreement between the City Engineering Department and the City Parks and Recreation Department, and the material had to be trimmed properly. But I once needed to write a letter to Mr. Moolman at the Parks Department, who may have been a new employee or otherwise did not know, and Jan Basson had not been able to convince him. Did the right hand always know what the left hand was doing? It appeared that Mr. Moolman was thinking of developing a new sports field.

Mr. Erasmus, the City's Clerk-of-Works, once asked that I write a letter to Mr. Bolhuis at the office of the City Traffic Chief, about changing Gota Road in Valhalla into a one-way street. This short street was behind some minor commercial properties in a 12,6m wide road reserve, and the 7,0m wide asphalt that we had designed for construction under Contract 78/51915, conflicted with a (shallow) newly installed 125mm dia. watermain and existing power poles. We suggested building a 5,0m wide asphalt street which would be inadequate for two-way traffic. This timely request was granted, and had already carried the verbal approval of Mr. Tidswell before it was made. One might assume that the original planner for Valhalla Township, shortly after the end of WWII, might also have agreed "logic always wins".

[68] Mr. R.L.S. Weir was no longer at the City of Pretoria at that time, and Mr. G.W. Gie had taken over from him.

Another complication in Valhalla stands out: On behalf of the City, we had to apply to the TPA Roads Department for **improving** the existing intersection of Stephanus Schoeman Road with Provincial Road P66-1. This resulted in my design for a horizontal alignment with a deflection angle of 67.5º, a tangent length of 57.6 metres leading to a horizontal curve with a radius of 200 metres. I had already convinced Mr. Christo Kuun that a north alignment shift would result in the City's need to expropriate land from a TPA Road Camp, and that a south alignment shift would shorten the tangent length. Moreover, a south alignment shift would also cause a low crest k-value on an existing local road with a deflection angle of 43.0º. My letter confirmed the application, and was approved. This was an "extra work" item that had not been in the original project, but was added to Bramley's Contract 78/51915, being close by.

The consulting engineering firm Strydom & Roux had been awarded a street design project (like ours) in Erasmia/Valhalla, and we had to sort out issues between our Contracts 78/51869 and 78/51915 and their proposed designs. This caused some minor amended elevations, but also some minor changes in "end of project". This was actually "just in time" to alert Bramley Earthworks! Confirming the changes, I wrote a letter to Mr. Meintjes, whom I remembered as a few years my junior at UP. Was his name Tertius? There were also a few occasions in which we had to liaise with Geustyn, Forsyth and Joubert (responsible for a City watermain installation contract in Erasmia) and Scott and de Waal (responsible for a City sanitary sewer installation in Valhalla). They had to deal with "slow to start" and "slow to progress" contractors; I was in the position to deal with an efficient Bramley Earthworks.

From the street and storm drainage projects in the **eastern suburbs**, the following stands out. This City ward contained "upper middle class" residential areas, while Erasmia/Valhalla could be described as "lower middle class" residential areas. One project linked Monument Park and Waterkloof Ridge Ext. 2; this street had not been built when servicing these areas had been completed prior to house construction. These were "newer" townships, under the system described in my "Part 1" book. This "Link Road" (called Cliff Road in Monument Park) was in a dip, adjacent to the Provincial Highway between Fountains Circle and the Flying Saucer Roadhouse; within the road servitude to the west ran a tributary to the Apies River. As the storm drainage system of the area had already been completed, we only needed to design and build an embankment with kerbs (= curbs) and a set of catchbasins in the bottom of the dip, and so lead the stormwater directly to the north flowing stream within the "highway right-of-way".

House almost flooded due to blocked stormsewer in higher-up block. Photo taken toward the south.

But it was a major storm event. Pond between the "link road" and the highway to Germiston at rear.

This design had been approved by the City Roads Department. During construction in January 1975, however, a massive cloudburst occurred, and within a few hours, the whole "Link Road", which was an incomplete berm only, was flooded, including a low lying yard of a house on the west side of the road, adjacent to the Provincial Highway. **How could this have happened?** Mr. van Staden's inspector went out

to investigate, and discovered that, in the street above and paralleling Cliff Road, a set of catchbasins had failed miserably. How? The outlet pipes from these catchbasins had been improperly connected to the outlet drain[69]. With this huge storm, the catchbasins (also clogged up with debris) had overflown, and stormwater had flowed between two houses, onto Cliff Road and then down to the dip. It then overtopped the berm and almost flooded this house, because the outlet drain for the "proposed catchbasins" had not yet been installed. So notwithstanding the intensity of the storm, the Contractor and the City (and by implication, MB&S) were not at fault. A City crew came to reinstall the "leads" (as we call them in North America) between these catchbasins and the stormsewer, which was found to have an adequate capacity.

In May 1975, directly after our return from an overseas visit (see below), there was a little "tail" to this "tale", and I was asked to respond to a letter that had come during my absence. Mr. Fasken (perhaps in consultation with the firm's lawyer) had thought that it should go out under my signature, so I wrote:

ACL 4929 4013/5/21

Messrs. Industrial and General Insurance Brokers (Pty.) Ltd,
P.O. Box 2600, Pretoria, 0001. Attention: Mr. A. Venter.

Dear Sirs,

Contract 78/51869 – City Council of Pretoria – Bramley Earthworks,
Third Party Claim – Messrs. Ridge Ventures (Pty.) Ltd.

With reference to your letter dated 22nd April, 1975, we consider that you refer to two incidents occurring on the 12th and 18th of January 1975, in which rainstorms and flooding caused damage to Mr. de Lange's dwelling.

We do not feel competent to comment on the adequacy of Mr. de Lange's drainage measures on his property, but we do note that he has since provided extra facilities in this connection.

Insofar as Messrs. Bramley Earthworks is concerned, we consider that they were caught with their drainage measures incomplete during periods of excessive rainfall. (We understand that in the first instance, some 100mm fell within the hour.)

We trust that the above will be of value to you, and apologize for the delay in replying to your letter under reference, but the writer has just returned from overseas.

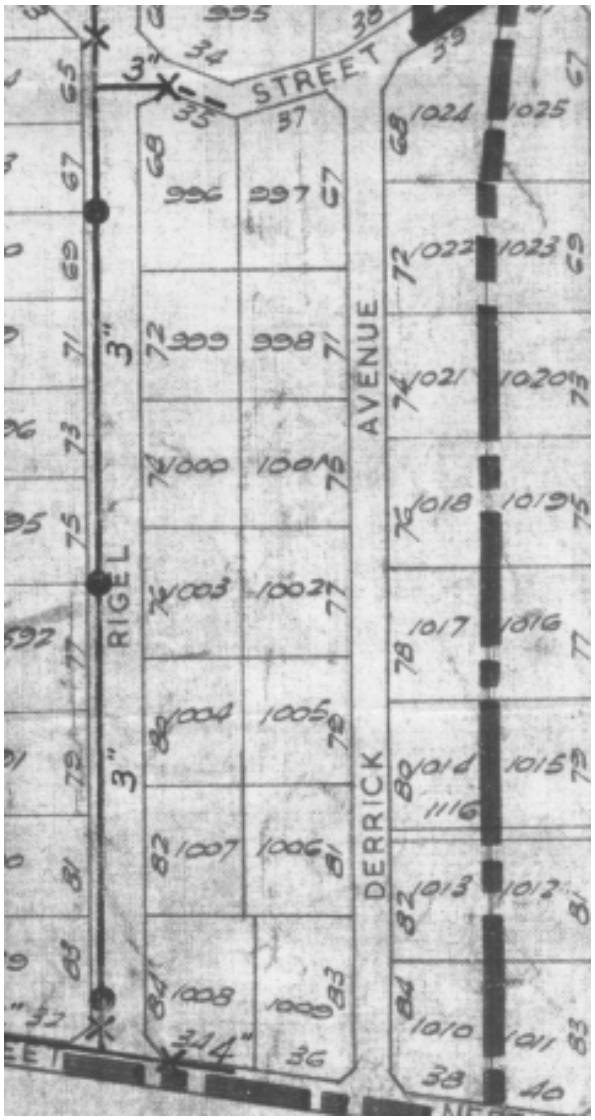
Yours truly, J.A. de Raadt, PrEng. for MB&S

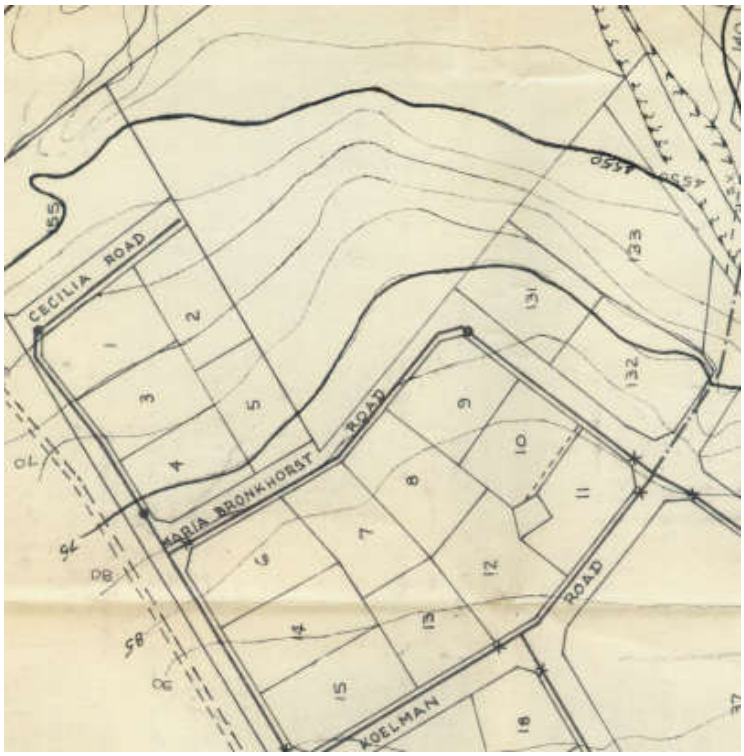
That was the end of that situation. Derrick Lane **(left, next page)** and Maria Bronkhorst Road **(right, next page)** stand out as specific situations that required **(a)** common sense and **(b)** patience. On Derrick Lane, Waterkloof Ridge, one block below the Postmaster-General's residence on Rigel Avenue (see "Part 1"), the design grade was 16%; this street had to be built in concrete. The City's maximum grade for asphalt surfaces was 12.5% at the time. But Derrick Lane also had a substantial cross-slope, from the lot line on the one side to the lot line on the other side. There were 8 vacant lots, numbered 997, 998, 1001, 1006, 1018, 1021, 1023 and 1024. We asked the City Electrical Engineer if he would temporarily remove the power poles and over-head wires on Derrick Road, between Poles 13 and 17. We also asked the City Building Department if any building permit applications had been submitted for those lots. The answer was "No", and we then asked the bureaucrat at that office to hold any Building Permit in abeyance "until the end of the year", after completion of Derrick Lane. Both these letters obviously explained that the City Engineering Department was already in agreement. This street had a 2.0m cut at the knoll, and a

[69] These days, video camera monitoring of storm and sanitary sewers is commonplace; several serious intrusions into were detected (and fixed) in stormsewers when I worked for the City of White Rock BC during early 2008.

1.5m fill at the dip. On this Derrick Lane, I remember seeing Bramley's vibrating roller (compacting the sub-base layer below the concrete) **driving around the block**. Vibrating down Derrick Lane, unable to return uphill (even without vibrating) so a detour had to be taken. And note that Waterkloof Ridge has large irregular street blocks. (Note that the original Developer had not even installed watermains on Derrick Lane, from the City's Record Plan.)

Maria Bronkhorst Road in Ashlea Gardens was another story. Ons section of the road "right-of-way" was only 35 ft. wide, too narrow to built an asphalt road with curb and gutter. During the design, the City had been made aware of this, and had promised to procure the necessary land by way of expropriation or easement. So when the Contractor wanted to start working in that area, we enquired, and the City staff had done absolutely nothing. A series of letters followed: I even once contacted the Clerk of the Council in person, so as to speed up the process, because we could not cause Bramley Earthworks a delay – which would result in a claim for additonal costs. The City staff was sometimes not as efficient as we, in the private sector, expected them to be. On the large property north of Maria Bronkhorst Road was a (future)





special school site called "Nuwe Hoop Skool", and the City asked (during the construction period) to organize building a brick entrance gate for it – for which we asked Bramley Earhtworks to obtain three quotations. Prices came in at R 730, R 800 and R 880. We checked this out, and obviously recommened that Bramley Earthworks get the work done by Grant & Nunn, Building Contractors, for R 730,00 – as a Contingency Item. This may well have been part of the "compensation" for the land taken to widen the road reserve or a servitude.

We also had to comment on a "petition" by residents of Duvernoy Street in Constantia Park who wanted their street constructed under the already awarded Contract 78/51933. "The Contractor's programme is presently arranged to give priority to the construction of Lois Avenue and William Nicol Street, as requested by you, and he is further set up so that surplus cut from certain areas is used for required fill in

other streets. It therefore does not seem feasible to change the programme to take account of the request in the petition", I wrote to Mr. Tidswell. And by the way, "any alteration in the programme might result sin petitions from residents in streets which prioritiues are altered," and "It is noticed that your Dept.'s water tankers presently water roads near the Constantia Park Shopping Centre, and it is suggested that, to alleviate the dust problem, Duvernoy Street is also watered when necessary."

We also experienced the "± normal" type of construction project challenges. (Is anything ever "normal"?) Like three stormsewer crossings over an existing oil pipe line, in Orion Lane in Waterkloof Ridge, for which a specific "application" to the SAR had been forgotten…although the SAR had given "approval"(!)

As an exampe, the situation with a Mr. van der Linde from Erasmia, who complained twice. **(1)** A storm-sewer had been installed (with rock blasting) at 1.0m off his property's front lot line; Bramley Earthworks actually had to neatly work inside his property for the sloped trench, with sod removal and the like. After completion, Mr. van der Linde dared to lodge a complaint to the City, that the Contractor had damaged his "septic field, fish pond, rock garden and lawn" in the front yard. So we asked the Contractor to "re-pair" these, but when Bramley started to look for the septic field, there was none, only a lid which was as-sumed to be for the septic tank (but was not). During a visit at Mr. van der Linde's home, the Contractor bent over backwards by agreeing to build a (new?) septic field, but during its construction, Mr. van der Linde asked that his house's roof drains also be connected to this, and then he changed his mind. Once lawn restoration had been completed, the Contrastor discovered that the property owner had, during the previous evening, broken up the works again. I had to write a report on what I called an excessive claim, stating that the Contractor had gone out of his way to please, and attaching a report by Mr. Brown, one of the principals of Bramley Earthworks. The City Inspectors were also quite amazed at this strange situation. **(2)** When road construction commenced near his house, with vibrating rollers, he lodged a complaint to Allied Building Society, (who rejected it) and then to the City, with the result that yours truly had to write a report to Mr. Tidswell asbout the virtual impossibility of damage to his house, even attaching a pamphlet with BOMAG equipment specifications to provide some "manufacturer's proof".

Then there was the regular destruction of brand new fencing in Ashley Gardens, where (black?) vagrants had just wanted to take a short cut, by walking through private property – and I think it was at the Nuwe Hoop Skool. How many times should a Contractor be asked to repair a fence? And there was the individual who complained to the City about damage to his "bakkie", while driving over an as yet unpaved <u>stormsewer</u> crossing trench on the Welbekend Road, the Provincial Road through Erasmia. Mr. Fasken asked me to investigate that situation, as it did not make sense to him. So during a site meeting with the Contractor, Jan Basson and **all three City inspectors**, it was confirmed that Bramley Earth-works' stormsewer trench had already been backfilled and paved on the date of the alleged "incident", but …… a kilometre up the road was a <u>sanitary sewer</u> crossing trench that had not yet been paved on that date. So dear people at Munitoria, (I wrote, not literally but that was the gist of it), would you be so kind to forward this complaint to Messrs. Geustyn, Forsyth and Joubert, whose Contractor perhaps did not backfill and pave? Administrative duties like writing letters of this nature took up some of my time (as they have also done during the remainder of my career), as somewhat "unavoidable".

Jan Basson was a short and muscular person, very dependable and up-front with the Contractor if he saw something being done that was untoward or did not meet the City requirements. He had some kind of "mobile telephone", (or was it a "pager"?), likely the first person I know who had one. From my office, I could talk to him on site; what a luxury! He was already with MB&S in July 1973. Over and above conducting normal site inspections with him, we also went out just after MB&S had received a new City assignment. In that way, we could indicate to the surveyors what they needed to survey, before even starting design. I once climbed a substantial hill with him to the north limit of this vacant Christoburg Township close to Erasmia, to confirm the stormwater catchment area and to see how much rock outcrops

existed. (This became a temporary dump site.) A few weeks later, during a coffee break in the front of the top floor of the office, Jan Basson almost "**complained bitterly**" to Mr. Bergh (and obviously, everybody else around us, who laughed….) that I had been much too hard on him, virtually running up that hill, with him just panting behind me with his shorter legs, and unable to keep up! I enjoyed working with him (and the feeling was mutual); he also was of great help with preparing "as-built" drawings. It is almost a given that some things change between an "Issued for Construction" version and an "As-Built" version of that specific design drawing. One peculiarity of City of Pretoria projects was that "As-Built" drawings needed a "**Z**" in a box on the title block, which clearly meant to say: "No more revisions!"

Louis van Wyk, looking after the Soils Laboratory (in and out of Pretoria West), working directly under Mr. Bergh on behalf of Roadlab (Pty.) Ltd., became involved with these municipal projects, during both the design and construction phases. Mr. Bergh handled the structural designs. But I cannot recall projects for other municipalities from my three years with MB&S in Pretoria. Louis obviously also worked with my colleagues and their projects, and for Mr. Bergh's "own" projects (see below). He was the only MB&S colleague that I re-visited in March of 1991, at his home.

The **7000 file series** contained projects for "all private sector" clients of the firm. I became responsible for a number of them, some in the preliminary stage and some of them in the execution stage. I will now describe some of them. The first one, **Project 7013**, was development of "**Lot 91, Roseville Township**". This was part of a township proclaimed in the 1920's, and its development (as a subdivision of Roseville Township) followed different rules than those for new townships. Roseville is in an area west of Paul Kruger Street, north of the SAR Capital Park yard, east of the Apies River. The Ivo Sinovich family (his father had a Z for his initial, and all correspondence went to "Messrs. Z. & I Sinovich, c/o Messrs. Getz, Baer, Ogus & Mendel Cohen") owned 16 hectares of land. They had for many years had market gardens, with irrigation water from the Apies River and the main ditch of the Les Marais Irrigation Board, serving Roseville Township, Les Marais Township and also parts of Mayville Township to the north since 1924. All kinds of vegetables, but particularly tomatoes, had grown there until around 1960, when it was discovered that "**ash**" and other deleterious pollutants from the City of Pretoria's Power Station contaminated the water, and the owners were told (by the Transvaal Department of Health?) that they could only grow cabbage. Realizing that one cannot normally make money by growing cabbage, the Sinoviches decided to redevelop Lot 91 with a proposed layout with streets and mostly "duplex erven", and with 12 "single family residential" erven on a north-south street linking Franzina Street on the north and Hercules Street on the south. A preliminary layout had already been planned by Ferhsen & Douglas, and approved by Pretoria City Council; I was to prepare design drawings for streets and stormsewers, while Mr. Roy, Redshaw PrEng, a colleague in the recently opened MB&S office in Cape Town, would prepare design drawings for sanitary sewers and watermains. A single construction contract would be advertised to install these services. However, before starting the design, a specific important issue had to be resolved: The southern one-third of the land was waterlogged due to leakage from the (SW to NE) irrigation furrow, located just off the property line with SAR land. Something needed to be done about this, and soon.

Investigations made at the Department of Water Affairs resulted in the discovery of a very strange and abnormal situation. The Bylaws of the Les Marais Irrigation Board stated that the owner of any property within its serviced area or jurisdiction (meaning properties that paid an annual fee for irrigation water, and received a certain quantity of water for a certain number of hours per week) would lose that "right" if any of the lots subdivided would be less than a certain area. I cannot remember the exact numbers, but say that the original lots in Roseville or Les Marais were 1 hectare in size. If someone would subdivide his land into ten residential lots, and every lot would be (say) 1 000 square metres in size, all these ten lots would no longer have any water rights, and these new lot owners would not be shown on the membership list and current assessment roll – of which copies were all available at the Department of Water Affairs.

While reviewing the 1924 Bylaws and the Regulations for private irrigation boards under the 1956 Water Act, it dawned on me (and on a very co-operative Mr. Audi and Mr. van Wyk, Regional Engineer for Western Transvaal at the Department of Water Affairs), that the Les Marais Irrigation Board had been completely ignorant of this stipulation for about twenty years. Particularly since WWII, most of the area within its jurisdiction had been subdivided into small residential lots, and the Board was still receiving annual fees from all their owners, which should have been taken off the rolls. Such "implosion" had actual been the intent of the Water Act, as the result of "urbanization" of areas that were originally "rural" and "agricultural". We were asked by Water Affairs staff to write up the history of this specific situation.

The majority of people in the area no longer wanted the irrigation water. Most of them lived on medium sized residential lots (say 1 200 square metres, with a house and garden), but they did not really irrigate their land. Ditches and sluices were all in the boulevards of the streets, and there were maintained by three or four black labourers who were hired by the five (I think) white Board members, who did use the irrigation water! How? Not to irrigate their own individual properties on which they lived, but to irrigate a Board owned street block, (not subdivided), on which a market garden operated, with vegetables sold by the Board on the Pretoria Public Market. Now do not thick that this was a profitable operation, but the Board survived by the annual fees that all the other "members" paid on an annual basis. And if someone did not want to pay, because he did not want irrigation water, that member and its property was just placed "in arrears", without starting any proceedings to get the outstanding money paid. The Board just waited till the property changed hands – due to a sale or the settlement of an estate, and at that time, the "outstanding balance of the arrears" was automatically "due" to be paid as part of the finalization of the transfer of the property, whether or not the new owner wanted to receive irrigation water. There was no recourse to address the demand for payment at that time. It was one huge convoluted affair, all this while the Board thought that they had (say) 200 properties under their jurisdiction, but due to the oversight of many years, actually only twenty properties could be considered as "eligible" to belong to the Les Marais Irrigation Board. But about 200 properties were shown on the "membership roll", sometimes had some irrigation water running past their properties, and somehow paid the annual dues, directly or indirectly. The property of Lot 91, owned by the Sinovich family, was actually "legit" (as we would say today). Mr. Ivo Sinovich told me once that he had had suspicions of this type of "wrongdoing" for a long time, even before he was prohibited to grow anything but cabbage. (Please read on to my own later suspicions.)

Main ditch along property line, photo in southwest direction.

So I strolled all over the Roseville neighbourhood for a few days, following all the canals and ditches and looking at the sluices, with a laboratory assistant called Vincent, whom I had "borrowed" from Louis' soils lab to measure the flow of water between the take-off point on the Apies River (southwest of Lot 91) and at various other locations. (Lydia and I later sold Vincent a brand new electric stove that the builder had installed in our house in Schoemansville, as we had brought our existing stove from Bloemfontein that month. I even delivered that stove to his mother's house in Atteridgeville, on the back of my bakkie.)

For the report to be prepared, Mr. Bergh and I sat down in my east-facing office on a bright Saturday spring (October) morning, to finalize and correct my draft effort, and also to investigate and confirm the

Sinovich family's claim – that due to a lack of canal maintenance, the bulk of irrigation water did not even reach many of the properties whose for owners paid the L.M.I.B. an annual fees for unwanted water. The worst leakage occurred near the very beginning of Roseville Township **(see photo on previous page)**, with Lot 91 below the canal and the (non-irrigated) northwest corner of the SAR Capital Park yard above it. Flow at that point was much more than the flow where the canal left the Sinovich property, at Hercules Street, and entered the rest of the Les Marais Irrigation Board's service area (with almost exclusively small lots).

The final report was presented to the Department of Water Affairs. (Ironic that in South Africa, the "Departments" were considered "Subdivisions" of the Government, while in Canada they are called "Departments" (federally) and "Ministries" (provincially). Mr. Harry Savage, the firm's lawyer, at also received a copy – one never knows! While it took some time to sink in, when the response came, it was likely more based on the initial cooperation with their staff than the quality of the report itself – it was my first effort in this kind of "forensic civil engineering", and Mr. Bergh was first and foremost a "soils engineer", which would nowadays be seen as a "Geotechnical Civil Engineer". I believe that in those days, work was less specialized, both for senior people like Mr. Bergh and for me as someone with almost eight years of experience. The action taken by the Department of Water Affairs in **March 1974** was to place a "Notice" in the Government Gazette, indicating its intent to "take over" the entire operation of the Les Marais Irrigation Board (called a "Private Water Scheme") on a specific date (which was mentioned) about a few weeks after the Notice's appearance in the Government Gazette. Due process was then being followed; this was in terms of a specific clause in the Water Act of 1956. MB&S received a copy by mail, and so did Mr. Ivo Sinovich, who lived in the house at 84 Franzina Street, directly north of Lot 91. The Water Act allowed the Department of Water Affairs to take over a Private Water Scheme, but only with one of two specific purposes (which did not need to be disclosed at the time of the Notice):

1. To continue to operate the water scheme as a State Water Scheme, or
2. To abandon the Private Water Scheme (after 31 days' notice) but only after step 1.

The latter is exactly what happened then, as well as 31 days later, in April 1974: The Les Marais Irrigation Board was first taken over (Proclamation no 16 of 1974 called it a "**transfer of control**") and then abandoned (Proclamation no. 17 of 1974 called it a "**disestablishment**"). We at MB&S were not involved at all, we just continued with the design for the development of the site. We never even spoke to any of the Board members; I once saw the black employees working at the Board owned "market garden", and there was no "public hearing process" or even a "members meeting" of participants in this "Private Water Scheme." Nobody could even start thinking about suing the Les Marais Irrigation Board for collecting the illegal fees. I found that sad, as all the L.I.M.B. Directors had been "**unduly enriched**".

The development concept for Lot 91 (and I do not really know who at F&D first developed it) consisted of 12 west-facing single family residential lots backing on to the existing built-up single family lots to the east of Lot 91, while the remainder of the site consisted of duplex lots. Two north-south streets would connect Franzina Street on the north side of Lot 91 with an extension of Hercules Street, which at that time dead-ended at Lot 91 as it came from the east. A duplex lot in South Africa is not the same as a duplex lot in North America; one could rather say that these would be lots for "townhouses", with perhaps 6 residential units per lot, as a double storey "six-plex". Between Hercules and Franzina Streets, there were three street blocks (running east-west) with 6 duplex lots each; west of these, toward the Apies River, was a strip of duplex lots and some parkland along the river, and the triangular area south of the extension of Hercules Street had duplex lots as well, some of them served from a cul-de-sac proposed adjacent to the property line next to where the irrigation canal was. Once the flow of irrigation had stopped, we expected no more water there, but still designed and installed a subsoil drainage system from perforated Santar pitch fibre pipes. These pipes were made from recycled newsprint, impregnated with tar, by the Everite Limited group of companies; and had been in use in South Africa for more than 40

years already. They were popular at the time, unperforated for cable ducting and perforated for non-pressurized storm drainage pipes. I later learnt that such pipes had also been in used in Western Canada for a while, but had soon been replaced by PVC pipes. The reason for their continued popularity in South Africa was likely in that waste products were used; tar from coke ovens at the steel factories, and newsprint from consumers, all local and not needing foreign oil for plastic. (We sometimes joked that pipes made from "Die Vaderland" would obviously be much better than those made from the "Rand Daily Mail".)

Prior to joining the firm, Mr. Redshaw had been with the Department of Bantu Affairs, where the design of water reticulation and sanitary sewers had been his forte. I was to design the street network of the property (with non-prosaic names "Street A", "Street B", "Street C", "Street D", "Street E" and "Street F".) One of these six streets (Street F) was of course the extension of Hercules Street. No construction at all (road widening, kerb and gutter or sidewalk) was needed on any of the existing Franzina Street, which strikes me now (2018) as quite odd. Why? In British Columbia, any municipality would obviously insist on this kind of "off-site servicing" or "improvement" along the boundary of a development site. Or alternatively, have the Developer pay "money in lieu" with DCC rules - called "Development Cost Charges" or "impost fees", which started during the first NDP government in the 1970's.

Obviously, the City of Pretoria's Engineering Department staff reviewed all the design drawings. When the Roseville project was advertised in April 1974, tenders were received from four firms: Nolec (Pty.) Ltd, Lukas J. Botha (Pty.) Ltd., Tosi Construction Co. and Valente Bros. (Pty.) Ltd. We had to send these original tender documents to a Mr. B. Hallick at the City Engineer's office "for your information and checking", with the names of the clerks-of-works for the project. I find that strange. But when these documents were returned, "**Contract MBS 7016**" was awarded to Lukas J. Botha (Pty.) Ltd., a Silverton firm. The value of the work was R 188 135,03 + contingencies. Very soon, the City asked that we request the Contactor to change the chip-seal wearing course to a 16mm premix asphalt wearing course. This was agreed to, at the same unit price per square metre; old-fashioned chip seal was "out". This had already happened with Contract 78/51869, so we were in fact prepared for this type of "progress change".

Jan Basson was also assigned as the Clerk of Works for supervising this work, together with a Mr. L.G. Stewart, an experienced water reticulation Clerk-of-Works, who was hired by MB&S on a temporary basis (or "on-call"). A small on-site temporary shed was constructed for their use; the huge dilapidated homestead / vegetable barn north of the west end of Hercules Street had not yet been torn down. Construction started without further ado, with installation of watermains and sanitary sewers. In South Africa, watermains are commonly installed within the boulevards and not under the asphalt (as is common in North America). Sanitary sewers are also commonly installed within the boulevards, but also through street blocks, if possible, within "servitudes" (= easements). Good progress was made, and I conducted regular Progress Meetings, wrote the Minutes and prepared Statement for MB&S's professional fees, also checking the Contractor's Payment Certificates – which I then forwarded to the Sinoviches' lawyers.

The lawyers paid the Contractor for work done under Payment Certificates 1 & 2, but an arrangement was then made that Payment Certificates 3 & following were to be paid to MB&S, and would be forwarded to the Contractor. It appears that Lukas J. Botha (Pty.) Ltd. might have been "on the brink of insolvency"[70] at the time, and that Mr. Bergh's idea to assist everybody (including the client) saved the day. Forgetting "what really happened", it may well have been overextension due to (short term?) growth in the private sector. The invoices of MB&S to the Client included "Bank Charges" for this financial arrangement.

One day, just after many of the asbestos cement watermains and their tees and valves and hydrants had already been installed but not yet backfilled, Jan Basson received a site visit from two very official looking

[70] Mr. Bergh's words in a letter toward the end of the project, requesting an early release of holdback money.

men in a black official looking car, (an ugly North American based sedan called a Chevrolet Commander, built by South African GM) and they asked to see the design drawings. Jan showed them the Key Plan, and they then left the field office and walked around for about ten minutes or so. On their return to the "office", they thanked him, and he overheard them when they entered their vehicle, saying: "Only money will fix this problem." When Jan came to the Rose-Etta Street office that afternoon or the next day, we all wondered what this might possibly mean. We did not need to wait as long as we had with Water Affairs.

The original Hillview School site, close to the downtown of Pretoria.

It appeared that these "men in suits" were TPA Department of Works (and Department of Education?) officials, scouting for a new high school site. Why? One particular English language High School was supposed to be demolished in the near or medium future, and a new campus was therefore needed by the TPA Department of Education. "Forward thinking" or even "Long Term Facility Planning", perhaps?" Emphatically **"No"!!** This supposedly "threatened facility" called Hillview High School, was at the northeast end of the downtown of Pretoria, near the north (bottom) end of Du Toit Street. The Pretoria Freeway System (already accepted by City Council in 1967, as the result of BKS&H's report and many years of prior "transportation planning"), was to be implemented, at some undetermined time in the future (see **map at left**). But … if you look at current GoogleMaps imaging, **that school site is no longer threatened at all**. It is still there; this freeway system was never built. Were these TPA actions perhaps "premature"? I happened to know something about this freeway proposal, due to my former employment with the City of Pretoria in 1968/1969, the 1968 SAICE Convention, and the City's occasional land purchases, directed by Dr. Gaigher of the Traffic Engineering Department. The Sinovich development of Lot 91 in Roseville had somehow **bypassed** the "normal" provincial scrutiny process, which would never have occurred with a "normal" Township's "Proclamation" through the Provincial Administration. My "Part 1" shows how the regulatory system worked. It did not matter that only English speaking children lived in this area of "die Moot", as the area north of Daspoort Ridge was commonly described. I do not know how many people actually lived in downtown Pretoria, but it is likely that there were more English speakers there than in the area between Capital Park and where the Apies River runs through Wonderboompoort. Even in 2018, as I discovered on the City's website, the Roseville area is still predominantly inhabited by Afrikaans speaking people. This "school site" would have been requested if "due process" had existed and been followed.

Within a week or so, Mr. Ivo Sinovich came to our office and showed Mr. Bergh, Mr. Fasken and me a letter from the TPA's Department of Works with their formal "Notice of Expropriation" of a portion of Lot 91, namely three whole street blocks of the proposed development, including two short east-west streets parallel to Franzina Street, plus all the proposed duplex lots west of that street, almost down to the Apies River. I do not recall the amount of money that he was offered, (was it a million Rand?) but it was a substantial amount, and he said that he just had to accept this "offer" – he was not even going to dispute the amount. Being a consulting engineering firm, what could we at MB&S do, except to realize the validity of the saying that "**the client is always king**"? Particularly with an offer of a million Rand…..

Now what did we then do with the work that was already ongoing through a contract with Lukas Botha (Pty.) Ltd.? And how did this fly with the City of Pretoria; how did this affect the (preliminary) land survey on the subdivision by Fehrsen & Douglas; and interestingly enough, from a 21st century perspective, what about the public (also called the electorate)? The answer to the last question can be very short:

The public had not even been made aware of this. There had been no "public hearings", no "public information meetings", nothing to alert the people about the future, before 1974 or after this occurred. I doubt if parents of children at the existing Hillview High School were even told anything at that time. It was a time of "authoritarian government", much different from what we have today (in Canada). Official Community Plans and Neighbourhood Control Plans are currently being developed by municipalities to locate almost every type of building, long before a Developer has even purchased a property, proposing his actual "development". This is of course also not a very good system; this causes land speculation and even "bribery" during the preparation of those "plans". But for this project, things got very strange.

The City of Pretoria, meaning the staff in the various sections of the Engineering Department, the City Electrical Engineering Department, those at the Planning Department, and obviously even City Council – although one might assume that Council was not even advised of this detail – obviously had to accept the TPA Department of Works' decision to expropriate a portion of Lot 91, even if this occurred during the construction phase. Fehrsen & Douglas likely told the Surveyor General's office about it – we at MB&S didn't – and they were asked to prepare a Plan of Survey for the school site (at the cost of the TPA) and to revise the Plan of Survey for the remainder of the development. But I know that we agreed with Fehrsen & Douglas' approach, and I was actually asked by Mr. Bergh to say so in a letter to their Mr. Douglas. And it was up to us at MB&S to sort this out with the half-way completed construction contract.

From a purely logistic – should I perhaps say "**engineering**"? – point of view, it seemed fairly easy to me. I would just need to notify the Contractor's foreman (or even Mr. Lukas Botha himself) about the situation, and then prepare a written Change Order to the Contract, to adapt to the new reality, as follows:

- Disconnect watermains on both ends of the two abandoned streets at the tees (it was a looped system);
- Do not remove the two sections of 100mm dia. AC pipes, (about 2 x 100m lengths) just leave them;
- Backfill these two watermain trenches;
- Complete the watermain in the western north-south street as per the original design;[71]
- Complete the sanitary sewers with specific changes, allowing for a single school site connection;[72]
- Complete the project with the necessary changes to road construction, kerbing and the like.
- Sort out how and when underground cable systems (for electricity and telephones) would be installed.

At Progress Meeting No. 7, on 15 August, just before we heard of the Expropriation Notice, it had been reported that 80% of the watermains had been laid, that 60% of the sanitary sewers had been laid, and that base course material (crusher run) "was being tipped and spread on the northern roads" of the development. Also, quoting from the Minutes, in point 7.3.6, "The Contractor offers a tack coat plus a 16mm min. thick premix course in lieu of Cape seal surfacing as specified, at the tendered price. This will be confirmed if and when approved." Nothing was amiss, and good progress was being made. But at Progress Meeting No. 8, on 23 August, Jan Basson and I had to formally tell the Contractor's representatives (Bosch, Briel, Byleveld and Human) about the Expropriation Notice, and that this obviously and necessarily changed the work to be completed – which I outlined in the Minutes. By that time, I had also advised various other parties by letter: **(1)** The City Engineering Department, (asking that they would agree to these logical changes), and **(2)** the City Electrical Engineering Department, and **(3)** the Post Office (asking both for their alternative designs for the site, due to the new reality). In South Africa, at that time already, all electrical and telecommunication services were underground, and for the electric

[71] This was necessary for a "looped system", this watermain had therefore to be protected by a registered servitude.
[72] This sanitary sewer could be protected within the same servitude as in the previous footnote. At this time, it was discovered that the 25" main sewer through Lot 91 (closer to the Apies River) had never been protected by a servitude, so that could also be done on the legal survey that Fehrsen & Douglas was to prepare for the school site.

system, this meant at least three transformers less. During Progress Meeting No. 9, on 12 September, the Contractor reported that the water reticulation system (as amended by instructions during the previous Progress Meeting – see the first four bullets above) had been completed and tested with water from a (19mmØ) contractor's connection, and that no further testing was necessary. Point 9.5.2 of the Minutes stated: "Connection of water mains to City Council mains to be organized by Consultant." The requested changes to the sanitary sewer system had also been made, and almost completed, with "Only MH 15 – MH 16 outstanding." Adriaan Street (it was shown as Street "B" on the drawings) had already been primed on 10 September; kerbing work was to start on 18 September. Mr. Sinovich, attending this meeting, promised to demolish the old building "by the end of the month".

But all this was easier said than done. The Contractor notified us that he was likely to sue. The City Water Engineer came up with all kinds of objections, even that the original application to connect this development to the City's water supply had become invalid, and that new application was needed. I believe that some water valves were actually salvaged by the Contractor, and taken to his yard in Silverton for use on a future project. There were no hydrants on the east-west streets. The Contractor had just been paid for the installation of these fixtures. The western north-south street became part of the school site; the eastern north-south street was completed, and a single sanitary sewer connection to the school site was installed. GoogleMaps (2018) **as annotated** shows what happened in those days. (See below.)

Cul-de-sac adjacent to SAR lands while being built.

Adriaan Street looking north with old house on left.

Under South African Contract Law, (which is based on uncodified Roman Dutch Law and not on English Common Law), this type of drama was all possible, and Change Orders were written all the time. I do not think that in Canada or the United States, such disruption during construction would be as easy to handle as it had always been in South Africa. At that time, we already knew the outcome of a recent South African Appeal Court claim by a Contractor for the TPA Roads Department, which had settled this once and for all. Without getting too involved in the legal jargon, this is what Wikipedia shows:

Alfred McAlpine & Son (Pty) Ltd v Transvaal Provincial Administration **is an important case in the South African law of contract, heard in the Appellate Division from 18 to 21 February 1974, and decided on 20 May. The case concerned a contract to build a portion of a national road, into which contract an exceptional number of variations was introduced. The result was disruption. Because the contract had not lapsed, the court determined that there was no new agreement in terms of which the contractor was entitled to reasonable remuneration instead of the contract price, and there was no implied term stipulating that the owner must introduce the variations "at reasonable times."**

At MB&S, we were all well aware of what was at stake. Perhaps not all my colleagues had followed an elective 3rd year course called "Business Law". (I took mine during my third year at UP, with the Dean of the Faculty of Law, prof. E.M. Hamman, teaching the course "off-campus", meaning at the Pretoria Technical College close to downtown, and a brand new textbook by De Wet and Yeats was used.) But we had all used "Change Orders, "Variation Orders" and "Extra Work Orders" over the years. We had always assumed that the Contract Documents were crystal clear on our duties (as designers and construction supervisors) and the duties of the parties to the Contract. During the latter part of 1973, when this case was heard in Pretoria before the Transvaal Provincial Division, "our" Mr. Jack Fasken went to Court many a day, to provide evidence on specific details, sometimes going or returning with a big file (with red tape around it) under his arms. Before joining MB&S, he had worked for Van Niekerk, Kleyn and Edwards, the TPA's consulting firm (on behalf of the National Transport Commission) for design and construction supervision of the freeway directly east of Pretoria. His project had also (just like the "Sasolburg-Koppies" road) been somewhat of a politically motivated and rushed affair. Some stories went around about things that had supposedly not been designed "well" or that had been built "wrong", like the bridge with a certain skew angle that was built with a reverse skew, due to a supposed design or construction error, which to an outsider looked more like an obvious "lack of site supervision" or "common sense", or worse. But obviously, VKE had not been charged with any wrongdoing, but the Contractor had claimed from TPA.

By the grace of God, the Roseville project presented none of the problems just discussed, also no geotechnical challenges (as we would call them today).[73] The Soils Lab's investigations (with Mr. Bergh's approval) had determined that cement and/or lime stabilized local materials would be adequate for subbase construction, and base course materials were to be imported from a quarry, which in this case was norite from Bon Accord. We used the normal City requirements. Material excavated from the trenches was to be stockpiled, and not all of it was to be used for backfill; crushed gravel envelopes were needed around the pipes, whether concrete, pitch fibre or asbestos-cement.[74] During completion of the subbase, however, the Contractor ran short of material; perhaps our calculations of shrinkage had been out by a few percentage points. So a decision had to be made: Either "import" material, or "borrow" from an on-site source. Local material was available, and we chose to use a source as far away from the Apies River as possible, realizing that material would contain more clay to the west. A hole was dug on one or two of the eleven single family residential lots, and this was backfilled with "unsuitable material" like overburden and other non-descript materials, perhaps even the demolished concrete slab from his "site office". I instructed Jan Basson to ensure that, if possible, the future "building envelopes" (a North American term) on these lots should not be jeopardized. I said to him: ***"Do as if you would not be mad at yourself, if you somehow came to buy this lot to build your house."*** I am of the opinion that, in general, this kind of mindset was general in those days: Engineers and those working for them acted professionally and in accordance with a pursuit of the common good. The Contractor also suggested to

[73] While operating Grassroots Consulting Service during the 1990's, I once heard at APEGBC / ENCON's annual compulsory Liability Insurance Seminar, that of all sub-disciplines of civil engineering, those consulting engineers who do geotechnical engineering pay the highest insurance rate.

[74] Only in 2008, while working for the City of White Rock, I became aware that this universal construction practice of the past has caused major infiltration problems in wet climates like the Lower Mainland of British Columbia, where (a) the sanitary sewage treatment plants are overloaded, and (b) the design capacity of sanitary and storm-sewers is compromised, questioned and challenged. The reason is that water (both infiltration and outfiltration) flows within the compacted gravel surrounding the pipes, parallel with the sanitary or stormsewers. If these pipes had been laid in clay, this would not have been possible. Now why did people, many years ago, specify a gravel base for a sanitary or stormsewer? To ensure that the pipe would be stable and would not break, of course. Dayton & Knight, a consulting engineering firm from North Vancouver, handled many studies around the Lower Mainland of B.C., and came up with the idea of lining the sewers – which was very costly, and is nowadays being pursued.

lay 16mm pre-mixed asphalt instead of a chip seal, without an increase in cost. This was accepted; City projects had already done that fairly recently, as you may read from their projects I handled at that time.
The sanitary sewer system for Lot 91 was connected to the main trunk sewer that ran through the west part of the development, parallel and close to the Apies River. This was a 25" dia. concrete pipe[75] that served (as I had been told) much of Capital Park, and ran to the City's Rooiwal Sewage Treatment Plant, connecting with other outfall sewers along the way. (Sewage from the City's downtown area goes to the Daspoort Sewage Treatment Plant, but Roseville is downstream from that facility.) The single connection from all of Lot 91 was made at a specific manhole, at the very west end of Franzina Street. This work could only be done at night – and that was specified by the City Engineering Department – for "after midnight", when sewage flow was assumed to be minimal. Work could only start once the flow had been blocked at the manhole immediately upstream of the connection, and rising of the level of sewage in this manhole needed to be monitored. Within this maximum "window" of 4 to 5 hours, rapid setting cement was used for this part of the project – and this had to be personally supervised by me. The work was done on Sunday 27 October 1974, the very only occasion in my whole career that I spent the whole night on "on the job"! I took some photos with a flashbulb; see one of them **below**.

Sanitary sewer connection installed at nighttime.
A new manhole was to be built at this connection.

Prime coated Adriaan Street, from Franzina Street.
School site is at right, as well as PPC factory.

The project included construction of a road parallel to the lot line with SAR property, with an offset cul-de-sac bulb at its SW end. We had expected some rock in the southern section of the site, but seepage along water along the cracks of the diabase dyke was totally unforeseen, and while the Contactor was paid for the extra work to combat this water, he was delayed and claimed an extension of time for completion. We recommended to the Client to award this extension; it occurred simultaneously with a shortage, non-delivery and eventual change in size of steel water pipes (due to the expropriation. Due to the amount of measured "leakage" from the Irrigation District's main canal, and the lack of any overland drainage pattern for the adjacent land owned by the SAR, we decided to install perforated Santar subsoil drains in the boulevard of this along the road. These were available in 100mm dia. and 150mm dia., and were laid within a surrounding crushed rock "blanket" that was wrapped in Nylex filter cloth. While digging the trench for this pipe, we discovered a number of pipes crossing from where the canal had been, into Lot 91. This made me think quite a bit, and I came up with a strange personal conclusion. For more than forty years, I have not divulged my thoughts on this.

[75] This was not a standard 600mm dia. concrete pipe! In 1990, I heard that 25"dia. concrete pipes were also used in British Columbia for sanitary sewers. (District of Saanich, Vancouver Island, at McKenzie Avenue Interchange.)

I now firmly believe that the Sinovich family, as vegetable farmers, may have actually dug and installed those pipes, in order to "steal water" from the irrigation ditch. I was well aware that stranger things than this had happened regarding irrigation in water scarce South Africa: 1971 had been the Government proclaimed "Water Year", and a beautiful coffee table book with the title "Water" had a variety of articles about this since the founding of Jan van Riebeeck's fort at the Cape of Good Hope. Should I have exposed this situation? The problem obviously was that I knew that it would have been useless to tell anybody. Or not? Had this perhaps been done before, or even somewhere else?

While pondering this question many years later, in 2018, I stumbled upon an on-line document **KV203-WATER LAW.pdf** which is titled, "**WATER LAW OF SOUTH AFRICA, Report to the Water Research Commission**" [76] with a very strange link to the Les Marais Irrigation Board. See the summary of a certain court case on the next page. So if my assumption is correct, the Sinovich family may well have continued to do what this Mr. Nel had done in 1930 or 1931. Had they actually purchased Lot 91 from Mr. Nel? If so, what had he told them? For how many years had they then "stolen water" by undercutting the main canal, in violation of the Water Act? These are all "unanswered questions".

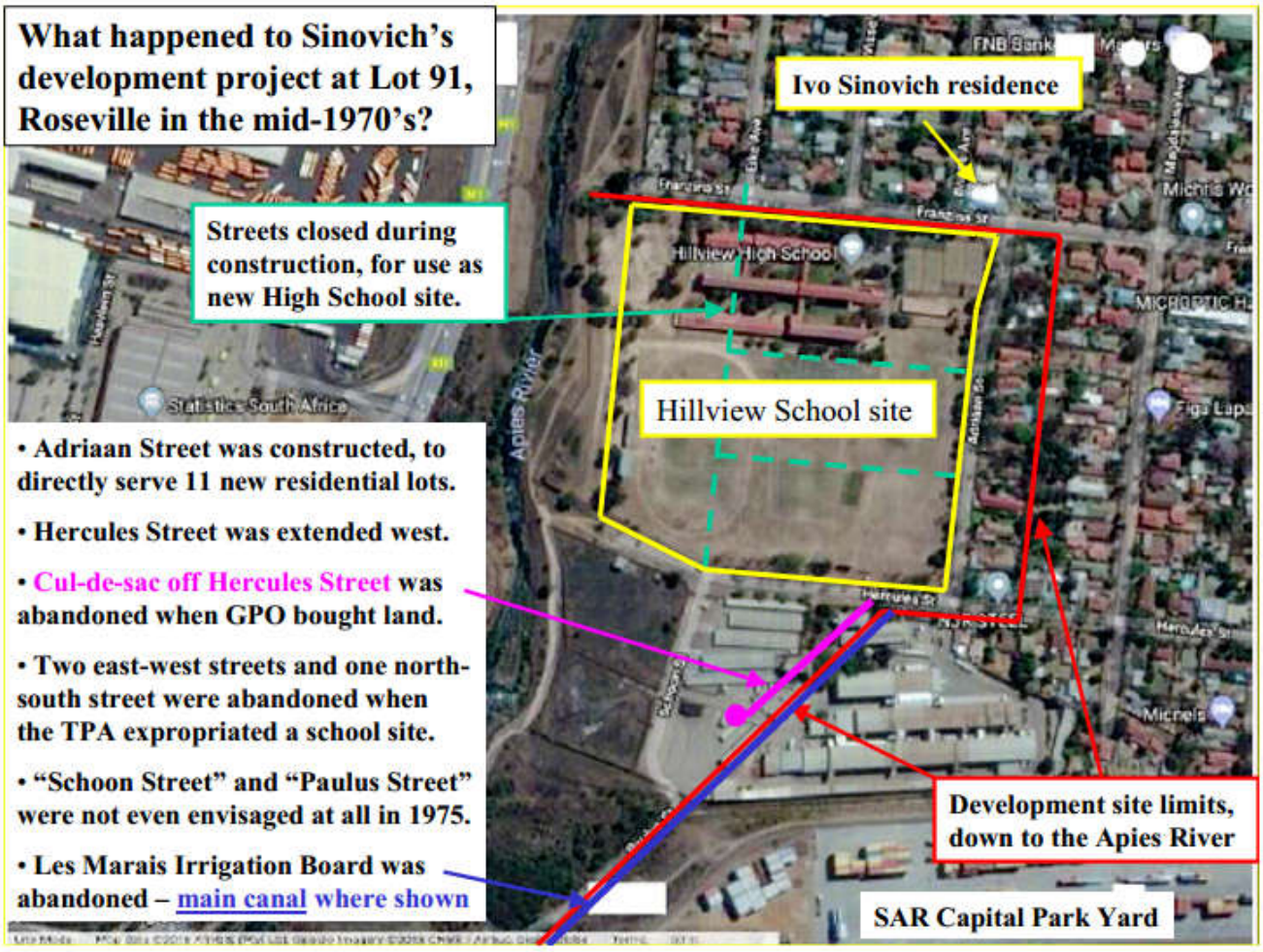
***Nel, R v* 1931 Uys WLC 164 T**

[WLC 164 NOTES]
Judgment Date 1931-09-21. **Court** TPD. **Judge(s)** CE BARRY, GJ MARITZ
Also reported as *Rex v Nel* 1931 TPD 486
Quick-note
Offence of altering or interfering with irrigation work – irrigation board regulation not *ultra vires* for providing the same
Summary
Section 133(2) makes it an offence for a person without lawful right or authority to obstruct an irrigation work or interfere with any irrigation work or alter the flow of a public stream.
The Les Marais irrigation board had an almost similar regulation (r 15). When Nel was charged under r 15 for diverting water in the board's canal, his defence was that the board's regulation was *ultra vires* because it covered the same ground as the section of the Act, and because it was too widely framed.
The court rejected both arguments, the latter for the reason that r 15 is not too wide if it is read with r 12 which provides that the interference should be without lawful right or authority.
Sources Noted
1912 Act 8 s 9(5) – WLC 164.03
1912 Act 8 s 133 – WLC 164.06, WLC 164.07, WLC 164.08, WLC 164.11
1912 Act 8 s 133(2) – WLC 164.01
1924 GN 327 r 12 (Les Marais Irrigation Board Bylaws) – WLC 164.10, WLC 164.11
1924 GN 327 r 15 (Les Marais Irrigation Board Bylaws) – WLC 164.01, WLC 164.02, WLC 164.04, WLC 164.08, WLC 164.09, WLC 164.10, WLC 164.11
Rex v Lotz 1927 TPD 836 – WLC 164.07

Prior to completion of construction of all the civil works, we heard that the South African Department of Post and Telegraphs, (known as the "HPK/GPO" or "the Post Office") intended to purchase a large part of the SAR lands which seemed to be redundant to the operations of the Capital Park railway yard. (At one time, a concept had existed to build a "railway link" between this yard and the railway to the north, which ran on the west side of the Apies River, so I can only assume that this idea had not been pursued. There was also an idea[77] to build a freeway directly west of the Apies River. That highway was later built.) The SAR/GPO land was directly south of Hercules Street and adjacent to the cul-de-sac on Lot 91.

[76] Its author is adv. Maritza Uys, BA.LLM (Stell), Advocate of the Supreme Court of South Africa, WRC Report No KV 203/08, ISBN 978-1-77005-675-6. March 2008, and contained a long series of court decisions, this one from the Transvaal Provincial Decision in 1931 against a Mr. Nel, during the days of the 1912 Water Act. Her sister is Dr. Tharina Uys, currently of Brandon, Manitoba, whom we met in 1993 at Nakusp, B.C. with Lydia's dad.
[77] This had already been shown in the BKS&H Transportation Study for Pretoria in 1968.

All municipal services (including water usage and sewerage flow) for the proposed GPO Workshops now had to be "redesigned" in conjunction with the **already installed** services through Lot 91. I was asked to discuss this with various officials, including an architect, who told me that the GPO and SAR had already "planned" this development a few years earlier; that had also been forgotten when Lot 91 was conceived, which did not surprise us because the SAR (at that time) was seen as somewhat of "a law unto themselves". The architect was quite happy that the Sinovich development on Lot 91 would save the GPO some money! I also had to meet someone from the City Electrical Engineering Department and from the GPO. This latter person turned out to be a Mr. Fourie (an uncle of Isabel Marais, my student girlfriend in 1963). When I left MB&S in mid-1976, the land purchase had already occurred; this included the old ditch and embankment of the former Les Marais Irrigation Board. Access was off Hercules Street.



Obviously, a lot of paperwork was required, and I copy part of the letter to Mr. Loubser, Senior Engineer at the City Sewerage Engineer, asking that the City take over the sewerage reticulation works, and adding:

> "The work has been carried out to our satisfaction and according to the plans and specifications. We would further like to express our appreciation for your kind co-operation rendered by your officials. We request that the 12 months maintenance period start on the 28th October 1984. "As-built" drawings will shortly be submitted to your Department."

Similar letters went to the other Divisions of the City Engineering Department. Mr. W. Thoms at the City Sewerage Engineer required its own drawing numbers on ours, (and later, an official asked for the return

of 9" expandable plugs that the Contractor had borrowed from the City), and Mr. C.C. Durand at the City Roads Engineer was satisfied. But a problem erupted with the City Water Engineer: It was claimed that due to the expropriation, the Sinovich's application for water had somehow lapsed. We could not see that from the information that we had, particularly because the system had already been connected to the City's water system (for testing) by a 19mm connection, just prior to the date of the Notice of Expropriation. We could only pass this concern on to the Client's lawyers; they would resolve the matter.

The street with 12 houses was later named **Adriaan Street**, obviously after Mr. A.O. Bergh. (When I mentioned this to him during the first telephone discussion with him in more than forty years, in December 2017, he said: "**No, that cannot be so, Jacob, I am not that important**." I then told him that he could go and see it for himself.) It seems that "Telekom" took over the whole south part of the Lot 91 development, including the cul-de-sac, that there industrial buildings and lots, but no duplexes at all.

After completion of the "amended contract", (for lack of a better phrase) there was an official "ribbon cutting" ceremony, almost directly opposite the Ivo Sinovich residence at 84 Franzina Street. MB&S was represented by Mr. Bergh, Jan Basson, Louis van Wyk and me; the client, Mr. Ivo Sinovich and his father attended with Mr. Ogus, their lawyer, and some of their Croatian relatives / friends, and Mr. Lukas Botha and his staff were there as well. Mr. Bergh and Mr. Ogus held short speeches, and I took a photo of the occasion. Afterwards we went into Mr. Sinovich's house for some drinks and other refreshments.

The cul-de-sac adjacent to the SAR owned lands.

Official opening of the development, looking south.

On the photo at right: With brown shirt = Louis van Wyk; directly in front of him = Mr. Adrian Bergh; with white shirt = Mr. Ivo Sinovich; man in grey suit = Mr. Ogus (?) talking on behalf of the Sinovich family.

But even this was not the end of my involvement. In May 1975, after returning from an overseas trip, I had to submit a second revision of the "Proposed water reticulation – Lot 91, Roseville" to Mr. de Kock of the City's water engineering department, in reply to the City's letter of 18 September 1974. This was letter 7016/1/2/60, so you can imagine how thick the file was! At that time, the TPA school site expropriation and the GPO land purchase had been completed. In October, the lawyers were still talking!

In early 1976, I had to send Mr. Kamp at the City Engineer's Department a letter 7016/1/2/71 with a copy of the executed Contract documents, plus a copy of the "final" payment certificate, on loan, because the system had not been taken over by the City. And we also notified the City that stormsewers outlets at Franzina Street and Booysen Street had broken off, tumbling into the Apies River.

(In early 1978, Mr. Bergh wrote a letter to me in Canada, asking if I knew where one of the two original October 1973 reports to the Department of Water Affairs was. I did not have it nor a copy; I understood that Henk Kaal was dealing with "the project". I later sent MB&S the colour negatives that I had.)

In the winter of 1975, I was asked to go to Bloemfontein for a week; Mr. Sturgess was on vacation in Natal.[78] I visited the Groenvlei Jail east of the city, where Mr. Ken Harpur was supervising a contractor doing civil works; I visited the railway overpass construction site between Universitas and Fichardt Park (which was a City of Bloemfontein project); I drove out to Clocolan for a day to provide a report on the just-completed railway overpass project, the OFS Roads Department's first project with a price escalation clause – see above. I also visited my cousin Andries Domburg, a 2nd year Architecture student at UOFS who lived in a dorm. I had last seen him at my father's funeral in September 1973, and had afterwards driven him back to the South African Air Force Gymnasium near Pretoria. On completion of his studies, Andries later practiced as architect in his home town Paarl (Cape Province) for many years.

During my three years in the MB&S office, I also became involved with private sector projects that had a railway component. Mr. Shuttleworth had brought these into the partnership in 1973, the prime reason of my transfer back to Pretoria. Two of the proposed railway siding projects come to mind: One was for the Laeveldse Tabakkorporasie in Nelspruit, for which Tender Documents needed some input from me. This project had already been approved by the SAR, and had been handled by Hans Labuschagne. My contribution was not substantial, except that the Tender Document had to be prepared in Afrikaans, which was (for a railway siding project) something that GVG Shuttleworth & Associates had not done before. I fail to remember the project number.

Clocolan "road-over-rail-and road" Overpass project in the winter of 1975, shortly as after its completion – (but see the black smoke marks!)

Photo taken from the railway overpass. Estcourt, Natal, May 1974. Photo of the proposed Abattoir site.

The other siding was for a huge brand new pig abattoir for "Eskort" (a well-known brand of bacon) just east of the Town of Estcourt, in Natal. The issue that was the most important was the length of the "**unloading dock**", as the idea was to bring a number of railway cars loaded with pigs beside the plant

[78] Perhaps he was scouting out opportunities to open an office there. The Pinetown office started before 1977.

(which was also in the design process). Another issue was the access road to the abattoir, off the main highway just east of Estcourt, near an existing railway overpass. This project was not resolved by the middle of 1976. Johannes Hoogenboezem (Lydia's oldest cousin) from Heidelberg, was at that time a Director of this substantial co-operative. Its other abattoir was at Heidelberg, and (by the way) his very first sow had been purchased from Lydia's mother! Lydia and I looked at the site when on our way to Ballitoville in May 1974, took some photos and later discussed the situation in the office. It was built.

Other proposed railway sidings that were being designed at the time were located in Babelegi Industrial Township, near Hammanskraal, north of Pretoria, and at Isithebe Industrial Township, north of Durban, in Natal. There were about six of them, in various stages of design, approval and construction. Martin Gouws and Hans Labuschagne handled those projects, and in retrospect, they moved very slowly indeed, for reasons that I did not question then and **only later thought** I knew why – for political reasons. Babelegi and Isithebe had (like Rosslyn) been two of the "first generation" **industrial growth points** that had been conceptualized or planned by Lydia's father during his years with the Department if Planning.[79] These were all in the "**border areas**" adjacent to the various homelands, through the IDC (see below), and only later they were initiated within the homelands. The Bantu Investment Corporation Act (Act No. 14 of 1959) had already envisaged and enabled the latter type of development – financial, commercial and industrial schemes in areas designated for black people, even closer to home.

The boxed text below had been read in a paper on "Planning" at the 1968 SAICE Convention, by Dr. G.S.J. Kuschke, Managing Director of the IDC (Industrial Development Corporation of South Africa):

Seven years ago the border areas development program was announced. During these seven years 210,000 additional Bantu workers throughout the Republic were given employment in secondary industry. The breakdown was as follows:

In Border areas	49,000	i.e. an average of 7,000 per annum
In City areas	160,000	i.e. an average of 23,000 per annum
Total	210,000	or 30,000 per annum

Up to now the IDC has been instrumental in providing employment for 28,000 of the 49,000 Bantu in border areas. To achieve this the IDC had to invest R47 million in the border areas.[80]

These earlier generation developments (since 1961) were the logical outcome of the NP Government's decision to reject a recommendation from the former SAP Government appointed Tomlinson Commission – **to put these developments inside the homelands** – while the more recent generation developments somehow reversed that concept. Rosslyn (west of Pretoria North) had been the very first development of the first generation, (original area 260 morgen) where the Datsun-Nissan factory was built in 1965. During 1964, the year that I had to give up completing my studies in four years and changed my goal to five years (see "Part 1"), working for J.B.S. du Toit, I had drawn structural steel and concrete drawings for some of the buildings in that factory complex, and a railway siding into the factory had also been designed and built. Just east of Brits was another of these "first generation" industrial townships, where a (very short) street – Van Tonder Street – had already been named after my father-in-law.

[79] My father-in-law obtained a two-year post-graduate Diploma in Town Planning at the University of the Witwatersrand in 1953 and 1954. He was the only one of eleven students (some of them his colleagues) who passed the final exam without a subsidiary exam. His knowledge came to good use in his work on black townships: Tsakane (below) and later Tembisa and Kathelong (as City Engineer of Germiston), and also with his "post-career" position.

[80] From this quotation, the conclusion can only be drawn that even with a lot of money, the IDC, a para-government entity, had only provided work for **23.3%** of Bantu in the border areas, and **7.5%** of total new secondary industry employment. Who would provide the rest? It was obvious that the flow of Bantu labour was unstoppable.

Time out, so that you, dear reader, may better understand the rest of this book: In early 1975, Lydia and I intended to go on vacation to see my grandmother, uncles and aunts and cousins in the Netherlands. My father had died in September 1973 at Potchefstroom (from a germ that he had picked up in the local hospital), and the relatives were anxious to hear about this and to see Lydia, who had never been overseas. Our son Joss (born that same September 1973) had quite some health problems when about three months old, he was over these a year later. Theo would enter elementary school in January 1976, so 1975 would be an excellent time to go. The grandparents on the nearby farm would still be able to look after our four children. Exceedingly great was our surprise when my father-in-law suggested to us that we extend our trip by visiting Canada. "Why?" we asked, to which we received his response: "Because you may need to emigrate there, sometime in the future, for the sake of your four children. Sad to say, I no longer believe that much of what is currently being proposed in this country may work out **in the long term**. You have an aunt in Edmonton, Jacob. Go and visit her; we just came back from London and picked up these brochures from an airline company called Laker Airways. A return ticket, flying from Gatwick to Vancouver, costs only £ 144 per person, and the minimum stay for a return trip is two weeks." Lydia's mother agreed with this view. **Anybody could have bowled us over then with a feather!**

But we made reservations to fly to Schiphol Airport near Amsterdam by way of SAA, for a 38-day retour trip, and also booked and paid (in Pretoria) for a two-week Gatwick-Vancouver return trip, with tickets to be picked up in downtown London at £ 144 per person, with Laker Airways, via Reykjavik. My mother's sister (tante Coks) was ecstatic about our visit, and so was my brother in Berkeley, California. He planned to travel to Edmonton by bus to come and see us all. (He had left South Africa in September 1969.)

In the office, our proposed overseas trip was not seen as something unusual. But from Mike Meijer I received a request about a project that he had planned/designed while working for Wilbur Smith & Associates in San Francisco, a few years before joining MB&S. (He had left South Africa in September 1967 to study there, and had afterwards also worked at WSA for a while.) He had prepared the Preliminary Design Report for the very first "single point interchange" in Calgary, Alberta, Canada (200 miles south of Edmonton) and had personally flown to Calgary to deliver the documents, but never returned to see if was ever built and how it operated. He showed me his copy of the design report – it was a few kilometres south of the downtown core, at McLeod Trail and Glenmore Trail, near a mall called Chinook Centre. I promised him some photos.

So Lydia and I departed and got stuck at Windhoek Airport for a whole night due to the failure of a Boeing 747 engine starting motor, we saw all my relatives and even one of Lydia's mother's cousins, (most of them before going to London with the overnight Hoek van Holland-Harwich boat). We flew to YVR via Kevlavik Airpott, we visited Vancouver and Victoria and then made a huge "figure 8" by Greyhound through British Columbia and Alberta. In Calgary, we visited Herman Heikens' (see "Part 1") sister, whose husband Joe Boone took us to Chinook Centre and this nice single point interchange, definitely the first one in Canada. It was cold that first week of May, and there was some sleet on the ground; I took some photos for Mike Meijer. In Edmonton, we saw the Borkent family and my brother Arie. We spoke to Rien Scheffer, son of friends of my uncle and aunt, who worked for a firm called Stanley & Associates Engineering Ltd. in Calgary, and professor J.J. Bakker (a Delft graduate), who taught transportation engineering at the University of Alberta (my uncle was his dentist). Returning in Vancouver via the Okanagan, we flew straight back to Gatwick (without going to Iceland), enjoyed a guided tour of Dover Castle, crossed the English Channel by Hovercraft and saw Paris for a Pentecost weekend. From Gare du Nord, we railed back to the Netherlands and visited the relatives we had missed earlier, then touching down at Jan Smuts Airport after 38 days. About a month after our return, my parents-in-law sold the farm due to full-time employment in Pretoria, when my father-in-law's supervisor, Mr. Fred Barnard, was fired. They then bought a house in the city. I made some colour prints for Mike.

A substantial industrial development project came to us from the Bantu Investment Corporation, (BIC/ BBK), for an expansion of 80 hectares to an **Industrial Town at Nkowankowa**, east of Tzaneen. This "second generation" industrial area was to be served by rail from Letaba Station, on the Selati Railway[81] that originally ran from Soekmekaar to Komatipoort[82], and it was inside Gazankula, the homeland of the Shangaan people, very close to Bavenda, the homeland of the Venda people. This **Project 4030** was multi-disciplinary, as it entailed all the roads, stormsewers, sanitary sewers, watermains, water supply (from the Letaba River just north of the railway station) and connecting to a pre-existing sewage treatment plant for Nkowankowa, an residential town, and a future railway yard and sidings to some (not all) individual lots. And of course, there was the logic of future designs for individual railway.

There were already some factories at Nkowankowa; I visited two of them during my first site visit. Bus Bodies (Letaba) (Pty.) Ltd. manufactured full-size transport buses, based on a Fiat design and engines. Such buses were to bring the factory workers to and from all their villages and the industrial area(s) all over South Africa, as part of the decentralization program to develop the homelands and avoid continuing inflow of black workers to the main industrial areas around the big cities. Their buses were already being used in the Pretoria area. I only drove by that site, but I had a chance to stop at two other (smaller) factories, one that made school benches and window and door frames; the other one set up to tear old automobile tyres apart, and using the material to make protective equipment for the mining industry – shin pads, knee pads and also huge sections of explosion matting. They had a fancy machine that quite accurately ripped open a tyre of any size, so that the strips fell to the side. It was quite labour intensive.

The site was bordered on the west by an existing Provincial Road with a railway overpass and a bridge crossing the Letaba River, on the south by an east-west access road to the Nkowankowa residential town, on the east by a creek that ran from south to north and to the north by the existing industries adjacent to the railway line. The railway yard was proposed parallel to the Provincial Road, and the lot layout was therefore based on this criterion, with spurs sticking out into the development, for a minimum of road/rail crossings[83]. The road system basically came from the other side, so that the layout looked like fingers of two hands meshing together. This "rail served" lot layout was typical in South Africa. We were to design the road system and the stormwater system, while Roy Redshaw in Cape Town would design the sanitary sewer system and the water reticulation system. I had an opportunity to discuss the water supply once with a former classmate, Murray Louw PrEng., who was at that time working for the Government of Venda, and came south from his headquarters in "Vendaland"[84] to discuss the ideas of a new filtration plant along the Letaba River that would also improve the existing system residential Nkowankowa.

The need for an adequate and efficient bus system was obviously essential to the expected success of the Government's policies, as implemented by the Bantu Investment Corporation. In Schoemansville, our neighbour was one of their employees, and he had lived in Tzaneen as Manager of bus system owned by the Bantu Development Corporation (BBK in Afrikaans), which was supposed to be "taken over" by black managers after a few years of operation, a logical assumption. The system had failed miserably after he had left Tzaneen, and he had been called back to sort out the problems. There had been fourteen buses on the road when he left, but within three months, only two buses were running, and factories were

[81] This private railway company was initiated as early as 1890, but (as quoted by Lewis and Jorgenson), "(t)he project was riddled with financial misdealings and bribery, and as a Government subsidy was payable on mileage the railway was routed so as to add unnecessary miles. The resulting scandal had international repercussions and only long after things had settled down did the South African Government take up the project, completing it in 1915."
[82] The Selati Railway first ran through Kruger National Park. In 1971, the bypass section to Kaapmuiden was built.
[83] This principle was almost universally used in the layout of rail-served industrial areas, also at Babelegi. In October 1975, it had been approved that the "legal survey" work of the township would be done by Fehrsen & Douglas, but only once the detail design of the railway sidings had been approved (meaning: by the SAR).
[84] Murray Louw (and others) may have worked for both homeland government services at the time.

complaining that people did not turn up for work. He found many of the bus company's black staff at the bus depot, sitting around and playing cards all day; some parts had been ordered, other buses just stood there waiting to be fixed or serviced, and there was a huge staff conflict. The specific problem was that Venda people and Shangaan people do not work together well (and this had caused many tribal wars in times immemorial.) Our neighbour had then developed the bus company's new staffing system ("pecking order", we would say), so that any Venda employee would have a Shangaan supervisor, and that every Shangaan employee would have a Venda supervisor. The existing staffing system had entirely "broken down" (just like the buses) after his first departure, because of a lack of understanding of an ethnic reality.

We first prepared a Feasibility Study for the project, and this was submitted in July 1974. After its approval, we solicited prices for aerial surveys, and (out of three quotations) the firm Pretoria Opmetings (Pty.) Ltd. was selected for a price of R 8 750. On completion, we started design work and liaison. As examples of this liaison: **(1)** We needed an easement for a stormsewer along one of the side property lines of Bus Bodies, from where stormwater would run underneath the existing railway by an existing box culvert (or bridge); Letaba Station was on the north side of the track. **(2)** We expected to use "Dan Hill" within an existing residential development (south of the Provincial Road) for a water reservoir and water purification plant, and there were no legal plans (yet) for this township. (Being in a homeland, we did not know what type of system was used for land registration.)[85] **(3)** The Bantu Mining Corporation asked mining rights of R 200/square mile and 25c/m^3 royalties for materials excavated from a certain pit, payable to Mr. Olivier, Tzaneen Magistrate. {At site handover to Mollerkon, thus was increased 35c/m^3, so I requested a waiver.} **(4)** There were graves to be relocated, first in the streets and later in the lots. **(5)** A sports field needed to be relocated. Those at the BBK were satisfied with our design efforts; we only dealt with Mr. Charl du Toit there, and not with a Committee (and obviously, there was no public input). But I felt that somehow, I needed to get some feedback from someone at the town of Nkowankowa, which had no municipal council but a black Administrator. On one site visit, I therefore met this person and explained to him what was proposed. He seemed to be quite satisfied, thankful for the new employment opportunities that these factories would bring, and appreciative that we would also improve the access road that served the existing residential area. This road ran directly south of the proposed industrial area, and there was a high school along that road (currently a college). The existing east-west access between the Provincial Road and the area of Bus Bodies and other existing factories, would be closed because this was "just too close" to the existing railway overpass, and would also conflict with the proposed railway yard. Design of all "services" as mentioned above was completed within a reasonable period, with soils information and test results for the development provided by Louis van Wyk and his staff.

During a week vacation (by train) to my cousin Nico Domburg's wedding in Wellington, Cape Province, in July 1974, Lydia and I popped into the MB&S office in Cape Town, to discuss a lot of specifics with Roy Redshaw about this particular project (as well as what had happened at Roseville). I met Mr. Kobus Pienaar there for the first time, he was the firm's traffic engineer who taught at the University of Stellenbosch.[86] The secretary (was it Mrs. Ferreira?) looked out the window and said it was a perfect day to take the cable car to the top of Table Mountain, because there was no "table cloth" that day. So we went, with our two sons, Theo (6) and Joss (not yet a year old); we had left our two daughters Plonia (5) and Sara (2½) with their grandparents on the farm. My uncle Andries let us use his light blue car for local travel, even up to the top of Franschhoek Pass (in the dense fog) and to Cape Point (where the view was much better). What can one expect in mid-winter in the Cape? Lydia had never been there before. On our return, the train's heating system did not really work, and it was extremely cold in our compartment.

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[85] Something similar occurs in Indian Reserves in Canada and Indian Reservations in the United State**s** (in plural, because different systems exist; each State had its own system, and treats Reservations in terms of its Constitution.)

[86] He visited the Pretoria office a few times during the next two years, and became a partner. He once left a copy of his Transportation Study for the Town of Stellenbosch, of which (at that time) I did not really understand much.

Tender documents were then prepared, and the project was advertised. The results were very interesting, and a lot can be learnt from what happened next. This situation below may be strange to you, dear reader, and needs to be explained; it deals with a specific South African practice (of British origin?) that does not exist in North America: One tenderer (the Moller brothers' company called Mollerkon Pty.) Ltd., had made a **significant error.**

Item 5.1.1 Supply and Lay Premix Asphalt, 1 000 t @ R 149,50 per t should have been **R 149 500,00**. Mr. Moller had extended the 1 000 x R 149,50 and shown **R 14 950,00** in the tender, **R 134 550.00** short.

This could be addressed (and corrected) in **only one specific way,** as explained in our **Tender Report**:

The General Manager (Development), **Letter 4030/1/162**
Bantu Investment Corporation of South Africa Limited,
PO Box 293, Pretoria 0001
Attention: Mr. Du Pisanie. **CONFIDENTIAL**

Sir, **TENDER REPORT: Contract 4030/A, Water distribution system, sewerage, stormwater drainage and streets, Nkowankowa Industrial Area.**

The site inspection for the above contract, advertised on the 12th of March, was held on the 23rd of March in the presence of Mr. Van Vuuren of your Tzaneen office. Thirteen prospective tenderers attended it.

On the 2nd of April, nine tenders were submitted, arranged according to price as follows: **(RANKING)**[87]

1. Mollerkon (Pty) Ltd.	R 1 164 029,27	**100.00**
2. Aquavia (Pty.) Ltd.	R 1 175 125,28	**100.99**
3. Meumann & Heyneke Civil Engineering (Pty) Ltd.	R 1 198 902,50	**103.00**
4. B.D.F. Construction (Pty) Ltd.	R 1 226 682,10	**105.38**
5. Murray & Roberts Roads & Earthworks (Pty) Ltd.	R 1 231 847,08	**105.83**
6. L.M. van Vuuren - Edmunds Construction Company (Pty) Ltd	R 1 313 830,70	**112.87**
7. Grinaker Construction (Africa) (Pty.) Ltd.	R 1 346 478,43	**115.67**
8. Basil Read (Pty.) Ltd.	R 1 568 349,32	**134.73**
9. S. & H. du Plessis Construction (Pty) Ltd.	R 1 693 867,44	**145.52**

Tenderer no. 2 has submitted an alternative tender for the amount of R 1 117 645,68 on its own initiative.

The five lowest tenders were checked for extension and addition errors, and some minor errors were detected. According to the introduction to the Schedule of Quantities, the Total Price is final and binding so that any error does not affect the order of tender, but in such case unit prices need to be adjusted.

1. With regard to the lowest tender, that of Messrs. Mollerkon, we report as follows:

A large calculation error has occurred in this tender, in **Item 5.5.1, premixed wearing course**, where a calculation error of **R 134 550** has been made. This error was discovered after an interview had already been arranged with Mr. J.S.W. Moller, a director of the firm, who was informed directly. If this error had

[87] In North America, comparing (ranking) various tender prices with the lowest one, is a normal practice. The difference between the lowest and second lowest tender is also sometimes called "leaving money on the table." This practice was not known in South Africa, and that is why I show this additional information in **red**. It is obvious that tenderers 7 and 8 (being large companies) were not "keen prices". Tender 4 (also a large company) might have had equipment available in the Lowveld, like Mollerkon. However, much more could be presumed – after the fact – while translating this letter with GoogleMaps. Were construction projects already becoming scarce? Seeing my non-involvement with the tendering process after 1976, I cannot respond to that question, except considering that Mr. Grodsky's fears (see my "Part 1") might have been proven correct.

not been made, the tender price of Messrs. Mollerkon would have been fifth lowest.

At our request, the company undertook to investigate the matter, in order to decide to withdraw its tender or to stay with its price, in view of this single mistake, which entailed the largest single item of the entire contract. The attached letter was subsequently received, together with the said financial statements.

It appears that unit rates for the various items in the quantity lists are well-balanced. Even with a reduction of unit rates by about 11%, these prices will remain balanced.

The firm's operating equipment is unencumbered and fully owned by the firm and its related companies. It appears to be a family organization. Work can be started immediately after the contract is awarded, as the equipment is currently in Tzaneen. It is planned that Mr. J. Moller will be the terrain agent and Mr. Le Grange (a relative) the soils technician. As subcontractor, Messrs. Roadmix or Limmer will act for the pre-mix work, and possibly Messrs. P.J. Roos Construction for sewerage. The work will be completed in 9 months as stated in the tender form.

The firm is well-acquainted with conditions in the Lowveld and will try to complete all pipe work during the winter. No problems are foreseen with guarantees.

The references mentioned in the Schedule of the Tender Form have been followed up by us, and it appears that this firm has in all cases done good work and progressed well with these projects. The Mollers are reliable and although there is no highly qualified staff, they are well-experienced in this type of work if proper supervision is taken. From a supplier of concrete pipes was learnt that the company has an excellent record of payment. A consulting engineering firm confirmed that the soils technician, Mr. Le Grange, knows his work.

The bank reference to Volkskas Nelspruit has been followed up by our bank and code C is reported, while the latest financial statements (28 Feb. 1975) also give the impression of a healthy organization.

2. With regard to the 2nd lowest tender, that of Messrs. Aquavia, we report as follows:

This company, on its own initiative, provided an alternative tender, utilizing alternative materials for the sanitary sewers and prefabricated concrete culvert inlet and outlets (Item 4.4.1). However, in the light of the currently unknown quality of industrial effluents, the use of pitch fibre sanitary sewer pipes is not recommended by us, while the use of the concrete inlet and outlets is not possible in all relevant positions, due to the depths of these outlets. The alternative is therefore rejected in its entirety.

The firm is a newly established organization founded by two current staff members of a large construction company, Mr. D.A. Malan (B.Sc. (Eng.) and S. Groenewald (B.Sc. (Q.S.). An interview with these persons indicated that they really intend to perform the work in 7 months as reported in the tender plan. A planned work program has been submitted to support the intention. Operating equipment will be obtained through term lease and rent and a descriptive list has also been submitted. Work can commence once the two gentlemen have completed their current obligations to their employer (about 2 months). Mr. Malan reported that he had already resigned, while Mr. Groenewald would resign directly if the contract was awarded to the firm.

Both Messrs. Malan and Groenewald will handle the job themselves, and staff will be obtained mainly from current employers. As subcontractors, Roadmix will do the pre-mix work. Guarantees will be arranged by Federated Employers.

The firm has shown nothing as references in the tender form, but Messrs. Malan and Groenewald reported that they gained a lot of experience in their current organizations over the years, which we can confirm.

The bank reference to Volkskas Kempton Park was followed up by our bank and code F was reported, and it was added that the account was opened on the 15th of March 1975.[88]

3. With regard to the 3rd lowest tender, that of Messrs. Meumann & Heyneke, we report as follows:

This firm did not attend the official site visit, but Mr. Mathieson of the firm visited our offices and then the site. The firm has been in existence since March 1975 and has been running various projects in Klerksdorp, Randfontein and Johannesburg since June 1975.

During an interview with Mr. Mathieson, he stated that the firm could start work within 3 weeks after award and that the work could be completed in 9 months. Most operating equipment under term rent is approximately 9 months old. The firm intends to place a junior engineer with two skilled foreman in charge of the work, while Roadmix will do the pre-mix work as subcontractor.

The tender was qualified by the price changes of bituminous products after 1976-03-30, and it is currently impossible to determine any value for this qualification.[89] Guarantees are envisaged by Federated Employers.

The reference given in the Schedule of the Tender Form has been followed up by us, and it appears that the company has delivered very satisfactory work and is well-managed by two engineers, Messrs. Mathieson and Rossouw.

The bank reference to Nedbank Hillbrow has been followed up by our bank and code C has been reported. The firm is a subsidiary of Meumann & Heystek, a Johannesburg building construction company.

The other tenders were not investigated to the same extent, as it is felt that any of the lowest three tenderers will be able to perform the work.

Recommendation:

It is clear that the choice lies in this case between Messrs. Mollerkon and Messrs. Aquavia – a reputable firm that has made an error and may now have to do this job at a lower profit margin, versus a new firm that wants to work faster with leased machinery. We investigated the possible savings that may occur if Messrs. Aquavia completes the work in 7 months, compared to the 9 months of Messrs. Mollerkon. Such savings can amount to approximately R 20 000. However, a monthly production figure of R 152 000 (as R 1 065 000 **:** 7) seems very high for a company of which the abilities of the persons concerned is not questioned, while the team knowledge is not known and cannot be estimated, nor the reserves in case of unforeseen setbacks or problems.

On the other hand, it is clear that Messrs. Mollerkon as a well-established company with sufficient reserves, may well be able (or willing to be, due to the known summer conditions) to complete the work before the rainy season. In such a case, you will also be able to save on the price change costs.

[90]Taking all in all, our recommendation is for Messrs. Mollerkon (Pty.) Ltd.

The documentation is herewith returned to you, together with comparative schedules and estimate.

We await your further instructions, Yours truly, MB&S.[91]

[88] Just after the project had been advertised!

[89] I guess that this project did not include “cost adjustment factors”. This tenderer wanted them in, their effect was to reduce contractor’s risk. Asphalt was to be laid toward the end of the contract period, before the summer rains.

[90] The ending of the letter is not translated, but shows in English within my Carbon Copy Book of these days, likely dictated to me by Mr. Bergh (or Mr. Fasken, who attended the meetings with the three lowest tenderers.)

Explanation of the above:

- South African practice (as clearly spelled out in the General Conditions of Contract) states that the "extensions" of the "estimated quantities" and the "unit prices" need to be verified. In case of a conflict or discrepancy in any submitted tender, **the "extension amount"** (meaning the "tendered item amount" as the "estimated quantity" X "unit price") **is taken as the one used in the "total tendered amount"**, **while the "unit prices" are not binding**. In a case like Mollerkon's, the Engineer needed to advise the low tenderer of his tendering error, and also to request him if he intended to complete the project based on an unamended "tender price" that would correct his error, and would be based on the total of "amended unit prices" x "estimated quantities" (as calculated by the Engineer). Obviously, such "tendering error" could work both ways, although with a "windfall" error, the initial "low tenderer" might not remain in that position.
- North American practice (and I do not know its origin) is that **"unit prices" themselves are binding in a tender document**, and that the specific "tendered item amounts" for all the items need to be amended and presented to the Owner as the true "total tendered amount", if there is an error in the extension's calculation. Following such practice would make Mollerkon the fifth lowest tenderer, (as mentioned in the letter) and MB&S would have to proceed and then recommend either Aquavia (not a good prospect) or Meumann & Heyneke (perhaps acceptable) to the BBK, or even Murray & Roberts!

The single error (shown above) made Mollerkon the "low tenderer". Aquavia's tender was only a tiny R 11 096,01 higher than that of Mollerkon, and therein lay also a possible problem. This firm had been "just established" by two very qualified staff members of an existing (national) Contracting firm. When we met these people, we were impressed by the diligence already shown with their tender, the balanced prices, and that they presented a document (using Critical Path Methods) outlining the flow of the work, with labour needs and equipment utilization (with was all to be rented equipment)[92] so that we were somewhat inclined to "bypass" Mollerkon. However, we could not do so – as we (meaning Mr. Bergh, Mr. Fasken and I) had already met with them[93] and had asked them if they would be "willing and able" to stand by their "total price" with around 11% reduced "unit prices" **for all pay items**. This would need a family gathering, we were told.

Within a few days' time, I had recalculated all the unit prices in Mollerkon's tender document. I re-did the extensions so that the total price was exactly (within a few cents) the same as that tendered by them. Though it lead to some weird unit prices, going to e.g. R 9.26 for a water valve instead of R 10.40, (we tried to stick to single cents and not half or partial cents) we then received written confirmation that the family would not break word with their original price – and I believe that if they had reneged, they would stand to lose one of their "security bonds", as they were the lowest tenderer and that information was already public knowledge through the media of the construction industry. During a follow-up meeting in Mr. Bergh's office, they were able to convince us that they could do the work, and that we had no reason to have any qualms about it. So we wrote the above "Letter of Recommendation" (mentioning the process that had been followed) to the BIC, and a few days later, I also wrote **Letter 4030/5/2** (see below). We received a copy of the formal contract agreement a week or so later.

Messrs. Mollerkon (Pty.) Ltd, PO Box 845, Nelspruit 1200

Re: Contract 4030 / A - Nkowankowa

Sirs,

[91] Most likely, seeing its significance, this letter was signed by Mr. Bergh.
[92] All these things were normally required from the Contractor – but only later, after a Contract had been awarded!
[93] The only thing that a "low tenderer" can be ensured of, is that he has a **right to be heard first** about his tender.

Please find enclosed, for your approval, the list of amended rates for the above contract, which, as you have already heard, has been awarded to your company by the Bantu Investment Corporation.

These adjustments have been made in accordance with your letter of 1976-04-06 (without using half-cents), and please accept these rates in your reply to the letter of acceptance, which will be sent to you by the BIC.

Sincerely yours, MB&S

Shortly after the award had been made, we heard (through the grapevine) that the two individuals who told us that they intended to leave the existing construction company firm in which they held mid-to-senior professional positions, decided not to break away after all. This made us at MB&S feel good, knowing that we had been correct by "sticking with Mollerkon". Mr. Bergh (who had been President of SAACE (the South African Association of Consulting Engineers) in 1972, would likely agree to my views on this: **Consulting engineers do not only have a responsibility to their clients, but also to the construction industry as a whole, as well as "the common good".** If we had not been up-front with the Moller brothers, (as the low tenderer) in their strange self-inflicted predicament, but had been "bowled over" by the smooth talk of two people who seemed a bit disgruntled in their current positions with another construction company, that position might have bitten us later. By allowing Mollerkon to accept this substantial project (even with an obviously decreased profit margin), the industry was better served than with yet another "fly-by-night" construction company and a weakened firm where they came from.

Creek in flood near existing industrial area.

Store near the Nkowankowa residential area.

Mr. Bergh then found a Resident Engineer for this project, in the person of Mr. Jorge Simoes, through his niece. He was a young engineer who had just come from Lourenço Marques, Moçambique, in which a rebellion against Portugal was raging at the time, due to a revolution against Salazar. He was Portuguese trained, and single; he was to live in a nice motel in Tzaneen for the project duration. I was to "super-supervise" (called "project management" later on) the project by regular site visits, flying to Letaba Airport (northeast of Tzaneen) from Jan Smuts Airport (actually located in Kempton Park and not in Johannesburg as many people think.) During the design process, I had already twice flown there, with an airline company called Letaba Airways. This firm operated return flights every (early) morning and (late) afternoon out of Jan Smuts Airport, with 6- and 8-seater planes. Mrs. Procos did the booking, which was easy because the planes were never full. One was an older Beechcraft 18 (lower wing) plane, and another one was a younger Beechcraft Commodore (upper wing) plane. The first plane had formerly belonged to an important Texas oil magnate, I was told by a pilot. During one of my earlier flights, we had come down over the escarpment of the Drakensberg in a narrow gap of thick fog, which continued further east, and the landing procedure to Letaba Airport became a lesson in navigation (to me) of a full "instrument

landing", where the pilot flew directly over the beacon, flew straight for two minutes and made a sharp 180 degree curve, returning to the beacon and continued with this zig-zagging process (with only clouds outside, knowing that this was mountainous terrain) while losing altitude all the time, until we could vaguely see some trees below us and then the airstrip itself. I flew to Tzaneen twice more during construction, meaning before I left MB&S and joined the staff of the NITRR at the CSIR.

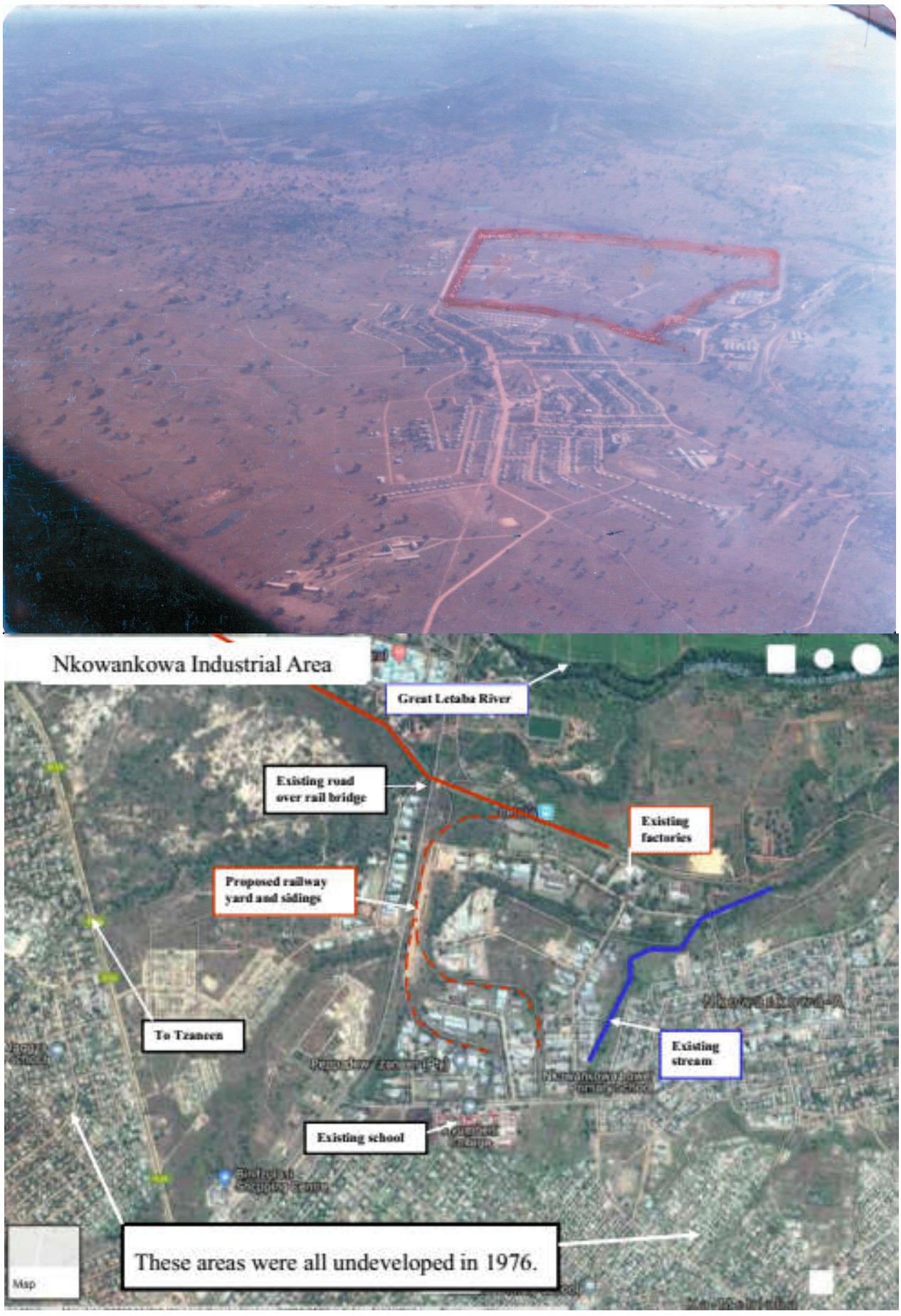
During the first construction field trip, when it was still the rainy season in the Lowveld, I met Jorge at Letaba Airport and we drove to the site with his light blue (rental?) car, experiencing a massive downpour of rain. The box culvert of the creek between residential Nkowankowa and the Industrial area flowed full bore and overflowed the east-west road! It's Jorge in all four photos below. I understood from Mr. Bergh in May 2018 that Jorge (George) Simoes later joined Mr. Sturgess in the Pinetown MB&S office, built a number of substantial bridges in Natal, in a successful career, married and had children.

Mollerkon at work. On both photos (**at left**): Louis van Wyk (with dark glasses), and Jorge Simoes next to him. The other person is likely a BBK/BIC representative. These trenches were for the stormsewer on a north-south road in the Industrial Area. These photos were taken in the late fall or early winter of 1977. Note the amount of groundwater in the trenches. It would have been very difficult to construct these works in summer.

I took the photo on the top of the next page from the window of a Letaba Airlines flight, on the way from Jan Smuts Airport to my last site visit to the Nkowankowa project on 14 July 1976 – mid-winter in the Lowveld. In red pencil on the photo, I outlined the project limits of the Industrial Area Expansion. North is to the right on the photo; the then-existing residential area of Nkowankowa is the foreground.

Now please compare the residential area of 1976 with that of the more recent GoogleMaps image (on the bottom of the next page). Looking at Nkowankowa on GoogleMaps, I note that some of these 250 hectares have yet to be fully developed. The school is still there (as a College) and so is the then-existing "original" Nkowankowa residential area, and yes, there are some industrial looking buildings. But very many new residential areas exist, and my obvious question would be: "Where do all these people work?"

But then I recall reading a report on the internet about the Limpopo Province Development Department (dating about a decade ago) that considered Nkowankowa the industrial development with the highest manufacturing component, and suggesting that unit sizes ought to be made smaller for the expensive refurbishing.


Nkowankowa Industrial Area
Great Letaba River
Existing road over rail bridge
Existing factories
Proposed railway yard and sidings
To Tzaneen
Existing stream
Existing school
These areas were all undeveloped in 1976.
Map

Our **Project 4010** also resulted from these Governmental homeland development policies. It was for a proposed access road and railway overpass at the north (or west) end of the Town of Mafeking, Molopo District, Cape Province, (since that time again named Mafikeng and now Mafiheng) to access the (brand new) Legislature of Bophuthatswana. Our client was the **Department of Works of the Bophuthatswana Government Service**, and had already been "on the books" in August 1973. This railway overpass was to span four existing and four proposed tracks, as this was in the yard of the main railway to Rhodesia[94] (currently called Zimbabwe) and at the north end of the yard of Mafeking Station. On the east side of the existing single north-south railway track was a long ninety degree curve approaching the proposed over-pass structure, and on the west side, the road alignment was to join and follow the alignment of an existing gravel road that was the arterial road of the Town of Montshiwa, just south of where an almost new Legislature Building already existed. Mr. Roy Redshaw told me once that one of his last projects when working at the Department of Bantu Development had been the design and installation of sanitary sewers in this Town of Montshiwa, at an extremely low grade of 1:600, for which the "aqua-privy" system had been developed, meaning that the sewers take liquid waste to oxidation ponds, but that solid waste remains in the individual concrete outhouse sump tanks, that would need to be pumped out occasionally. This was seen at the time as a "typical South African solution". It may now well be used somewhere else. To explain the system, it may be worth giving some technical information about it:

Aqua-privies:[95] An aqua-privy is a small, single-compartment septic tank directly under or slightly offset from the pedestal. The excreta drops directly into the tank through a chute, which extends 100 mm to 150 mm below the surface of the water in the tank. This provides a water seal, which must be maintained at all times to prevent odour and keep insects away. The tank must be completely watertight; it may therefore be practical to use a prefabricated tank. The tank must be topped up from time to time with water to compensate for evaporation losses if flushing water is not available. This can be done by mounting a wash trough on the outside wall of the superstructure and draining the used water into the tank. The overflow from the tank may contain pathogenic organisms and should therefore run into a soil percolation system (it can also be connected to a settled-sewage system at a later stage).

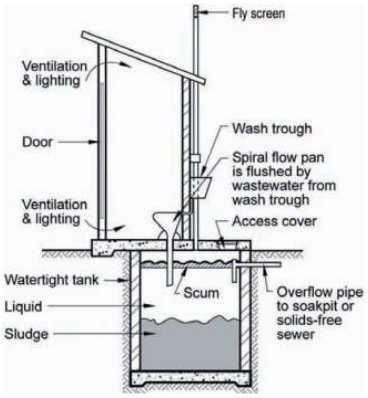


Figure10.11: Aqua-privy toilet

Factors to consider before choosing this option are the following:
- The excreta are visible to the user.
- The tanks must be completely watertight.
- The user must top up the water level in the aqua-privy to compensate for evaporation losses.
- The system is hygienic, provided that it is used and maintained correctly.
- It is relatively inexpensive.
- The system can be regarded as a permanent sanitation solution.
- This system has excellent potential for upgrading, since the tanks work in the same way as a septic tank and can thus be connected directly to a settled-sewage system. • The tanks need regular inspection, and sludge removal is required from time to time.
- An adequate, uninterrupted supply of water must be available.

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[94] Indeed. Rhodesia's railway link north of Messina in Northern Transvaal was only completed in 1975, and this also explains the importance of the railway line between Mafeking and the Witwatersrand, via Swartruggens.
[95] Copied from Chapter 10 – Sanitation – Guidelines for Human Settlement Planning and Design – "Red Book" Volume 2 – CSIR Building and Construction Technology.

For this project, MB&S had 500 mylars pre-printed with letterhead and title blocks, etc., all ready for use by Mike Burgess' bridge design drawings and our road and stormsewer design drawings. When these 500 mylars arrived, it was unfortunate that my eye was drawn to a huge spelling error in the title block.[96] Not (as might be expected) in the difficult word Bophuthatswana, but lo and behold, the title blocks read **Goverment of Bophuthatswana** ! When Mr. Bergh saw this, he directly ordered that the whole ream (and they were B1 size mylars)[97] be thrown in the refuse bin. Trying to fix this "blooper" by erasing the error and then stencilling in the correct word **Government**, was just unthinkable to him.

see below of discussion on **red line**

After my initial field trip to Mafeking on 10 May 1974, I wrote Letter 4030/1/104[98] to the Department of Posts and Telegraphs, sending a layout plan and suggesting that they determine where cable ducts for future use could be installed crossing asphalt roads, just as ducts were proposed in the bridge structure. In September 1974, there was a meeting with Mr. Shuttleworth and Mr. B. Smook (formerly of TPA Roads Department, but then with the Department of Bantu Administration & Development) about this project. This Department was still much involved with it, as Bophuthatswana had not been declared a separate and autonomous Republic. I then wrote a letter, stating that the site was actually "too flat" for storm drainage; at the west end were sewage oxidation ponds. We asked that high kerbs be considered with a minimum road grade of 1:400 (= 0.25%) and stormsewers around the railway overpass only. My "Schedule of proposed engagements" to Mr. Fasken (dated 1975-10-01) shows for this project: "Nothing for me shortly, I hope." I was busy!

South Africa was in those days quite progressive about what is called "undergrounding" of electric and telegraph/telephone services. (Note "Part 1" about the Postmaster General's official residence in early 1968.) There were various reasons for this, as they were (and are) so different than in North America:

- A lack of good timber poles in South Africa, vs. abundant timber in Canada. When opening our St. Regis Hotel room in Vancouver in April 1975, we were astonished to a massive array of wires and timber poles (and a transformer on top of it) in the lane off Dunsmuir Street.
- South Africa used steel poles for electric and telegraph/telephone wires. In the 1950's already, in urban areas, undergrounding had started, using SANTAR pitch fibre pipes. This was also later done in rural areas. When fibre optics came, the same SANTAR pipes were sometimes used.
- Timber poles would have deteriorated in many parts of South Africa, or the wood and wire would have been stolen. But North America has not been immune to the threat of copper wiring theft.
- I would venture to say that underground wiring is much safer than overhead wiring. South Africa was much earlier concerned about this kind of safety, than Canada and the USA are (even today).
- In the City of Surrey in the 1990's, undergrounding was normally required from Land Developers, for single family residences, but I was amazed at the costs charged by BC Hydro and BC Tel.
- There seems to be total reluctance to even think about the economic advantages of undergrounding – and this while every year, with every storm, anywhere in North America, extremely costly "power outages" occur and need to be "fixed". Work preservation for unionized personnel?

[96] This was not the first or the last time in my career that I spotted typing or printing errors!
[97] TPA and the City of Pretoria used the "A" method of dividing a square metre of paper; the "B" way was used by some other clients.
[98] This means that there must already have been a lot of correspondence on the project!

Looking at the current GoogleMaps, I note two east-west railway crossings at Mafiheng, and I believe that the one with which I was involved, is the one at **First Avenue**, directly west of the (old) downtown, and **not the one further north**, where there is only one railway line, on Sekame Street, near a current Industrial Area east of the mainline and a lot of residential development in **Montshiwa Unit 1**. But I do not see the long sweeping curve (**red line**) on the east aside of the track, which was part of the east bridge approach, so I must conclude that the proposed road alignment was changed or that my above assumption is wrong. I wonder when these roads and overpasses were built, and if this was done during the (short) life of the Government of Bophuthatswana, or after all the homelands were dissolved. I also cannot find the Bophuthatswana Legislature Building….. Bophuthatswana became an autonomous republic on the day we arrived in Calgary, Alberta, Canada, and the commemorative stamps of that day, **6 December 1977**, are cancelled at **Montshiwa**. I am not sure if it became the capital. And on 19 September 1980, Mafeking was incorporated into Bophuthatswana, (and renamed Mafikeng) and I have another first day cover of that occasion, with an insert showing many interesting facts. Oh, the joy of stamp collecting!

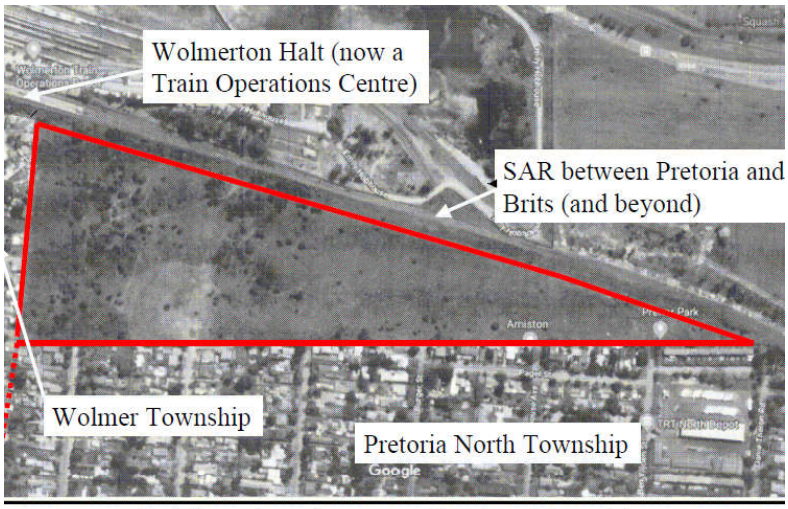
MB&S became involved in the beginning of a number of private township development projects, and I should explain how we got in on the ground floor (pun intended). A soils investigation was needed for every proposed township (whether for 5 or 50 lots), because proof had to be given of the quality of the soil for building houses. Soils in large areas of South Africa contain a high percentage of mont-morillonite, a clay mineral that does not exist in most other countries in the world. In the mid-1960's already, a South African scientist named D.H. van der Merwe had developed a method to determine the amount of swell that would result if houses were built on these soils, and there were certain ways to counter this swell which, if not countered, would cause wall to crack and floors to distort and the building to "fail". The Transvaal Provincial Administration had decided that every application for establishing a Township needed such soils report. Fehrsen & Douglas recommended to their clients that MB&S be retained, and this became a series of small projects for Louis van Wyk and me. Louis used the auger-fitted Toyota Land Cruiser; he drilled the holes, logged and sampled the soils and tested them in the laboratory, and I had to have some site plans made up and to write the report in A4 format with a nice cardboard cover[99] with a window for the title on page 1. One of the specialized soils tests (for what is called spectrography) had to be done by the South African Bureau of Standards; this test differentiated between the various clay minerals and determined the percentage of montmorillonite, the basis of the

[99] MB&S used burgundy for these (and other) report covers, with black Cerlox bindings. (Standardization?)

"Van der Merwe Method". The SABS office was near the Pretoria Mint on Visagie Street. Louis and I completed about half a dozen of these projects; and I will now describe them and their peculiarities:

Our **Project 7017**, a proposal for **Colmar Township**, on a triangular site north of Pretoria North, east of Wolmer Township, had already been submitted to the TPA Department of Local Government before my return to Pretoria, by Ferhsen & Douglas (agent for the Owner, a Mr. C.T. Reynolds).[100] There had been discussions with the SAR in July 1973 about a serious storm drainage problem at this site; water running east in a ditch south of the railway line, due to their inadequate drainage system. Our Soils Report for the site was submitted to Fehrsen & Douglas on 19 April 1974, who passed it on to the TPA. A few months later, Mr. Douglas sent us copies of letters (from the City of Pretoria or from The TPA), indicating that the SAR planned to construct a new culvert under the railway line at the north end of Bakenkloof Street, Wolmer, opposite Wolmerton Halt, and requiring a hydrologic study. I wrote a response letter to Mr. Douglas that, in MBS's opinion, this was "fairly complicated". I explained: "In case of a 1:50 year flood, the present bridge at Boepens Spruit where it crosses the railway line, will not be able to carry the water, which will then dam up and run eastward along the railway bank (*i.e.* ***through Colmar***), aggravating stormwater problems at Wolmerton Halt. We have therefore decided to prepare a 200m radius detailed survey of the bridge site to be able to show various alternatives of the flood line (with and without the bridge) and will shortly come in touch with you with some results and questions regarding legal and administrative implications."

These days, I would consider this a serious "**off-site problem**", which might necessitate development setbacks and the like, which is environmentally a good approach if properly administered. I knew that most streets in the former Town of Pretoria North (which included Wolmer) had been built before the 1964 annexation with the City of Pretoria, without any storm drainage system – it was just sheetflow, all the way north from (the appropriately named) Berg Street, flattening out toward the east-west railway line and beyond. My resurfacing projects (as a City employee) had included portions of some of these streets. There was a storm drainage system for the north access to that part of Pretoria North, a railway underpass. (At one time, a tanker truck with bitumen or tar had turned over in an "accident" in that underpass. Lots of the asphaltic material had spilled and run straight into the catchbasins, solidifying as it went. It was impossible to remove; the concrete stormsewer was replaced down to where the gucky blockage ended.)
I do not know the end result of that topographic study and the hydraulic study report. In April 1976, I sent this report to Mr. Chapman at the office of the TPA Director of Local Government, and copies to Mr. Durand of the City of Pretoria Roads Department, Mr. van der Westhuizen of the Transvaal Board for the Development of Peri-Urban Areas, Mr. Louw at the office of the District Engineer (Construction) of the SAR in Capital Park, and of course Mr. Douglas at F&D. But GoogleMaps shows that the site is now still just as barren as when Louis and I went to drill holes in the autumn of 1974, and that the north side of the railway line, Wolmerton Halt is a Train Operations Centre. I trust that any (costly) drainage challenge for developing that specific facility (and land further north) would have been addressed. But I also note a white dot ● on GoogleMaps, in the SE cor-



Red lines show the proposed Colmar Township

[100] Perhaps his Christian name was Colin and his wife's Christian name was Mary or Martha…

ner of the site, that shows "Prenor Park", and perhaps that's also a good land use.

For the proposed **Roseville Ext. 1, Project 7053**, on Haarlem Street, west of the Apies River and also adjacent to the railway line, a Soils Report was also prepared. The Owners were Messrs. P.N. and N.F. Toich. This work was completed in August 1975. GoogleMaps shows that this site seems to have been completely "swallowed up" by the north-south highway west of the Apies River. A Soils Report for the proposed **Mountain View Ext. 2, Project 7052**, owned by Mesdames Stipinovich & Sakota, c/o Mr. N.F. Toich (in a downtown office), all of them likely of Croatian background like the Sinovich family, was done almost simultaneously. Then there was the proposed subdivision of two lots in Mountainview, adjacent to the Apies River, for which a Soils Report was not needed but a 1:50 year hydrologic study – in which we made use of the 1:50 year flow of the Apies River, calculated by Dr. van Heerden in the Johannesburg office of BKS&H: **530** cubic metres per second. We billed F&D under **Project F&D Gen**.

Some Soils Reports were for proposed townships in Pretoria's eastern suburbs, the "development hotbed" at that time. **Project 7041** was for the proposed **Equestria Township**, and **Project 7049** was for its proposed **Equestrian Ext. 1 and Ext 2 Townships**. (Two owners, three holdings at Willow Glen, economy of scale.) In the same area, **Project 7051** was for the proposed **Die Wilgers Ext. 18 Township**, and **Project 7045** was for the proposed **Dorandia Ext. 14 Township**. There was also a Soils Report for **Ashley Gardens Ext. 2 Township**, but that was on the file for **Project Sm. Cons**. (I don't know why.) For many of the soils tested, we needed X-ray tests on a soil sample, in order to determine the percentage of swelling clays. This work was done in the Laboratory of "Geological Surveys" in Visagie Street, and we were required to send a copy of our report to that Central Government facility. Their work on 10 soil samples cost R 20. Mr. Jack Fasken once made a comment that "we were getting out these reports quite handily" as if they were the major source of income for MB&S for that particular month or quarter! The "PWV consortium" (see below) froze a number of these proposed township applications, and they were afterwards individually "unfrozen" by the Provincial Administration.

There was also a **Project 7026** for which I wrote an Afrikaans letter in January 1975 (on behalf of Mr. Shuttleworth) to the CEO of the **Magaliesberg Grain Cooperative Limited** in Brits. This was obviously an "old project" (my letter was # 130 on the file) and it dealt with a proposed private railway siding (and development) at the Coop's property at Thabazimbi. I sent two copies of a Soils Report, of which one was suggested to be used by the client to discuss compensation with the SAR, closing with the hope that – even under changed conditions – the report might still be useful. I have no idea what it was all about.

Project 4009, on the **National Cultural Historical and Open Air Museum** site, was already "on the books" in August 1973, as a Department of Public Works[101] assignment to Shuttleworth and Associates. For more than a year or so, no work was required; in early 1975, I became involved in its initial stages. This project was spearheaded by Mrs. Kotie Roodt-Coetzee, Director (= Curator) of the National Museum on Boom Street, adjacent to the Pretoria Zoo. I do not recall how or on what basis GVGS&A had been selected for this project. I was delegated as the civil engineer on a "team" of other professionals like an architect, a botanist, a geologist and some historians; our liaison person was a Mr. Conradie. The site designated for this project was at the south end of the Fountains Valley, accessed off Eeufees Road, directly south of the Voortrekker Monument, and almost directly north of the end of the main runway of Waterkloof Air Force Base, which had its entrance from the west near Valhalla. On this site, a few piles of carefully numbered old hewn rocks, being parts of already demolished buildings from previous centuries and various parts of South Africa, had already been placed at their preliminarily designated reconstruction sites, and the Concept Plan that had to be developed was for a complete Open Air

[101] Of the **Central** Government, not of the (Transvaal) Provincial Administration. We called it the **National** Government; that name did not always sit well with those of a different political persuasion than the National Party.

Museum, (not unlike the Hooge Veluwe in Gelderland that I had visited as a child, and also as an adult). Accurate site contour mapping was al-ready available, and I attended a few regular on-site Project Meetings (as these are currently called). While the noise of military jet planes (Mirages) flying almost directly over our heads was almost overwhelming, I was able to suggest some ideas regarding possible road layouts and standards, (no asphalt please, oh no!, only cobble stones, it all had to be very authentic!) and also for specific parking lot and road access locations off Eeufees Road. Some meetings were held at the National Museum Headquarters (nice and cool, with high ceilings in the Curator's office). But because Mr. Paul Roux's geological report showed "dolomite", and that serious or even catastrophic sinkholes would be likely on this site, it was determined in October 1975 to abandon the project at this location and look somewhere else. More than forty years later, I sometimes wonder "what really happened", and what they did with all the numbered hand-hewn rocks, some of them now 200 years old.

In November 1975, DPW (as it was called) wrote us a letter, to which Mr. Shuttleworth responsed (**entirely without my knowledge**) – to which I then saw fit (risking my job?) to confront him with a **"Personal Memo" (copy on file)**[102] with five very specific points (in English, so it's not translated):

Memo to GVGS Re: Letter 4009/1/48 *(Note: # 48 had been GVGS's letter – JAdR)*

It is a great pity that this letter was written and sent without my knowledge, because:
(1) DPW's letter did not even ask us for a response from our side; see the slashes (/////) or their letter.
(2) The cost estimate is not ours – we are not even aware if there is **any** cost estimate for the project.
(3) DPW's letter 44 gave an indication of requesting that we **do not proceed** with the project; how could you then confirm a completion date?
(4) (It is my opinion that) the current geological problems will cause this site to be abandoned anyway.
(5) A golden opportunity existed to respond (though not needed) with these facts, enquiring about cancellation of our contract with DPW and asking for payment of services rendered to date on a time basis.[103]

That chance has now lapsed. JAdR.

Mr. H. Human of DPW responded to GVGS's letter with one dated 1975-12-11, to which I had to reply, in (I think) my very first letter written in January 1976:[104]

Dear Sir,

We acknowledge receipt of your letter of 1975-12-11 and apologize for the fact that no recent progress reports have been submitted to you.

As you may note from the contents of the attached progress report for the September-December period, it was clear to us that the site would be given up. Moreover, on 1975-09-11, we had been instructed to provisionally suspend our planning, due to the site access problems.

We trust that this progress report is in order and that you will be able to give us definite answers about the points mentioned under (4), and whether further progress reports by you is required.

Respectfully yours, MB&S.

Shortly afterwards, on 1976-02-27, I was asked by Mr. Bergh to write another letter to DPW, not to some bureaucrat or clerk, but to the Secretary himself – on the /9/ file which contained all the "agreements":

[102] A copy also went to the "correspondence file"; these files were read by all the partners on a regular basis.
[103] We had not yet invoiced DPW at all, and our fees were to be on a percentage base of future construction costs!
[104] Details in "Part 2" come straight from three "Duplicate Books" of those days. This was letter #18 in my Book 3.

4009/9/6 1976-02-27

The Secretary of Public Works, Private Bag X 65, 0001 Pretoria.

Dear Sir, **Retirement from Partnership**.

We hereby notify you that Mr. G.V.G. Shuttleworth will retire from this Partnership on 1976-02-19.

Mr. Shuttleworth has agreed, however, to act, full-time if necessary, as an Advisor to the Firm, for a period of at least two years. His services will therefore be available to us for a further period, which will ensure continuity in respect of the assignment that will are being worked on.

The assignmernt with which Mr. Shuttleworth was involved, and that had been assigned to the firm Shuttleworth and Associates after composition of this firm, is as follows:

PRETORIA – CULTURAL HISTORICAL AND OPEN AIR MUSEUM – CIVIL ENIGINEERING SERVICES.

We notice from your letter of 1976-01-13 that this assignemnt has been terminated, but in case any query in relation with the project would arise, you will realize that it is your decision whether or not such enquiries should be directed to this firm, which will be re-established after 19 February 1976 with the remaining Partners.

Would you therefore please advise us as soon as possible of your further instructions.

Respectfully yours, MB&S.

A month later, during March 1976, I wrote the following Invoice – which put an end to the project:

5/515/23(CEC) 4009/9/17 Account No. 14/76

The Secretary for Public Works, Private Bag X 85, 0001 Pretoria. Attention: Mr. J.C. Raap.

Mackintosh, Bergh & Sturgess in association with Shuttleworth & Associates,
P.O. Box 2723, 0001 Pretoria.
Dear Sir,

Pretoria Cultural Historical & Open Air Museum - Civil Engineering Services;
Invoice for Professional Services No. 1 (Final).

With reference to your letter of 1976-02-13, we enclose (in duplicate) our invoice to you as required under Agreement 5/515 of 1973-10-24.

Professional fees are calculated on a time basis, taking into account clauses 16, 11.6 and 10.1, because no more progress was ever made except consultations with the Director of the Museum, the Architect, the Geologist and Officials of your Department.

1. Time: Professional Engineer	73.5 hours @ R 15/hour	= R 1 102,50
Technician:	6.5 hours @ R 5/hour	= R 32,50
(see attached state for particulars)	Total	= R 1 135,00
2. Printing costs: (see attached state for particulars)		= R 15,17
	TOTAL now due	= R 1 150,17

Your truly, MB&S.

Hans Labuschagne had spent 6½ hours on the project in August 1975; I had spent 1 hour in August 1974, ½ hours in January 1975, 2 hours in May 1975, 2¼ hours in June 1975, 40¾ hours in July 1975, 14½ hours in August 1975, 4¼ hours in October 1975, 7¾ hours in November 1975 and ½ hour in January 1976. I would not be surprised to hear that this project later "died of a natural cause", not only because of those possible sinkholes at the end of the runway **at this particular site**, but also for the "lack of money" for development **at any alternative site**, exemplified by the sizzling military costs of what is called South Africa's "**Border War**", in which these Mirages leaving Waterkloof Air Force Base were increasingly becoming engaged at the time, the real sinkhole into which South Africa was falling without realizing it.

A minor "spin-off" during this project was Mrs. Kotie Roodt-Coetzee's request that MB&S auger a row of 33 holes for a fence made from timber railway sleepers (like guardrail posts in North America) at a much smaller project of the National Museum: the parking lot of a small ancient farmhouse where the old National Road crossed Moreleta Spruit just east of Silverton. This work, to prevent parked vehicles from going over the bank into the Spruit, had to be done in the winter of 1975. Louis van Wyk took care of it, I later sent an invoice on the **S.C. project file** (for "small consultations") for staff and equipment time plus travel only, not for the holes because no soil sampling had taken place. An amount of **R 74,50** was paid; a year later, Lydia and I received a formal invitation. On the Day of the Covenant, **16 December 1976**, the State President, Dr. Diedericks, inaugurated that "**Pioneer House Museum**" named after the original builder / occupant of the restored raw brick house. Lydia and I went to the event, held in a huge tent, and listened to a very patriotic speech. By that time I had already left MB&S and worked for the NITRR of the CSIR, and we were actually in the process of selling our house in Schoemansville, because we had also, unbeknownst to virtually everybody there that day, applied to emigrate from South Africa to Canada.

There was also a **Project 7054** in mid-1975, about "**Silverton Ext. 14, Installation of Services**", which was minor, involved 15 hours of a partner's time @ R 20,00 per hour, 11 hours of my time @ 16,50 per hour and R 200,00 for survey of an intersection, plus 76 km @ 9c/km – for a total of R 691,64. I guess the partner was Mr. Jack Fasken, but cannot recall what it was all about, except "a (completed) sewer to stand no. 2" and "liaison between the various parties". Just a "second opinion" on someone else's design?

As you, dear reader, may have noticed while reading this, during the three years at MB&S in Pretoria, I **multi-tasked** a lot (although I did not know the word). I thoroughly enjoyed all my work, and did my best in providing civil engineering work worthy of the professional requirements. The partners generally appreciated my work, I believe, and in February 1974, I was offered the opportunity to share in the annual profits of the firm. Together with **Jens Frehse** and **Colin Louw**, I would become an "Associate", (with a ¾% profit share, if I am not mistaken).[105] Two colleagues, **Mike Meijer** and **Mike Burgess** (who were more senior us) were to become a "Senior Associate" with a different percentage (which I never knew). By that time, Mr. **Kobus Pienaar** had already become a partner of the firm, out of the Cape Town office[106]. I gratefully accepted this opportunity, and starting on 1 March 1974, was then included in the list of Associates, on the bottom of newly printed stationary, while the names of the Partners were all listed at the top left hand corner. Big deal, one might say in retrospect, but I felt content with this accomplishment[107]; a few of my classmates at Tukkies had already become partners in other Pretoria firms. This

[105] This was in lieu of receiving a 13th month salary (bonus) payment. For 1976, the change in income was minor.
[106] He lived in Stellenbosch. Mr. Roy Redshaw PrEng, member of a religious sect, likely declined this offer, or had left the firm's employment at that time. The undated Organizational Diagram, attached to the Promotional Brochure of August, 1973, mentions a Mr. C.L. Ferreira PrEng as "a partner in the Cape Town office only". Mr. Kobus Pienaar likely replaced him as partner. That brochure also mentioned that Jens Frehse was in the Cape Town office; he had also been transferred to Pretoria in August 1973, like me.
[107] Jens, Colin and I sometimes even joked: "The partners are on the top and the associates are on the bottom, just like the offices of the partners are in the front of the building, and our offices are in the back of the building."

was somewhat different that the Rikent situation with BSB&P (see "Part 1".) Three weeks before leaving South Africa, a full fifteen months after leaving the firm, I received a copy of a letter by MB&S's auditors, Van Sittert Leask & Rheeder, addressed to the Receiver of Revenue (dated 1977-11-02), stating: "We are presently preparing the financial statements for the firm for the year ended 28 February 1977. We wish to state that an amount of R914-44 will become due and payable to Mr. de Raadt as at 28 February 1977 in respect of a bonus which represents a percentage of the firm's calculated profits for the year to that date." Bean counting takes time, I discovered. I only received that money in December 1978.

Around the same time in early 1974, I felt privileged to be asked by Mr. Bergh to become the Employee's Trustee in the Mackintosh, Bergh & Sturgess Pension Fund, of which he was the Employer's Trustee. This fund had a commencement date of 1 March 1970, and I was therefore one of its "original members" while in Sasolburg. There were about 40 members of the Fund at the time, spread over the three offices, but (very strangely) I do not remember if any Bantu or Coloured or Indian members existed.[108] (Perhaps this was not allowed!) The firm also paid insurance fees for all employees[109]. This trustee position (if one can call it that) did not take up much of my time, but it lead into knowledge of financial management in a way that I had perhaps vaguely foreseen when studying for my MBA in 1970-1972. The Fund took in money every month from every employee, and the firm (as employer) also contributed an equal amount every month.[110] These moneys had to be invested (and also re-invested) properly, but only as allowed by the law. Mr. Nagel was the firm's accountant, and I believe that he was not in the office on a full-time basis but only now and then – and in the beginning, he sat on a chair at a desk in this huge unused space in the front part of the fourth floor. He received and reviewed all the brochures of debentures of the various municipalities and provincial administrations and the Central Government and some private businesses, and decisions needed to be made on a regular basis: The Fund had to stay invested by certain percentages in certain investment categories – and could not e.g. put all its eggs into one basket called Corlett Drive Estates shares (or even Krugersdorp Municipality Debentures). I think that some "shares" were allowed, but only if they were of a preferred category. The issuing entities each had their own dividend or interest percentages and their own issuing conditions and payback times, and even roll-over conditions. So decisions had to be formally made, so that Mr. Nagel could do his job. I do not think that I ever rocked the boat by going against Mr. Bergh's (and Mr. Nagel's) suggestions, I was too green for that. But I once made a suggestion for an "investment" which, in my opinion, would have been beneficial to all employees who paid into the MB&S Pension Fund, and … Mr. Bergh turned it down.

As family, we went on vacation at Ballitoville (on the Natal North Coast) for a week in May 1974; this coincided with our son Theo's 6th birthday. While there (in a rented house that we saw advertised in the newspaper and was owned by someone in Verwoerdburg), we noticed a "vacation flat" that was listed "for sale": the beach end unit of a row of eight two-storey apartments. The thought came up why the MB&S Pension Fund could not invest in this piece of real estate, primarily for the benefit of its members? I thought that it would be feasible to develop a list of Fund members who would be interested in going to Ballitoville for a week, and an annual schedule could then be developed, with some level of preference for

[108] The soils lab had M. Rampersad (Indian), G. Solomons (Coloured) and D.M. Llale (and I confess that I did not know his actual ethnicity, as it could be either).

[109] During my 6½ years with MB&S, only a single employee died, and it happened over a weekend. This Bantu male worked in the Print Room at Inflo House, *(I saw him every workday)* and died from a combination of **A**sthma and **A**lcohol, aggravated by **A**mmonia. While some staff members (perhaps the partners?) had likely been aware of his asthma and drinking habits, nobody had even asked if this asthma was perhaps the result of his working conditions. Workers' Compensation legislation did not include black workers. I am not sure if he had been "insured"; that is why I include this story while describing my involvement with the MB&S Pension Fund.

[110] Much later, when working for the Arizona Department of Transportation (2002-2008) I became aware that ADOT, (my "Employer") paid more (11%) than the Employee (9%) into the Arizona State Retirement System.

those with children during the school holidays (noting that the Transvaal and Orange Free State school holidays were different), and for those without children outside the school holidays, and then a "lottery" or "raffle" of some kind (although I did not mention the words). These Fund members would of course pay for their week in Ballitoville, (directly to the Fund) and once you had made use of a week, a Fund member would not be eligible for another week for the next few years, to keep things equitable. And for the weeks when there were no takers, (seeing that Natal vacations are seasonal, with almost nobody going there in February (=called "suicide month", due to the heat), the apartment could be rented out on the open market for short-term periods. Note that this idea came to me before I knew anything of the concept of "time shares", which became so very popular internationally. But Mr. Bergh said "no", and that was it.

Ballitoville, Natal, 19 May 1974. Theo's 6th birthday.

← Schoemansville, before our overseas trip in 1975.

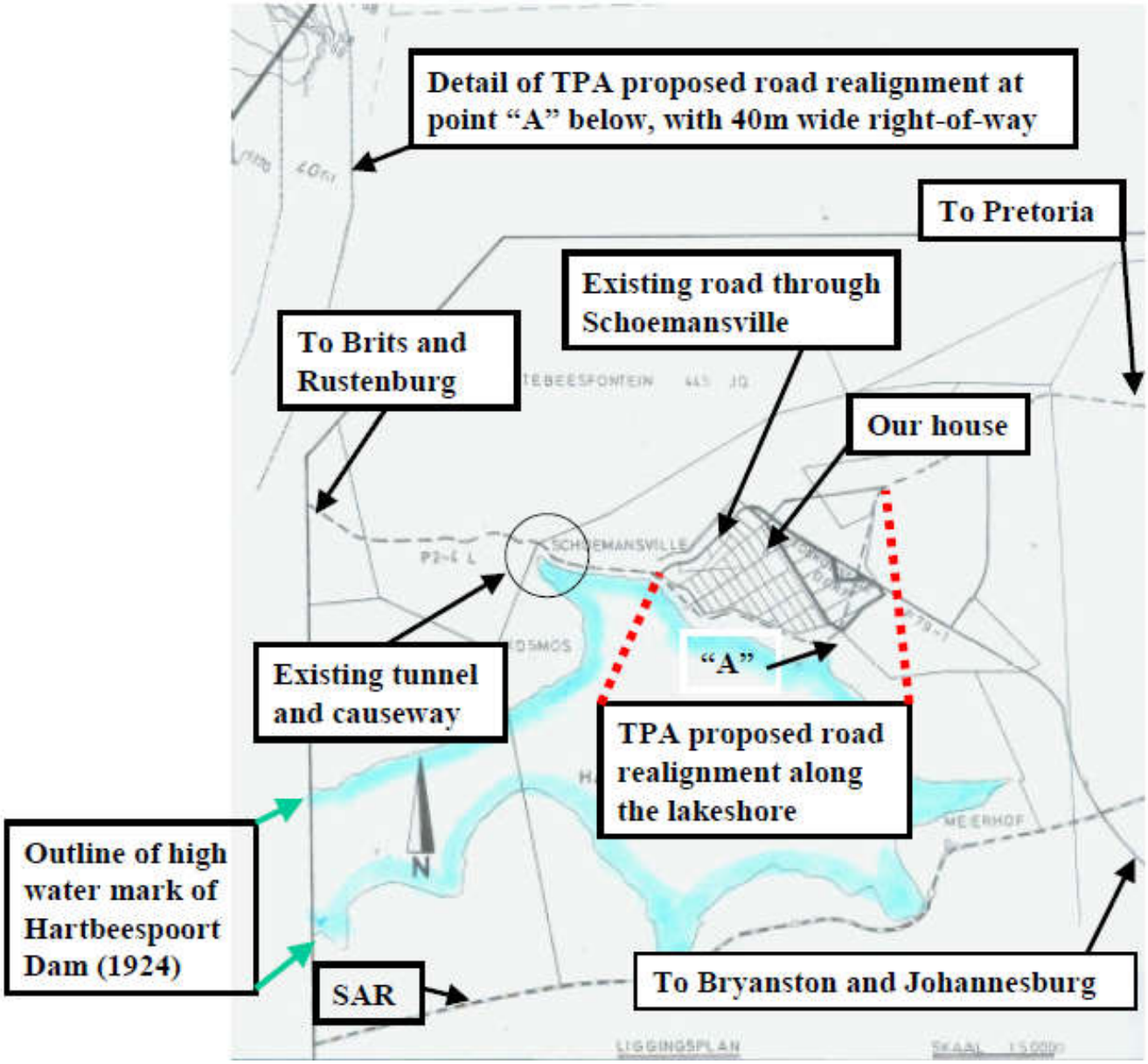
Another peculiar situation occurred when MB&S (and the other consulting engineering firms for TPA) was asked to provide comments on applicable details of the "**PWV Transportation Study**". This regional transportation study had just been prepared by the consulting firm of Bruinette, Kruger, Stoffberg & Hugo, for the TPA, in order to establish a comprehensive set of future long-term highway corridors within the whole **P**retoria-**W**itwatersrand-**V**ereeniging area.[111] Their suggested routes needed to be checked and verified for compatibility with the many existing TPA design projects (by consulting engineers) for short-, medium- or long-term improvements to the existing highway network. The impact of these routes on the many proposed township applications was also to be investigated. When we were provided with sets of the PWV plans (consisting of a series of colour prints on A1 format paper), it was somehow obvious that there had been some major "pie-in-the-sky" thinking, and that this ought to be mentioned loud and clear to TPA staff. As an example, it was clear that **IF** a specific highway or freeway was to be built within the next 10 years, (and my colleague Colin Louw was actually preparing a Preliminary Design Report for an Interchange, somewhere near Alberton if I am not mistaken), it would be logical to assume that the route suggested by the PWV team would conflict with that facility, if built ten years later or even twenty or thir-ty years later. One just does not build a traffic interchange for a life of 20 years.[112] So one day, three of us, Mr. Bergh, Mr. Fasken and

[111] On a smaller scale, my father-in-law had been responsible for the "Germiston Highway Guide Plan" (with a 1% tax), for the construction of some necessary new road links providing better north-south and east-west connectivity. In 1993, while visiting us in Walnut Grove, Langley, B.C., we had to go to Vancouver Airport. He noticed that we drove a different route from when we had picked him up, and asked: "Is there no better route, Jacob?" Lydia and I had no difficulty telling him that no, there is no direct route at all, and traffic jams can be expected on any route at almost any time. That is 25 years ago already, things have not improved substantially, as far as the enlarged YVR.

[112] Later, in Arizona, I became much aware of the minimum of 20 years design life of a highway maintenance project; mostly based on the projected AADT after 20 years. This is much even more true for actual "capital projects".

I, went to TPA, where we had our say on the projects with which I was or had been involved, like the Golden Highway. I cannot remember if the TPA engineers listened. One of my former classmates at UP – Casper Sonnekus – had a similar discussion with TPA engineers: At the time, he was finalizing a substantial detail design project near Broederstroom. I cannot recall the name of the consulting engineer that he worked for. But the "PWV Consortium" made a drastic decision to "freeze" **all** proposed township applications, and then only allowed them to proceed after individual scrutiny – which caused quite some controversy at the time.

As a resident of Schoemansville, within the jurisdiction of the Transvaal Board for Development of Peri Urban Areas (the renamed Peri-Urban Health Board of "Part 1"), I also became part of a local activist group, commenting to the Local Community Committee for the area including Meerhof and Kosmos, about the PWV Study's idea to build a freeway between Schoemansville and the east shore of Hartebeespoort Dam. This idea did not make sense, we argued when we met this Committee, whose members were all employees of Pelindaba and Valindaba, nuclear scientists, including Johan Slabber, (see Chapter 1 above), and Nico Ligthelm, as well as Tinus Mulder who was an accountant at Pelindaba. There was al-



Note that the northern extremity of Road P 79-1 (see "Part 1") was actually within Schoemansville. The PWV Transportation Study proposed a **freeway** between Schoemansville and the edge of the water.

ready a TPA proposal to realign an existing "normal" highway (P 2-4) between Schoemansville and the lake shore (with a "road reserve" width of 40 metres)[113], and we felt that it would be detrimental to property values to even think about a freeway in that location. What would the right-of-way width be? And how would this freeway possibly cross the causeway of the dam? Could it replace the existing signalized one lane road and a curved rock tunnel[114] that had been in existence for as long as everybody remembered – with the Latin phrase "**SINE AQUA AGRICULTURA NON EST**" on the arch?[115] This must have been a major point of discussion among those who commuted to Pelindaba and Valindaba by bus on a daily basis! We may have made our point: Looking at GoogleMaps, I can see **no freeway between Schoemansville and the water**, but a freeway that crosses the west reach of Hartebeespoort Dam and then runs over the Magaliesberg, close to the farm Bokfontein, where Lydia's father's citrus farm was.

I also once took the opportunity to comment (professionally) on a street construction issue in Schoemansville, through the Local Area Committee. "Peri-Urban" had already designed roads with 7.5m wide chip sealed surfaces and concrete kerbs in some 60 Cape foot right-of-ways for "phase 1" of Schoemansville, where we had only dirt roads, where a motor grader visited about once a year, and storm drainage was absent. This project would allow for future sidewalks. But we lived in the four block wide Schoemansville Ext. 1, where Hertzog Street, Baldwin Street and Malan Street (running from NW to SE) had only 40 Cape foot right-of-ways. I suggested that in those locations, only 5.5m wide chip sealed surfaces be constructed, once "phase 2 or "phase 3" was proceeded with. I opined that doing this would somehow preserve the residential character of the neighbourhood, and not create dangerous situations. None of these streets was a "through street" where future speeding could be expected. My letter seems to have been heeded by Peri-Urban: just before we left Schoemansville in December 1976, the contract was awarded for the top half of Hertzog Street, down to the school. When Schoemansville Ext. 2 Township was proclaimed, the 40 Cape foot of Marais Street (on the common boundary between Ext. 1 and Ext 2) was widened by 5 metres. (Metrication, of course.) This street became a "collector road" adjacent to the site of General Hendrik Schoeman Elementary School.

On one occasion, Dr. Michael Barnes, a British expert on using the price escalation factors (see above), visited South Africa and had a speech to the SAICE at the Sans Souci Golf Club in Johannesburg. Mr. Bergh asked me to accompany him. At that time, he was likely still the (current) Past President of the SAACE (South African Association of Consulting Engineers) and had to participate in the discussions following Dr. Michael Barnes' speech, more than I dared to do. Mr. Bergh was very much against the use of these inflationary factors, as they removed the "risk" that a Contractor had to take upon himself when tendering a project. I believe that it was at that specific occasion that he formally pleaded for not using the "Price Escalation Factors" for projects with a cost estimate of less than **half a million Rand**. Shortly afterwards, he was able to convince the City of Pretoria to "keep projects small", meaning "under the value at which these factors kicked in". (See above.) From that time, our annual projects for the City of Pretoria Roads Department did not use these factors (fortunately unknown in Canada). That day I saw "grass grid" for the first time, concrete blocks through which grass can grow and be mowed, right where Mr. Bergh's blue Citroen was parked!

All kinds of things seemed to go "strangely off-key" within the office, starting around the end of 1975. I think that Mr. Shuttleworth's divorce was part of it, (being aware that both Mr. Bergh and Mr. Fasken were, as Presbyterians, against marriage break-up in principle.) Mike Meijer had also been divorced, although that was before he had joined the firm. It was also something else. The merger of "Mackintosh, Bergh & Sturgess" with "Shuttleworth & Associates" was part of it; as e.g. evidenced by the fact that I

[113] This 40 metres width was shown on the plan for the proposed Schoemansville Township Ext 2".
[114] A comparison with the situation at Hoover Dam over Meade Lake (between Nevada and Arizona) is appropriate.
[115] Hartebeespoort Dam, built in the early 1920's, had enabled a large and very productive State Water Scheme.

had been introduced by Mr. Shuttleworth to Mr. Christo Kuun of TPA (see above), the letterheads that showed "**Mackintosh, Bergh & Sturgess <u>in association with</u> Shuttleworth & Asssociates**", that (as far as I knew) the TPA likely questioned the idea that the firm would be retained on more than one panel[116], the experience that some of the projects that Mr. Shuttleworth had brought into the firm, were "progressing very slowly or not at all" (from my point of view), the growing rate of inflation, the lack of actual "construction projects" due to these price escalation factors, but also that we seldom saw Mr. Shuttleworth talking to his partners, and that there were many a "meetings" downtown (with lawyers or accountants?). Perhaps this is why I (and my colleagues) had to prepare a "Schedule of proposed engagements" to Mr. Fasken on 1975-10-01. I was not the only one to wonder about the state of affairs. Once again, the Charge of the Light Brigade comes to mind.

I was well aware that my status as an "Associate" of MB&S might at some future date lead to the firm's partners' offer to become their partner. I realized that this would obviously mean buying into the partnership, which would be costly at first but also rewarding in the medium and long term. Did I really want to do that, particularly because of Lydia's parents' recent well-meant advice? Questions like this arose, and I seriously hope (in hindsight) that this did not affect my work and productivity at that time.

There had been a case before the Courts about the legitimacy of a consulting engineering firm's change from a partnership of three people, into a company with many shareholders and unlimited liability. This case, known as ***Secretary for Inland Revenue v Geustyn, Forsyth and Joubert*** **(1971) 33 SATC 113 (A)**, was later often quoted and summarized thus: (The following quote comes from **An analysis of the 2006 amendments to the General Anti-Avoidance Rules: A case law approach",** being a "Mini-dissertation submitted in partial fulfilment of the requirements of the degree of Magister Commercii in South African and International Taxation at the North-West University"[117] by T. Calvert, Potchefstroom, 2011.)

In the *Geustyn* case a company with unlimited liability took over the business of a partnership of consulting engineers from 1 June 1966. The company was formed with R 5 000 capital which was allotted in equal shares to the three former partners of the partnership, who became the sole directors of the company. Under the agreement whereby the company took over the business of the partnership, the company undertook to employ the three former partners at an annual salary of R 10 000 each and also to pay to the partnership R 240 000 for the goodwill of the business (this amount was calculated by aggregating the three years of the partnership profits). No individual service contracts were entered into between the company and the former partners and no guarantee was furnished by it for the payment of the goodwill. The amount of goodwill was credited on loan account to the partners in equal shares at an interest rate of 8.5% p.a. In addition to this, each former partner received a R 7 500 fee for the 1967 year of assessment. During the 1967 year taxable income of R 72 840 accrued to the company upon which R 29 136 would have been levied in normal tax.

The Secretary for Inland Revenue, being of the opinion that the formation of the company constituted a scheme for the reduction of the tax liability of the former partners, applied section 103(1) of the Act and allocated the company's taxable income to the former partners in equal shares, thus resulting in no taxable income being reflected on the company's assessment.

This was clearly quite different from how BSB&P's staff had been "taken over" by Rikent (See "Part 1").

It must also be noted that it was clear that the workload in the office slowed down, perhaps due to normal market cycle, perhaps due to the fuel price crisis by which speeding limits in Pretoria were very strictly

[116] Mike Meijer and I once reviewed the "agreement files" between TPA and MB&S for the Golden Highway and Road 473 projects; his eyes just **"lit up"** when reading some of the small print. Something was obviously not right.
[117] This is the new name of the (former) Potchefstroom University for Christian Higher Education.

enforced at 50 km/h. People received speeding tickets from men with gatsometers for doing 53 km/h along Mitchell Street, and gas stations closed at night, even on the main highways. It was not only that there were no "new" (public or private) projects, it was also that progress on those projects that had already been "on the books" for a few years, was imperceptibly slow. Looking at the August 1973 Promotional Brochure's list, this reality strikes me now (2018) even more than it did in 1973 or 1976. My basic annual salary in 1976 was R 9 000 per year and absolutely nobody knew about "unemployment".

On 1975-07-29, the TPA Roads Department, by way of "Consulting Engineers' Circular No. 4 of 1975" changed the schedule of professional fees, separating those for "**route location"**, "**basic planning**", "**detailed planning**" and "**during construction of contract**", each with its own schedule. That this required more work from each of us, was obvious. My copy has a note on top: "For clean blanks, ask Mrs. Procos please. She holds **the originals**." These days, that would all be accomplished electronically.

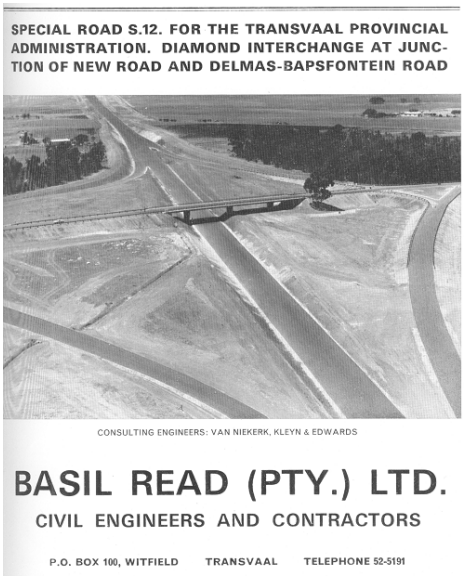
I cannot actually remember which particular projects my colleagues handled. **Jens Frehse** had a project with some strange "after completion of construction" challenges, **Colin Louw** had a substantial basic planning project for an expressway/freeway interchange project near Alberton), and **Martin Gouws** was mostly handling railway siding projects in Babelegi and Isithebi. I know that Mr. Bergh was heavily involved with TPA projects for what would be called "pavement preservation" today.[118] I possess a single pink page of the Schedule of Quantities for a project called "Herseël van Paaie in die Witwaters-rand Streek 1973/74", that shows 31,000m² of resealing with 13,2 mm aggregate Road P5-1. There were a number of rural roads in the PWV area that had already received a new surface[119], not just a "slurry seal" as had been done by COLAS for many years. Mr. Tiny Pretorius was the firm's Clerk-of-Works, we sometimes saw him in the office. Shoulders were now also improved, culverts were even extended. This was a "novelty" for TPA, and MB&S was (I believe) the first consulting firm engaged for this kind of work. While driving somewhere, Mr. Bergh once said to me: "They are planning to build all these new highways now, and they may find the money to build them; but Jacob, where will the money eventually come from to maintain all of them?" But he also handled a far bigger challenge on TPA's "Special Road S.12" at that time: a road that had **failed**.

Two large (full-page) advertisements (**next page**) had appeared in the monthly issues of "The Civil Engineer in South Africa", beginning with the one of Basil Read (Pty.) Ltd. in **December 1968** and the one of BP in **January 1969** (the latter alternating bilingually). The text in the small print in BP's adver-tisement was clear: This highway had been designed and built with the intent to handle heavy (coal) truck traffic between Witbank area mines and Johannesburg, then and still today, the country's industrial hub, and that it was "punishment-proof". But Road S.12 had in fact "fallen apart" in about six or seven years. Mr. Bergh was first asked to reseal the road, (maybe when early problems showed up) but later to come up with an actual long-term solution. An expensive fix was needed. As a former employee of both the TPA and the TPA's consulting firm (VKE) that had designed the road, his recommendation was to "rip up the asphalt + base course, pulverize and remix the material, add some more binder, spray bitumen on it, reconsolidate it into a brand new base course, and then pave a new surface course over it". This was unprecedented solution at the time, in South Africa at least. A year later, under the auspices of the SAICE, lots of engineers from Pretoria and Johannesburg visited the site where this work was actually

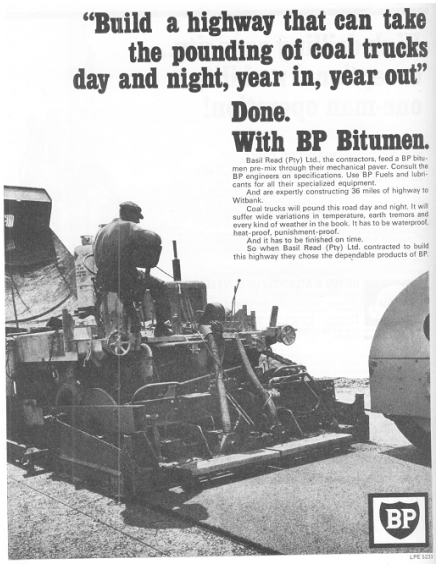
[118] Mr. Bergh's (undated) résumé (as copied from the internet) shows: Engineer, City of Germiston, South Africa, 1948-1949; Assistant Materials Engineer, Transvaal Provincial Administration, South Africa, 1950-1951; Resident Engineer, van Niekerk, Kleyn & Edwards, 1951-1953; Materials Engineer, Senior Executive, Northern Rhodesia Government, Lusaka, 1954-1960; Site Engineer, Gramond Earth Movers Ltd., Swaziland, 1961; Senior Partner, Mackintosh Bergh and Sturgess, Pretoria, 1962—1993; Consultant, Transportick, since 1994.

[119] The Promotional Brochure shows some completed projects, and this kind of work for TPA was continuing.

being done, and Mr. Bergh discussed this with anybody who would listen, handing out notes to take home … and read them.



Now, in 2018, while regurgitating the many projects that I handled during the first 10½ years of my professional career, it is strange to note that I was never involved with a TPA **construction** project, but only planning. With BSB&P and with MB&S in Bloemfontein, I had designed roads and supervised their construction. **Were there hardly any construction projects; were they already becoming scarce during those days– as Mr. Grodsky had feared before?**



Page 346 of the 1982 Official Yearbook of the RSA seems to give the answer "**Yes**", as follows:

> As early as 1969 it was clear that a recession could no longer be avoided. This recession lasted unto well into 1972. The average growth rate for the three years 1969-1972 was a mere 4 percent. After the recovery of the balance of payment position in the third quarter of 1972, it became possible to adapt monetary and fiscal policies once again to improve the economic growth rate. The improvement in economic activity which followed on this reversal of fortunes was in sharp contrast to the rest of the Western world where inflation and low growth rates continued to be the order of the day. The situation was, however, reversed once again in 1974 when inflationary pressure increased substantially and when the influence of the world recession could no longer be avoided. **The cyclical decline in economic activity which commenced in the third quarter of 1974, gained further momentum during 1976 and 1977, but reversed into an upswing during 1978."**

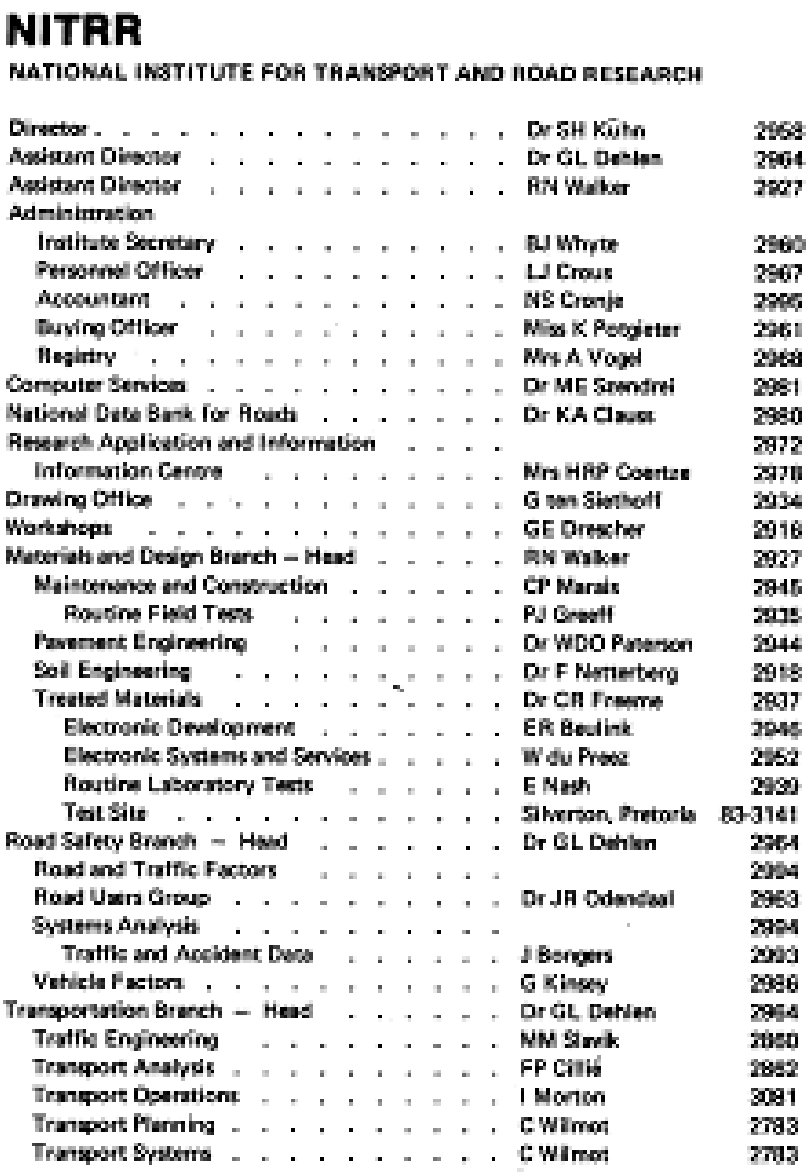
The reasons for these changes obviously fall outside the scope of these Memoirs.

In early 1976, I was allowed to attend two Training Courses held at the NITRR of the CSIR, one in March and one on 6 – 8 June. In February, that Research Institute had added a "T" (for "Transport") to its name, and it was reorganized from its earlier emphasis on material research; it now existed with three distinct Branches. These training courses were obviously offered to make younger practicing engineers (like me) more aware of how they could help us, and how we would even be able to assist the profession and industry with data, based on what was already being researched by NITRR. My colleagues also attended these courses; two identical one-week courses were offered, so that I could e.g. attend one week and Colin Louw and/or Jens Frehse the next week. Perhaps the lack of "work load" at that time (although I was not aware of it) allowed MB&S to send us, and it was nice to meet colleagues from other firms there. But my personal "apprehension" about the future, (see above) did not seem to be shared with my colleagues.

At left on the **next page** is a small excerpt of a chart outlining all branches of the CSIR, and though it has no date, it was printed in 1977, after Mr. D.J. Wium (head of Road and Traffic Factors) had died. To the (original) Materials and Design Branch (with three groups) were added the Road Safety Branch and the Transportation Branch, and there were also assisting groups like the National Data Bank for Roads, the Research Application and Information Centre, the Drawing Office, and the Computer Information Centre

for Transportation.[120] The NITRR would continue to issue many reports like they had done before. A brochure outlining the NITRR was also printed, showing an emphasis on "Systems Analysis". The "Road and Traffic Factors" group was renamed "Safety Engineering Group" during 1977, while I worked there.

When attending this first course, **I had absolutely no idea** that I was ever going to work there! It was only at the end of the second course that I noticed a posted position as "Senior Research Officer".



NITRR

NATIONAL INSTITUTE FOR TRANSPORT AND ROAD RESEARCH

Director	Dr SH Kühn	2958
Assistant Director	Dr GL Dehlen	2964
Assistant Director	RN Walker	2927
Administration		
Institute Secretary	BJ Whyte	2960
Personnel Officer	LJ Crous	2967
Accountant	NS Cronje	2965
Buying Officer	Miss K Potgieter	2961
Registry	Mrs A Vogel	2958
Computer Services	Dr MG Snedrei	2981
National Data Bank for Roads	Dr KA Clause	2980
Research Application and Information		2972
Information Centre	Mrs HRP Coertze	2978
Drawing Office	G ten Siethoff	2934
Workshops	GE Drescher	2916
Materials and Design Branch – Head	RN Walker	2927
Maintenance and Construction	CP Marais	2946
Routine Field Tests	PJ Greeff	2935
Pavement Engineering	Dr WDO Paterson	2944
Soil Engineering	Dr F Netterberg	2918
Treated Materials	Dr CR Freeme	2937
Electronic Development	ER Beulink	2946
Electronic Systems and Services	W du Preez	2952
Routine Laboratory Tests	E Nash	2939
Test Site	Silverton, Pretoria	83-3141
Road Safety Branch – Head	Dr GL Dehlen	2964
Road and Traffic Factors		2994
Road Users Group	Dr JR Odendaal	2963
Systems Analysis		2994
Traffic and Accident Data	J Borgers	2993
Vehicle Factors	G Kinsey	2936
Transportation Branch – Head	Dr GL Dehlen	2964
Traffic Engineering	MM Slavik	2950
Transport Analysis	FP Cilliè	2952
Transport Operations	I Morton	3081
Transport Planning	C Wilmot	2783
Transport Systems	C Wilmot	2783

So I sat through the various sessions of the first (general) course at the NITRR building at "Scientia" east of Pretoria, and enjoyed what the (mostly) men in whitecoats presented in a lecture room where the curtains were drawn and one could not even look outside when bored. (Since that time, I have learnt that the presentation just after lunch is the one that needs a firebrand speaker, because dozing off is a huge threat, at any Conference or assembly.) Later, when the second (Traffic Safety) course was offered, I was requested to attend and report to my colleagues at MB&S about what was being said and researched. The Lectures to 47 attendees from all over the country dealt with **Education**, **Engineering** and **Enforcement** aspects of the South African situation in detail. I began to see "traffic safety" as a challenge, particularly the pedestrian's part, which was covered in several lectures. During a coffee break, I saw on a bulletin board that the NITRR had an advertised vacancy for a civil engineer like me, offering a starting salary of R 11 000 per year, plus benefits.

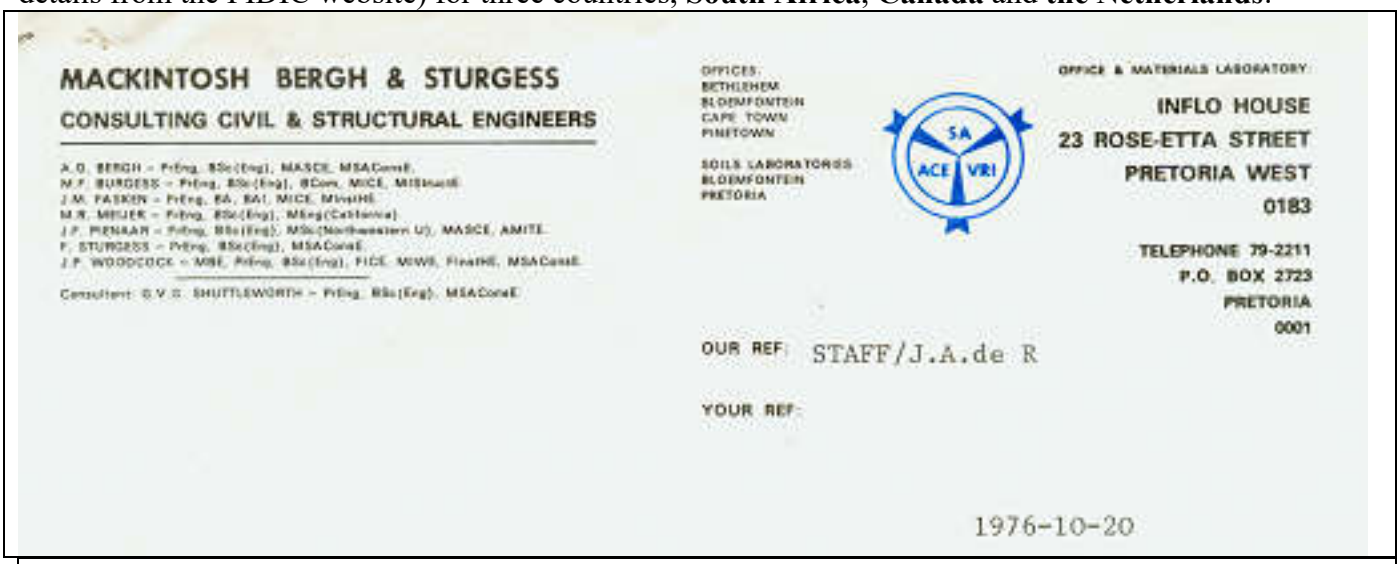
My remuneration at MB&S that year (1976) was R 9 000 per year + the ¾% profit sharing. But Lydia and I decided that I should at least apply, and then I was offered the position, with a starting date of the 1 August 1976. Accepting that "offer of employment" would end my consulting engineering career in South Africa. **I have long since realized that the Lord God had more in store for me.**

I am unaware exactly how and when the situation at MB&S resolved it-self somehow, but on a letterhead of 1976-10-20 (not quite three months after I had left, (see **next page**), some changes had already been

[120] This Transportation Branch was shortly to be expanded, based on the recommendations of the Driessen Report.

made. The cover letter to my "Letter of Reference" (written in Afrikaans under the signature of Mr. Fasken) shows (alphabetically) who the partners in the firm were at that time: A.O. Bergh, M.F. Burgess, J.M. Fasken, M.R. Meijer, J.F. Pienaar, F. Sturgess and J.P. Woodcock, while G.V.G. Shuttleworth was listed below them as a "Consultant". And J.W.J. Frehse was listed at the very bottom of the page as the single remaining "Associate". Three other particulars stand out: Unlike before, the firm MB&S is now shown as "Consulting Civil **& Structural** Engineers", the "branch" offices are shown as Bethlehem, Bloemfontein, Cape Town & **Pinetown**; and a Soils Laboratory at **Bloemfontein** is added as well. So the "consultant" capacity of Mr. Shuttleworth had not yet gone sour, Mike Burgess and Mike Meijer had become partners, and Mr. Sturgess had already moved to Pinetown to start an office in Natal. I also found it strange that although the Promotional Brochure (August 1973) had shown that Theo Hoffmann was a partner, this letterhead did not list him. Was he already contemplating starting his own firm in Bloemfontein – which he did in 1978, taking Attie Badenhorst with him (as the Internet advises me)? I also have no idea if Colin Louw had also left the firm already at that time; why was no he longer shown as an Associate? Mr. Ferreira was also not shown, and may have been retired.

Note also from this letterhead that Messrs. Bergh, Sturgess, Woodcock and Shuttleworth had the letters **MSAConsE** behind their names, while the other partners did not (yet). Differences in approach within the consulting engineering fraternity around the world need to be mentioned here, by showing (**below**) details from the FIDIC website) for three countries, **South Africa**, **Canada** and **the Netherlands**:



MACKINTOSH BERGH & STURGESS

CONSULTING CIVIL & STRUCTURAL ENGINEERS

A.O. BERGH – PrEng, BSc(Eng), MASCE, MSAConsE.
M.F. BURGESS – PrEng, BSc(Eng), BCom, MICE, MIStructE
J.M. FASKEN – PrEng, BA, BAI, MICE, MIHigHE
M.R. MEIJER – PrEng, BSc(Eng), MEng(California)
J.F. PIENAAR – PrEng, BSc(Eng), MSc(Northwestern U), MASCE, AMITE.
F. STURGESS – PrEng, BSc(Eng), MSAConsE.
J.P. WOODCOCK – MBE, PrEng, BSc(Eng), FICE, MIWE, FIwatHE, MSAConsE.

Consultant: G.V.G. SHUTTLEWORTH – PrEng, BSc(Eng), MSAConsE

OFFICES:
BETHLEHEM
BLOEMFONTEIN
CAPE TOWN
PINETOWN

SOILS LABORATORIES
BLOEMFONTEIN
PRETORIA

SA ACE VRI

OFFICE & MATERIALS LABORATORY
INFLO HOUSE
23 ROSE-ETTA STREET
PRETORIA WEST
0183

TELEPHONE 79-2211
P.O. BOX 2723
PRETORIA
0001

OUR REF: STAFF/J.A.de R

YOUR REF:

1976-10-20

The South African Association of Consulting Engineers (SAACE) was established in 1952, as a voluntary association of independent consulting engineers in private practice. In August 2008 the Association transformed from the South African Association of Consulting Engineers (SAACE) to Consulting Engineers South Africa (CESA). CESA membership has, over the years, grown from 30 individual members in 1952 to 480 firms in 2011, which employ more than 22,000 people in total.

The Association of Consulting Engineering Companies (ACEC) is a not-for profit organization that has been the voice of Canadian consulting engineering companies since it was founded in 1925.

NLengineers is the Dutch association of consulting engineers ('NLingenieurs' in Dutch). Our core business is providing knowledge-based services. NLengineers focuses on the organisation and management of the built-up and natural environment and offers added value across the entire value chain.

In South Africa, since 1952, the SAACE represented "**independent**" (meaning individual) **consulting engineers**, and membership was **voluntary**. The organization in the Netherlands is mum on this, by using the word "**services**". In Canada, however, since 1925, ACEC has been "**the voice of Canadian consulting engineering companies**". The same applies to provincial organizations like ACEC-BC.

When coming to Canada, I never knew if that organization would be the voice for a "sole proprietorship" like Grassroots Consulting Services and the many other independent consulting engineers, whose numbers have recently dwindled dramatically. The fact that in South Africa, SAACE morphed ("transformed") itself into CESA, does not seem to jive with the system that the independent consulting engineers under whom I worked, would have agreed to. I know that particularly Mr. Bergh, SAACE President in 1971, would be appalled. I believe it is really the difference between **professional ethics** and **business sense**. See also what the similar organization in the Netherlands sees as its "core business". And you may even go to the FIDIC website and check the situation in other countries.

Some more needs to be said about this: In South Africa, a consulting engineer signed a report, letter or drawings that he had prepared. A report normally included a cover letter, similarly signed and addressed to the individual who had requested the report. Before the SACPE existed, a signature (with a typed name) was considered adequate proof of professionalism, and after the SACPE was established in 1968, registered professionals were encouraged to use the letters PrEng (or PrIng) behind their names. That was enough, a "rubber stamp" was not needed. In Canada (meaning Alberta, Yukon and British Columbia) and in the USA (meaning Arizona), I have always tried to "stamp and seal" where required. Strange enough that "government"[121] seems to have tried to ignore this sometimes, and I found this a few times.

- In Alberta, (some) engineering drawings (prepared by consulting engineers) had to be signed by the person who prepared the design, and by his supervisor. A "company stamp" was also required[122]. I became aware of this when finalizing design of a series of stormsewer outlets along the Bow River (for the Deerfoot Trail project)[123]; perhaps this "double signing and sealing" was a specific Alberta Environment[124] requirement.
- The Government of Yukon Highways Department seemed to consider itself exempt from this requirement. As professional engineer working for YTG (Nov. 1983 – Jan. 1989), I was first not supposed to sign and seal drawings and reports. It needed my formal "complaint" to the Association of Professional Engineers in Yukon to have them send a letter to the Government Leader, advising that the view of YTG (of whom most members were employees!) was entirely unacceptable.
- In British Columbia, reports by consulting engineering firms were often not signed or sealed. In 1990, when working for Crippen Consultants in Vancouver, I was given a copy of the "Quadra Street Interchange Traffic Study", for the Corporation of the District of Saanich, prepared by UMA Engineering Ltd.[125] in March 1986[126]. This 15-page report had no "sign or seal" anywhere, and none of the 8 Exhibits (towards the end, which were not even mentioned in the Table of Contents) show the name or initials of "anybody with a skin over his or her nose". I had no idea if a former colleague of mine had prepared this study, or not. I also have a copy of an RCPL-prepared traffic study (from 1975 or 1976) for an area in Calgary (around Bow Trail and the Pumphouse Theatre) with the same deficiencies (as I would call them). It would appear from the above that fears of "professional liability" lie at the root of how things are done. That was not the case in the South Africa where I worked from 1965 to 1977. Perhaps it was the existence of South African Contract Law, (being "Uncodified Roman Dutch Law"); perhaps it was the ingrained professionalism due to the generally accepted "Christian Work Ethic" that had grown in that society, compared to what had already morphed (in

[121] Meaning "federal, provincial, regional and local" levels of government, as they currently exist in Canada.
[122] Perhaps this was an ACEC requirement. It is currently (2018) also being considered for British Columbia.
[123] I worked in Calgary, Alberta, for Reid, Crowther and Partners Limited, from December 1977 to August 1979.
[124] A City of Calgary project, fully funded by Alberta Transportation. Rivers are under provincial jurisdiction.
[125] This firm had been my employer in Calgary, Alberta, from September 1979 to September 1982.
[126] Quadra Street Interchange on Highway 19 was almost directly north of the north limit of the McKenzie Avenue Interchange project, which I designed in those days for the BC Ministry of Transportation and Highways. The study actually included traffic counts at the traffic signalized McKenzie Avenue intersection.

Canada and the USA) as a North American "engineering practice", based on English common law, pragmatism and commercialism, and particularly the fall back position to just "sue anybody, for anything, if something goes wrong". Perhaps that is why, here in BC, there has been a provincial governmental push for what is now called the "**professional reliance model**" of project delivery. That is why the "regulatory bodies" for professionals (and I mean engineers, technologists, architects, accountants, environmentalists, and even real estate agents and lawyers) are so busy with investigating "complaints" and "discipline cases".

When I terminated my employment with MB&S on **31 July 1976**, I became eligible for a "full refund" of my own contributions and the firm's contributions, minus Insurance Premiums which had been paid out of the firm's contributions into the Mackintosh, Bergh & Sturgess Pension Fund. This first took some sorting out, likely because the staff turnover at MB&S was almost non-existing at the time. I do remember some turnover of draughtpersons and receptionists coming and going, but in general, the people I left behind were the same people whom I had joined three years before. That did not make my leaving any easier. The outcome of my 100% refund (my contributions + the firm's contributions) took its time. I received a preliminary payment of R 4 000-00, and on 1977-03-01 a letter from the Fund's Principal Officer, Mr. Frits Pretorius, (whom I do not think I ever met), confirming that I would forfeit nothing, and that the balance of R 1 484-50 "will be paid in due course". However, Income Tax had to be withheld from my total benefit, and on 1977-11-01, I claimed 8% interest (in terms of Rules 22(a)(iv) and 22(b)(iv) of the Fund), on the outstanding amounts through a period of 16 months. This came to R 245-00, and I cannot remember how and when that was resolved and received, before or after we left South Africa.

Although I may well have attended a specific Pretoria Branch Meeting of the S.A.I.C.E. in March 1965 (held at the Engineering Building at U.P.), I cannot recall "**the three golden rules of Coyne**" that were mentioned that evening by the speaker, Mr. J.P. Frey, a French engineer, about structures. Page 132 of the May 1965 Transactions, (the Minutes of that Branch Meeting) shows that these three golden rules are:

- **i)** Thorough understanding of the site;
- **ii)** Weighing the pros and cons of all building requirements; and
- **iii)** Integrity of the choice to be reflected in the final design and construction.

I recently reread that May 1965 magazine issue more carefully than I did before. These rules also apply to highway engineering, municipal engineering, and civil engineering in general, and the American Mr. A.M. Wellington whose quote is mentioned on page 1 of this "Part 2" would also heartily agree with. Now how, dear reader, would I have known anything about "Wellington", you may ask, because I obviously did not have a textbook from 1903? For that, please read the following intriguing story.

When Prof. D.W. de Vos was introduced to present his "Presidential Address" of the SAICE in 1969, it was noted that the subjects he taught at UP were **Railway Engineering**, **Hydrology** and **Engineering Economics**. I'm pretty sure that he did not mention "**Wellington**" to us in 1965. So how would I know a thing about this American author named Wellington? The beauty of modern technology (on an inquisitive mind like mine) is that one can discover things by googling.

When googling "GVG Shuttleworth", I discovered that he, one of my bosses from 1973 to 1976, "**had not read Wellington**" either, but had yet dared to comment with a technical question (in writing) on a paper by one of his seniors (supervisors?) in the SAR, when he was still a young engineer (**next page**). It obviously takes some guts for anyone to question what his seniors or supervisors do or say, particularly in a societal environment. (Only rarely have I commented on papers at conferences.) But see the box right below on the next page. I now know that GVGS graduated from the University of Cape Town at the end of 1944, and (like so many others from the Union of South Africa) immediately went to war.

GVGS at Yalta.

"Shuttleworth served as flight engineer on an American-built SAAF Dakota DC-3 that flew from Cairo via Tobruk and Athens to the Crimea in late January 1945."[127]

Discussion on :—

APPLIED ECONOMICS OF RAILWAY DEVIATIONS.

By E. M. Retief, *B.Sc., A.M.Am.Soc.C.E.*

Mr. G. V. G. Shuttleworth :

The author is to be congratulated on this paper, which covers a number of aspects of the problem of Economics of Railway Location. His notes on curve flattening are especially interesting and the portions dealing with Maximum Permissible Speed and Justifiable Cost are most instructive to junior engineers such as the writer.

The writer has not read Wellington, but, from the extracts quoted by the author and Mr. Bruyns-Haylett, it is apparent that Mr. Retief's interpretation is probably what was intended. However, it would seem illogical to have such a sharp definition between amount of Rise and Fall credited to two grades which may differ only very slightly. From the table on page 42 it would appear that a train approaching a 1 in 100 downgrade (Fig. 1) with a total fall of 24 feet, at a speed of 20 m.p.h., would not have to brake, whereas if the preceding profile had been a little different and the approach speed were 25 m.p.h., it would need to apply brakes after 21·29 feet of fall. Thus in the first case this grade would be classified as 24 feet of Class A (as it is less than 25 feet) and in the second 24 feet Class C (as brakes would need to be applied), the unit costs being 0·095d. and 0·476d. (for a 1 in 100 ruling grade).

Mr. Bruyns-Haylett gives a method which assesses the precise amount of Velocity head dissipated in the brakes. This is Class C and the rest of the fall is Class B. A slight difference in the approach speed or in the length or steepness of the grade could not produce an abrupt change in the amount credited. It is noted, however, that Mr. Bruyns-Haylett regards as Rise and Fall worthy of classification only that portion of the grade on which braking occurs. Mr. Wilson suggested including the fall before braking as Class B.

If the Potential Energy and Kinetic Energy of the train are considered it seems to throw more light on the problem. If it is assumed that the train operates most efficiently at its maximum speed 33 m.p.h. on the straight and level then any departure from this state of affairs will increase fuel costs and wages (due to loss in time). Braking will, of course, incur additional expense due to wear and tear of brake-shoes, wheels and track. In effect, then, we will compare each profile with an ideal profile which is level the whole way.

Mr. E.M. Retief wrote his paper on "Applied Economics of Railway Deviations" in 1948.[128] I don't know his position within the SAR nor that of GVGS that year. The names of all three people in the article (Mr.

[127] The **[bolded]** sentence **above** was copied from an article that I downloaded from the "People's Post" (Cape Town) dated 2015-12-08 by Ralf Will and captioned: "**Local in top-secret WWII mission**". This article explained that GVGS was at Yalta during the crucial meeting of the "Big Four" world leaders, and that he seems to have never talked about those days of the war, until interviewed when 96 years old…….

[128] I have not been able to find the remainder of this article.

E.M. Retief, Mr. Bruyns-Haylett and Mr. Wilson) are unknown to me. I may have to google some more. I could not find the author's response to the question by GVGS.

Concluding this chapter, the following: In 1947, H.A. Fagan, (1889-1963) the well-known Afrikaans author, poet and play-wright, who also had a very varied career as Minister of Native Affairs and ended up as Chief Justice at the South African Supreme Court in Bloemfontein, wrote a play called "Die Nuwe Wêreld" (= The New World). The printed script had as its "motto" the following quote from James Burnham's book "The Managerial Revolution".

"The control of the world is passing into the hands of the managers. Capitalism has virtually lost its power, and it will be replaced not by Socialism but by the rule of the administrators in business and government."[129]

As can be clearly seen throughout the period that is covered by "Part 1" and "Part 2" thus far (meaning the first **ten and a half years**) of my professional career, it was indeed a time of change, also in the "consulting engineering world". This trend has not changed one iota since that time; on the contrary, it has become "worse" or even more "all-encompassing". Independent consulting engineers hardly exist, it has all be-come "big business". Sole proprietors of consulting firms, (like Grassroots Consulting Services) hardly exist in 2019. I am thrilled to see in the issues of "The Civil Engineer in South Africa" (1964-1969) how many senior engineers of those days confessed that they did not make a lot of money, but had thoroughly enjoyed their work. I do not think that this kind of engineer exists in 2018. This is the world to which my grandchildren, if they want to become professional engineers (or become part of any other profession), will need to adapt, in order to work.

Addendum 1 to this Chapter: I would like to add something about the reason why South Africa did not have poles for electrical power and telecommunication lines on highway right-of-ways. This topic may seem strange to someone who has not been outside Canada and the USA, because he/she likely cannot think that such highway safety promoting conditions can and do exist. We are too much in the groove to reconsider this alternative, although in European countries, power and telephone poles are also scarce within "roads" and "streets". The South African reason for this can perhaps be partly found in that ESCOM is a monopoly and the HPK/GPO is/was a para-governmental organization. This was brought to my attention again when finding TPA's Roads Circular No. 3 of 1972, addressed to Head Office Personnel, Regional Officers and Road Inspectors, dated 22 February 1972. The copy I have is what Mr. Jack Fasken gave to my colleague Colin Louw on 4 August 1975. I have no idea why MBS received a copy of that Circular 3½ years after the fact, except that MB&S (and Colin) may have handled a project for which this had become an unresolved issue. This Circular gave **"Standard Conditions that apply on all power lines (Transmission and Secondary) near or over roads under the jurisdiction of the TPA (excepting National and Special Roads)"**, stipulating this:

1 (b) (i): No towers, poles or anchors may be erected within a distance of 200 Cape foot, ***(62 metres)*** measured from the road reserve boundary, where such towers, poles or anchors are erected parallel to the road, or within a distance of 50 Cape foot ***(16m)*** from the road reserve borders at any crossing.
1 (b) (ii): No overhead wire may be stretched across the road lower than 20 feet above the highest point of the road surface.

[129] Quoted from "Afrikaanse Literatuurgeskiedenis" (Afrikaans Literature History), by Dr. G. Dekker, Nasionale Boekhandel Bpk., Kaapstad, 1960, of which I received a copy as a book prize at the end of my High School days ("Standard 10" = Grade 12).

1 (b) (iii): ESCOM undertakes to make provision to maintain at all times all towers, poles, anchors and overhead wires on own cost, and take all measures for the safety of road users.
1 (b) (iv): ESCOM undertakes move or shift at its own expense and without compensation, any above-ground power line towers, poles and anchors, if such shifting is required by road widening work, road construction work or road maintenance work, provided that such widening, construction or maintenance work does not bring about a change in the route of the road.
1 (b) (v): ESCOM indemnifies the Provincial Administration against any claims made or suffered by any person, including court costs, due to the establishment, construction of any towers, poles, anchors, overhead wires or any other works by said ESCOM or erected or established as a result of the said ESCOM's failure to properly maintain and secure the said towers, poles, anchors, wires or other works, whether due to any defect of the said towers, poles, anchors, wires or works by whomever caused; Provided that where said ESCOM negligence on the part of the Provincial Administration or its officials is proven, this condition is not applicable.
1 (b) (vi): The Provincial Administration shall not be liable for any damage that ESCOM may suffer as a result of anything that may be done in relation to road construction and road maintenance or by any other action whatsoever, unless negligence to ESCOM on the part of the Provincial Administration or officials is proven.
1 (b) (vii): No permanent access whatsoever to or from the road will be allowed.
1 (b) (viii): The work may only be carried out if all the foregoing conditions are fully accepted and provided that all the instructions, requirements and obligations that the Provincial Administration may impose for the work over the road, are accepted and met.

The Circular Letter stated in point 4: I would like to point you to paragraph 4 of Annexure A, which provides for concessions to deviate from the policy of RURAL transmission lines affecting the roads described in paragraphs 2 and 3 of Annexure A. The concessions as described in paragraph 4 of Annexure A are the minimum requirements that may be laid down and should only be applied in exceptional cases.

Provision has been made for these concessions as ESCOM has pointed out that they do not pay servitude fees in respect of the land on which rural transmission lines operate and thus only obtain permission from relevant landowners. These landowners are not inclined to divide their land by a servitude for the transmission lines, but prefer to place it on the boundary of their property, which is often also the road reserve.

I believe that the legal framework of South Africa (Roman Dutch law) was the reason for this prohibition.

Somewhat similar agreements most likely existed between the TPA (and other provincial) Roads Departments and the General Post Office, for telecommunications poles, wires (and towers), and between them and the South African Railways. The latter had its own telecommunication systems on railway right-of-ways. I wonder how much the introduction of fibre optics changed all that during the 1970's en 1980's. And then, the next generation of telecommunication, the situation about wireless systems like radio, television, and cellphone signals, which did not exist at the time when I ended my professional consulting engineering career in South Africa.

Chapter 3 – Working as a Senior Research Officer at the NITRR, Pretoria, (1976-77).

The west looking photo above[130] shows the NITRR building at Scientia, east of Pretoria. The offices of the Road Safety Branch were on the top floor of the east wing (at right). The office of Mr. D.J. Wium PrEng was near the east end of the hallway; above the garage/workshop at right was a large office housing video equipment, traffic counters and all the files. My office was just behind the red VW bus, near that of Mr. A.J. Jobson PrEng. He was completing a short research report on Rumble Surfaces[131] at that time.

Starting to work at Scientia, I was well aware of what I was expected to do as a Senior Research Officer – and earning a salary of R 11 000 per annum, plus all the possible benefits of a para-government organization – any specific research of "**the engineering aspects of pedestrian traffic safety**". I realized what had already been written about this over the years, e.g. in "The Civil Engineer in South Africa", and I had heard more about it at the Training Course that fall. The CSIR's general use of "Systems Analysis" as a philosophy meant that any problem (e.g. like traffic safety at the NITRR) had to be researched from all sides, with professional researchers of all stripes.

For traffic safety in particular, "**the 3-E approach**" (supposedly first developed by the Enos Foundation in the United States of America, as I read) had to be followed, and what this meant for

- the "**pre-crash**", "**during an accident**[132]" and "**post-crash**" periods (of time),

but research had also to be done based on investigating the "**causes**" and their "**possible remedies**", meaning "**solutions**" on each of the following "factors":

- the "**road**" (mostly civil and electrical engineering, but not excluding education and enforcement),

[130] The photo is copied from the (bilingual) Promotional Brochure of the NITRR – size A5, published in 1976.
[131] "Rumble surfaces are intermittent short lengths of coarse-textured road surfacings", used at freeway off-ramps.
[132] In recent years (in North America) the word "accident" has almost become a taboo. The word "crash" is used instead, likely due to the (perceived) legal implications. Calling a "spade" a "shovel" does not really always help

- the "**vehicle**" (mostly mechanical engineering, but not excluding education and enforcement), and
- the "**person**" (mostly education and enforcement), whether the driver, passenger, cyclist or pedestrian.

TABLE 1: EXAMPLES OF ROAD ACCIDENT LOSS COUNTERMEASURES (CLASSIFIED AFTER HADDON[1])

Factor / Phase	HUMAN AND LAW ENFORCEMENT	VEHICLE, EQUIPMENT, AND CARGO	ROAD, TRAFFIC, AND EMERGENCY SERVICES
PRE-CRASH	Driver training Driver licensing Pedestrian education Alcohol limits Fatigue: time limits Enforcement intensity Court procedures Register of offences	Braking systems Lights and signals Reflectorisation Tyre standards Roadworthiness Correct loading	Road-rail crossings Accident location improvement Pedestrian separation Skid-resistance Lighting Speed limits and control
CRASH	Safety belt usage Safety helmet usage	Safety belt fitment Steering column penetration Burstproof latches Pedestrian protection Underride protection	Guardrails Breakaway supports Recovery area Speed limits
POST-CRASH	Civilian first aid training	Anti-spill fuel tanks Non-flammable materials Flashers, reflectors and flares	Communication system Ambulances Wreckage removal

Excerpt of presentation by Dr. G.L. Dehlen PrEng at the Road Safety Course of June 1976.

There was even a team that went out on very short notice to any major bus accident, and Mr. Wim van Kralingen, working under Mr. G. Kinsey of "Vehicle Factors" would attend these most gruesome sites and report what might have been all the contributing factors when a bus with tourists ran off the road on a mountain pass near sunset, and would report to our monthly meetings, as we also had to provide input.

What was South Africa's **pedestrian traffic safety situation** in those days? That was for me to research. Statistics on pedestrian traffic safety (meaning the annual fatalities and injuries) or rather, the lack of it in South Africa, if compared with all other countries, had already been brutally candid. This was clearly the worst situation in the whole world, and had been like that for a few years. Why was this so? What could

possibly be done to improve this track record?[133] Was it **(a)** an education problem, was it **(b)** an enforcement challenge, or was there **(c)** any solution that might be seen as a (civil) engineering solution? Or was it (as more often in life) a combination of factors **(a)**, **(b)** and **(c)**, one that would be different for different counties, and would therefore need to be "discovered" and "tailored" to South Africa's situation? That became my daytime nightmare. The outline of the purpose of Road Safety Branch (next page) omits one thing: That more than 40% of traffic fatalities were pedestrians. Was everybody somehow in denial?

road safety

The Road Safety Branch investigates all factors which benefit or are detrimental to road safety. It works in close collaboration with the National Institute for Personnel Research of the CSIR, and also promotes the practical application of road safety research findings through the National Road Safety Council and the South African road and traffic authorities. The Branch has a number of specialized Groups.

The *Road User* Group studies road safety problems created and experienced by all types of road user, including the alcohol problem, seat belt usage, pedestrian and cyclist behaviour, and legal aspects. It has investigated and made recommendations on, *inter alia*, new vehicle registration plates and blood alcohol testing devices. The causes of road accidents throughout South Africa is another subject of research. A detailed analysis of the South African traffic law enforcement system is being undertaken for the purpose of making specific recommendations for quicker and more effective law enforcement.

The acquisition and analysis of data on accidents and traffic is undertaken by the *System Analysis* Group which also carries out surveys to measure the effectiveness of road safety measures as applied. It has evaluated the effects of fuel and speed restrictions on road safety, and made recommendations to the road authorities on the setting of maximum speed limits.

The *Vehicle* Group is seeking to identify the role of design and maintenance features in the causes and severity of road accidents.

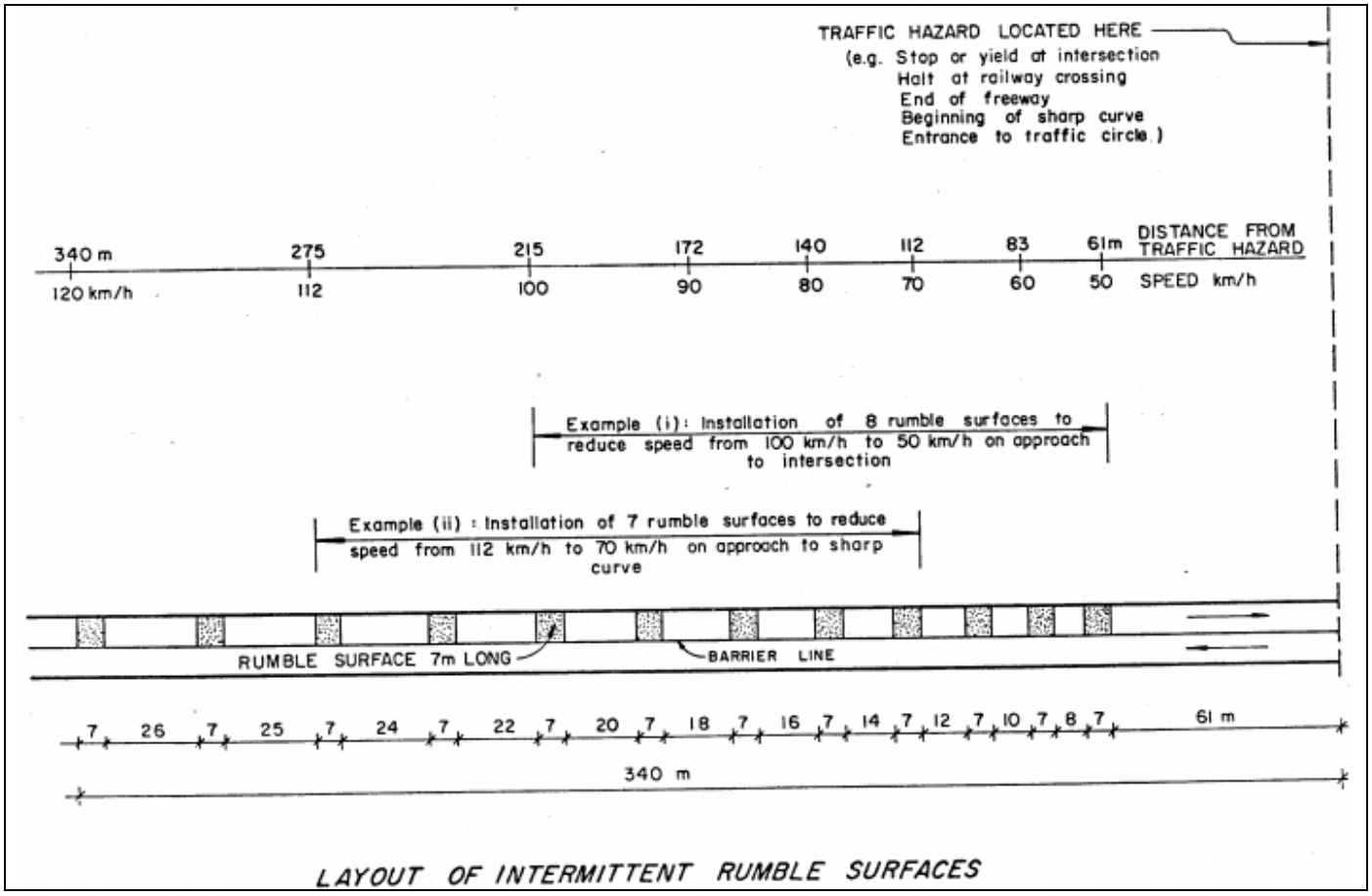
The *Road and Traffic* Group is concerned with the influence of road layout and geometric design on road safety. It also studies environmental factors such as lighting, road signs and roadside features, and demonstrates procedures for identifying and improving hazard spots on roads. The effectiveness and design of rumble devices for road safety, and pedestrian bridge location and usage have also been investigated.

Staff: This Branch employs civil and mechanical engineers, statisticians, legal experts, psychologists and technicians.

From the beginning, I read a tremendous amount of applicable books, magazines and NITRR reports, and diligently worked together with others of a like mind but a different background or education. One of

[133] At the 1963 SAICE Convention, Mr. J.G.R. Greathead mentioned that 44 out of 75 traffic fatalities during 1963 in Cape Town (± 60%) had been pedestrians. On a short section of a main arterial road, the number had been 80%. At the same Convention, Mr. P.J. Rigden and Mr. D.J. Wium said that 6,313 out of 20,112 rural accidents involved pedestrians, animals and pedal cyclists, and resulted in 44% of all rural fatalities. These facts had been well known.

them was Bill Cameron, (about my age) who had recently been hired by the NITRR. He had come from Rhodesia as an urban planner, and was an alumnus of the University of Cape Town. He did research on the urban planning aspects of traffic safety, and not necessarily the pedestrian component of it. Bill had already requested the City of Pretoria (and many other cities) for comments on his project that was titled "The influence of the layout of the road network on road safety".

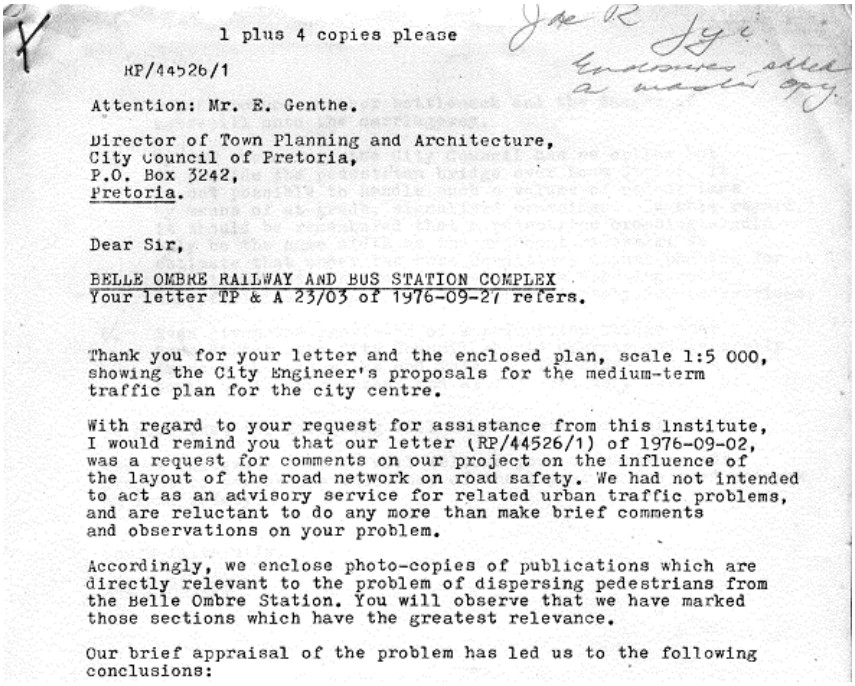


Excerpt of presentation by Mr. A.J. Jobson PrEng at the Road Safety Course of June 1976.

The City of Pretoria's original response (from the City Planning Department, appropriate as this is where planning functions resided) had asked the NITRR for help on their specific situation at a proposed railway station and bus station complex, at Belle Ombre, next to Boom Street. Was this perhaps a planning issue that had an engineering component? I do not know what was in their mind. But Bill then asked me (who had more knowledge of the City than he could muster as a newcomer) to go out with him for a few trips to the Asiatic Bazaar, Marabastad and Boom Street near the Pretoria Zoo. And then he wrote this letter, of which I copy page 1 of Bill's (draft?) 2-page letter, to the City of Pretoria (October 1976?) which also had some enclosures, still in my possession (**next page**). These data, details and calculations had come to Bill and me from various books (particularly Fruin's book) in the NITRR library, which we had accessed for use in our projects. This was obviously Bill's letter, and I do not claim any large part in it; I do not even know if this "draft" was approved by the person who would sign under the "for Director" on page 2. But I believe that this was "cross pollination" at its best. What I mean by that is Bill (an urban planner) using traffic count information, and I (a civil engineer) learning about traffic counts.[134]

[134] I did not know much about traffic counts at that time, nor about "warrants", a frequently used word in those days. My thesis at UP in 1965 had included some counts as they related to traffic noise. From Uli Wessman, in 1970, I heard this story: As TPA engineer, he was asked by a Transvaal MPC to conduct traffic counts on a certain gravel road over a mountain near Losberg. This politician obviously wanted that road tarred for his constituents.

Please note how diplomatic Bill's letter actually was – not giving direct advice (which was not the NITRR's function), but still yet giving the City of Pretoria a lot of valuable information and ammunition.



1 plus 4 copies please

RP/44526/1

Attention: Mr. E. Genthe.

Director of Town Planning and Architecture,
City Council of Pretoria,
P.O. Box 3242,
Pretoria.

Dear Sir,

BELLE OMBRE RAILWAY AND BUS STATION COMPLEX
Your letter TP & A 23/03 of 1976-09-27 refers.

Thank you for your letter and the enclosed plan, scale 1:5 000, showing the City Engineer's proposals for the medium-term traffic plan for the city centre.

With regard to your request for assistance from this Institute, I would remind you that our letter (RP/44526/1) of 1976-09-02, was a request for comments on our project on the influence of the layout of the road network on road safety. We had not intended to act as an advisory service for related urban traffic problems, and are reluctant to do any more than make brief comments and observations on your problem.

Accordingly, we enclose photo-copies of publications which are directly relevant to the problem of dispersing pedestrians from the Belle Ombre Station. You will observe that we have marked those sections which have the greatest relevance.

Our brief appraisal of the problem has led us to the following conclusions:

Part of first page of Bill Cameron's letter.

Enclosures:

- Proposed Belle Ombre Commuter Station (1 page) – Objectives; Relevant Information.
- Pathway and Stairway Design Standards (5 pages) – Walking Speeds; Speed Density Relationships; Volume; Levels of Service (After John J. Fruin); Implications of the various design standards for pedestrian flows on bridges, sidewalks and stairways – low standard design; Lane width, headway and person area occupancy; Balanced walkway and stairway standards; Hypothetical capacity of pedestrian crossings on 14 metre carriageway (Boom St. between 11th and Potgieter is that width);
- Conclusions (2 pages)

My initial research project (as approved by Mr. Wium) was to prepare a Memorandum and Questionnaire to a substantially large sample of Chief Traffic Officers in all of South Africa, to fathom their (collective, jurisdictional or even personal) opinions about the currently used pedestrian crossings, namely:

(i) those at existing unsignalized "mid-block" crossing situations;
(ii) those at existing signalized "mid-block" crossing situations;[135] and
(iii) those at existing school situation, that were "patrolled" at certain hours of the day.

Through the District Office, Uli organized the traffic count: A black labourer was given a paper bag full of dry beans and an empty tin can, and was dropped off before dawn one morning, on top of the "pass". He had to transfer a single bean (from the bag to the can) for every vehicle that passed the place next to where he sat in the sun all day. Afterwards when he was picked up around dusk, lo and behold, there had hardly been any traffic that day! A week or so later, in Pretoria, the MPC asked Uli about the results, and Uli answered that there was just not enough traffic to warrant tarring that road. So the politician asked whether the traffic count could be redone, and he begged long enough for Uli to promise him a specific day that this recount would be taken. Uli then got the District Office to use another black labourer, (= one who could read and write), and gave instructions that the bean transfer should be accompanied by writing down the license plate number of every vehicle that crossed the point where the traffic count was taken. The results came in: There were indeed many more vehicles that day, but one particular pick-up truck car had crossed about 30 times, another car had crossed 24 times, a few other pick-ups had crossed 18 times, and so on. The black employee even recalled that the intervals between vehicle crossings were only a few minutes. Uli and others like the District Engineer realized that this was obviously the riding constituency "at work"! When he was asked again, Uli was politely able to tell the politician the true facts, and he was gracious enough to consider himself "caught out". Only six years later, that road was tarred.

[135] The main thrust of Report RF/2/77 was to enquire about these facilities **(i)** and **(ii)**. South Africa had existing warrants for the **signalized** mid-block crossings since the 1971 South African Road Traffic Signs Manual, but no there were no warrants for the **unsignalized** mid-block crossings. These facilities were considered (and proven as) "inadequate" and "unsafe", and there was also no standardization at all in their installation or operation.

This Memorandum was developed during August and September, and my idea was that Chief Traffic Officers would also be given an opportunity to comment on the existing "traffic warrants" for those in category (i), whether any kind of warrants ought to be developed and used for those in categories (ii) and (iii), and if they would perhaps want to submit a comment on any other related matter like the types of signals, striping, signing, overpasses and underpasses, etc.

A few important things need to be inserted here, as they will explain the circumstances of my work:

1. Very soon after joining the NITRR, Lydia and I applied for immigration to Canada. We sent our first letter to the Immigration Officer in Cape Town on 24 August 1976. I guess it may be said that the overload of bad information on pedestrian traffic accidents so much overwhelmed me that we both realized the actual impossibility of reducing those deaths and injuries, that the topic of my field of research only highlighted a "symptom" of the country's possible future woes, and discussed them openly with both Lydia's parents, who supported us in making this decision. It was not easy at all.
2. The noise of Mirages constantly flying straight over Scientia, still accelerating from Waterkloof Air Force Base, on the way to the east border, became untenable to me. Time and again, I was reminded of the near-bombing of my parental house (by the RAF) in March 1945, and that my brother and I could not even take the noise of fireworks at Queen Wilhelmina's Jubilee in September 1948. Was this border war to continue? What would be my possible role in that; what might be the role of our four children in that?
3. Earlier, we had considered Australia and New Zealand as alternative immigration destinations; I had colleagues from there at the NITRR, and my father's cousin with wife and three children had emigrated to Manurewa (Auckland) in July 1952, the same month that we went to South Africa. But to immigrate (say) to the USA or to return (for me) to the Netherlands was never even considered, and obviously, we did not know how long our application process would take till coming to fruition. I wrote a letter to Rien Scheffer in Edmonton, asking for the names and addresses of some Alberta consulting engineering firms.
4. Another reason for applying to leave South Africa was perhaps the fact that after my father's death, contact with my stepmother had first deteriorated and then virtually stopped. Sad but true.
5. We attended the annual Hoogenboezem family reunion on the Settlers' Day weekend in Pietersburg without saying a word, and formally applied for "Permanent Residence" to the Canadian Embassy in Pretoria on 30 September 1976. In October, I sent letters to consulting firms and government agencies in Alberta and British Columbia, and the Canadian Embassy sent me form Imm.1112 "Assessment of Academic Qualifications – Engineering in Canada" which I then returned with the data.
6. In December 1976, we drove south to the Garden Route, and ended up at my my father's sister and her family in Paarl, Cape Province, where we told them about our intentions. I do not think they understood. Just before that road trip, we had sold our house in Schoemansville and rented a townhouse at 48 Mont Rouge, Albertus Street, La Montagne, Pretoria, supposedly because it was "closer to my work" and also "safer". **{{**A good friend of ours, Jan Koetsier, of Botanica Nursery east of Schoemansville, had been hit by a large rock that was thrown at him by a black thug, standing in the back of a dump truck. The pumpkin-sized rock went through the windshield and it might have been much worse if he had been in its direct path. It went through the rear window of the pick-up truck and lay there. The truck drove away and nobody read its licence plate number. The police just shrugged their shoulders, wrote a little report, and the insurance company paid for the damages. Many such occurrences happened later.**}}**
7. Due to our return to Pretoria, I decided to take up graduate studies at UP once more in January 1977, for two courses – "Transport Planning" and "Urban Planning for Engineers". Soon thereafter, we received a letter dated 13 January 1977, from the Canadian Embassy in Rome, Italy, stating that our "application for admission to Canada has been assessed and provisionally accepted on the basis of the information given on the form(s) which you have provided." Seeing the uncertainty about progress, I decided to continue with evening classes, held on the campus. I had all intentions to finish these courses.
8. On 25 February 1977, the Canadian Embassy in Pretoria asked us to come for an interview on Friday 11 March. During that interview (of all six of us) I was told that I ought to go find a job in Canada, but

only in Alberta or British Columbia. I bought a return ticket to Edmonton the very next day, via Schiphol, with KLM, left on 3 May, not telling anybody at NITRR that I was going any further than the Netherlands. Arriving in Edmonton, I re-contacted some of the firms I had already written to, and Mr. Brian Thompson P.Eng., Manager – Municipal Division, Reid, Crowther & Partners Limited[136], was so kind to refer me to their Calgary office, particularly to Mr. E.A. Tahmazian, P.Eng., in charge of the upcoming detail design of Deerfoot Trail, a large City of Calgary project funded by Alberta Transportation, and ….. it had to be designed in metric!

9. So I took the Greyhound bus to Calgary and had a good visit with Ed Tahmazian at 7410 Blackfoot Trail SE (in an industrial area), after which he gave me his business card and a verbal commitment of employment, on which I wrote a starting salary of "between $ 20,000 - 24,000" per year, (and they would do all the necessary paperwork), so that I just took the Greyhound back to Edmonton, ending up in places called Airdrie, Carstairs, Didsbury, Olds, etc., because it was the "**milk run**" local bus and not the "express" by which I had come down.[137] All my relatives in Edmonton were glad, and I then flew back to South Africa, first visiting my grandmother in the Netherlands, and my relatives in the Netherlands were also glad.

Dam wall Kosmos Schoemansville

<< I took **this aerial photo** of Hartebeespoortdam and Schoemansville on my return trip. Down below (in fact, 50 km to the east) were Lydia and our four children, who would later remember very little of this lovely country we were planning to leave quite soon, the Lord willing.

10. Mr. Ed Tahmazian followed through with a letter dated 9 June 1977, stating "We have completed the necessary formalities at Canada Manpower and Immigration office, confirming our offer of employment. They will now do the necessary investigations before approving it and forwarding it to Rome. I will continue pursuing them and find out the date they will complete and approve the confirmation and will let you know that date." I received a copy of the Canada Manpower Centre's letter to RCPL dated 6 July 1977: "Please be advised that we have approved the above-mentioned job offer".

11. Regarding my studies at UP, I attended all lectures and completed all the assignments, even though it soon became clear that I might not be able to write the exams in January 1978. I learnt a lot from taking these courses, passed tasks and mid-term exams, and had to wade through the many recommendations of the Report of the Driessen Committee[138]. Mr. Laubscher, head of the SAR, held a few lectures on what the South African Railways and Harbours Administration were responsible for, particularly the economics of transportation. The urban planning course was also extremely valuable to me – later on.

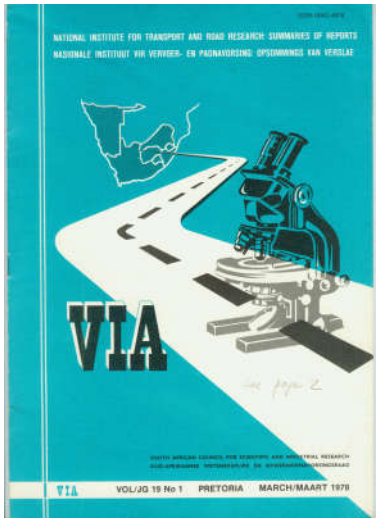
The Memorandum and Questionnaire, as approved, with a cover letter, was mailed out in October 1976 to 57 municipal Chief Traffic Officers. It was sent to those in all 23 cities with more than 30 000 population, to those in 14 out of the 29 cities with a population between 10 000 and 30 000, to those in 13 of the 29 cities with a population between 5 000 and 10 000, and even to those in 7 of the unknown number of cities with a population between 2 000 and 5000. This was considered a good "representative"

[136] The office at 10350 – 124th Street was a few street blocks away from the Borkent residence, where I stayed over.
[137] In July 2018, 41 years later, Greyhound announced to pull out completely from Alberta and British Columbia.
[138] See footnote 98 below, where I try to summarize what I had not known before.

sample – which had not been done before; smaller municipalities had always been overlooked. I also tried to have a "provincial balance", with 23 places in Transvaal, 20 places in the Cape Province, 8 places in Natal and 6 places in the OFS. A month later, (and actually in retrospect, also agreed to by Mr. Wium), the same Memorandum and Questionnaire, with a different cover letter, was mailed to the Directors of all 22 Bantu Affairs Administration Boards in the country. They were responsible for all traffic matters within the black neighbourhoods, I (or we) thought. Well, I got a rude awakening on what they thought!

Responses were received from 41 of the 57 Chief Traffic Officers, and from 16 of the 22 Directors. In both cases, this was a good 72% response rate. I then wrote a report summarizing the results, and this became Report RF/2/77 of April 1977, containing 41 pages, including the 2-page Questionnaire. VIA, the NITRR brochure of Summaries of Reports, Volume 19 No 1 (March 1978) gave a Summary (next page). Note that I had no hand in preparing that Summary, as I was already designing Deerfoot Trail in Calgary. I received my copy of Report RF/2/77 on 1977-04-29, the day before my job hunting flight to Edmonton. The above issue of VIA contained 21 Technical Reports, (17 in English and 4 in Afrikaans) 12 Reprints (all in English) a Preliminary document in Afrikaans about "Statistical Concepts of Quality Assurance and their Application in Road Construction," as well 3 thicker booklets called "Technical Recommendations for Highways", namely TRH 5 and TRH 8, (these were normally also translated into Afrikaans). These booklets were developed by NITRR staff and committee members from all the various road authorities – and the first one, TRH 1, about Prime Coats, had already been issued five years before. Provincial Road Departments had used the information to standardise their Specifications and procedures. Another series called "Technical Methods for Highways" was also developed; while already in Canada, Mr. Jobson sent me two copies of the bilingual TMH 4, "Geometric design standards for rural two-lane two-way roads, (September 1978)" which supposedly superseded the AASTO Guidelines (shown in "Part 1". In turn, this TMH 4 was superseded by TRH 17, 1988, "Geometric design of rural roads" by the CSRA (Committee for State Road Authorities), as my handwritten note in one copy of TMH 4 indicates.

The reason why I wrote all my Research Reports in Afrikaans has never been made clear to anybody. Having read all the horrible statistics, compared to other countries, I concluded that it would likely be too embarrassing (for South Africans) to let the rest of the world know how huge our pedestrian traffic safety problem actually was. As an afterthought, I believed that I was correct, but now (2018) I have an "after-afterthought". This is not only because I now have to provide some translations, but also because I believe(d) that my research into the engineering aspects of pedestrian safety would and could only unearth (or expose) a single and minor symptom of the much wider overall problem of the structurally "dualistic" South African society, which was likely unknown to many at the time, but has over the past forty years actually resulted in a "failed country". Like the Alabama Choir of the PU for CHE once sang in a medley that started out beautifully with a variation on the **Tritsch-Tratsch Polka**, and went on and on with all kinds of diversions and operatic variations, until at the end, when they suddenly sang the words: **"Where did we go wrong?"** as if they did not know how to end the song.



March 1978

March 1980

Printed next to the covers of VIA of those days, the question "**Quo Vadis?**" enters my mind. Did I know the way? Where was I going? Where was South Africa going?

The responses that were received and shown in RF/2/77 were quite clear, particularly those from the (white) officials who were "in charge" of the black townships. First of all, it appeared that there was a complete disconnect between responsibilities; of these 16 Directors, 4 of them returned only a letter, and I will now translate the comments of that group. noting that the 12 Directors who responded, probably reflected the similar views of the 6 Directors who failed to respond.)

RF/2/77 **VERKEERSHOOFDE SE MENINGS OOR VOETGANGERMAATREËLS TUSSEN STRAATKRUISINGS**

(OPINIONS OF CHIEF TRAFFIC OFFICERS ABOUT PEDESTRIAN ROAD SAFETY MEASURES BETWEEN INTERSECTIONS)

J.A. de Raadt April 1977, 41 pp

Note: Text in Afrikaans

Opinions about the pedestrian safety measures currently in force in South Africa were canvassed. For most of these measures there are no quantitative criteria. It is desirable to establish such criteria and modify existing warrants. There is general agreement among Chief Traffic Officers that the uncontrolled pedestrian crossing offers insufficient safety and should be abolished in street blocks that are relatively short. Alternative control measures are suggested.

<<<<< This is the English summary of Report RF/2/77. The NITRR was fully bilingual.

"The Bantu areas in the area of jurisdiction of this Council are located in the countryside and therefore the questions do not apply."
"All traffic control in Bantu towns is carried out by the Municipalities and not by us. Kindly write a letter to them in this regard."
"Since the traffic in the Bantu areas within the Council's area of jurisdiction is still controlled by the relevant municipalities, it is not possible for this office to complete the questionnaire. It will therefore be appreciated if the questionnaire can be sent directly to the relevant municipalities, of which a list is attached."
"Certain Bantu residential areas are within the jurisdiction of this Council, viz. (*followed by the name)*. The application of traffic regulations is the responsibility of the various local authorities. The Bantu towns are residential areas in the true sense of the word, i.e. they consist mainly of residential units for families and single people and that there are no extensive business centers that cause a concentration of pedestrians and traffic. According to the nature of the case, special pedestrian safety measures are therefore not considered necessary. In practice, as in any other residential area, pedestrians in the Bantu towns concerned cross streets as and where they see fit, and children use sidewalks and streets as playgrounds. In the light of the foregoing comments, the questions in your questionnaire are not applicable in this case and are therefore not answered and returned."

Some of the other 12 Directors, however, returned the Questionnaire with valuable comments. One was written in English (so that I do not need to translate it!):

"It is suggested that a causative assessment of the high pedestrian fatality rate amongst Bantu will be achieved through field research into Bantu transport facilities, commute volumes and distance travelled on foot. It may be necessary to instigate a systematic re-education amongst Bantu on road sense. It may be the case that attitudes to potential road dangers are not as realistic as they should be amongst Bantu road users."

That response suggested to return to the other two E's, **E**ducation (or Human Factors) and **E**nforcement.

About the unsignalized mid-block crossings – see type (i) above – only four Directors responded that there were 14, 4, 10 and 2 such facilities under their "jurisdiction". One Director responded: "Ask the

local government." (***meaning the municipality***). Another commented: "No asphalt surfaces." A third Director responded: "An inspection has revealed that such facilities exist." Only two Directors stated that in their areas, traffic counts existed, and were used. Six of the twelve responses said that these type (i) facilities did not provide adequate protection for pedestrians. One Director commented: "Because the (single) crossing is located on the main street, motorists do not give heed to pedestrians." The question whether these facilities ought to be scrapped, met with some ambivalence. I analyzed the responses based on whether these facilities existed or did not exist. The responses ranged between "It would not be noticed", "In black residential areas, it is currently still a waste of money", "Unpractical where blocks are long" and even "Not recommended, especially not on busy roads." (This response seemed to evade the question which was: "What is your opinion about the recommendation that such crossings {{meaning the type (i) facilities}} must entirely be abandoned between street crossings?" I was unsure what was meant.)

In all the black townships, only 2 signalized mid-block crossings existed, both in Kwa-Thema, near Durban. No counts were available, but it seems that the existing warrants had been used to determine if those installations had been needed. One Director even commented "Electric power is not available."

Scholar patrol pedestrian crossings of type (iii) existed in 5 of the 12 black areas. One Council had 10. To the question if these facilities provided adequate protection for pupils, 6 Directors responded "Yes" outright; 2 Director commented "Reasonable". 2 responded "Not applicable", and one commented "Yes, especially under supervision of teachers and traffic officers". The 12th Director commented "It varies from place to place. Where the school is located along a busy street, or where large numbers of pupils have to cross a main street, the school can do the necessary preparations for the orderly use of street crossings."

The question "How are these facilities manned?" the response was that of the 24 crossings, 17 were manned by pupils and 7 by pupils and traffic officers. One comment: "Scholar patrols in (name) Bantu Township are generally amongst the annual prizewinners in our City."

It was a completely mixed bag of responses whether these scholar patrols ought to be subjected to "quantitative warrants" or not. But on the question "How these crossings ought to be marked on the road", 8 out of 12 responses were "Like block pedestrian crossings." The fact that 1 Director said "Not applicable", that 2 Directors did not respond to this question, and that only 1 Director said "Like pedestrian stripes" meant an almost unanimity in favour of block painted crossings for youngsters.[139]

The link between the engineering aspects of pedestrian safety and the urban planning aspects of pedestrian safety was abundantly clear to me at that time, meaning the fall of 1977, when I wrote RF/2/77, more than what I realized when writing the Questionnaire in August 1976.[140] Both graduate courses were opening my eyes in ways that I had not expected, and in fact, strengthened our resolve to emigrate.

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[139] There is a difference between stripes and blocks. In North America, in 1977, pedestrian stripes were normally used at street crossings, and blocks (originally coined "Zebra" in Great Britain because white alternates with black) were used at mid-block locations and school crossings. Over the decades, this issue has not yet been entirely resolved in North America, where even multi-coloured blocks are now being promoted in certain cities in our society that is being "homogenized" in a way that milk never was. In Osoyoos, two sets of stripes and one set of blocks are in use at Main Street (Highway 3) and 85th Street! I also saw this recently on Bridge Street in Princeton.

[140] In the "Transport Planning" course at UP, I was confronted with the "Report of the Committee of Inquiry into Urban Transport Facilities in the Republic" (the Driessen Committee) that clearly identified (in para. 3.14.3) a "dualism" in the South African economy, concluding that this had caused two types of problems: (1) about the transport of white people (mainly by automobile); (2) about the transport of black people (mainly by public transport) and also an additional type of problem, namely (3) about goods transport. This situation was accepted "as is" in February, 1974, not even questioning it. I saw the pedestrian safety problem similarly "dualistic" and so complicated to render it insolvable.

Responses from the 41 out of 57 Chief Traffic Officers first showed that there was no correlation between the size of a city/town and the number of type (i) unsignalized pedestrian crossing. Varying street block lengths was noted as the reason for this – some towns had many short street blocks; others had many long street blocks. Urban planning principles changed over the years, but how does that affect what is existing? In Johannesburg, there were 4, in Cape Town, there were 7, while Vanderbijlpark had 63.

It surfaced that at about 50% of the type (i) unsignalized pedestrian crossings, pedestrian traffic counts had been taken. Some municipalities counted all of them, some only a sample of them, and some at none of them. This did not correlate with the size of the city/town; some smaller municipalities were diligent. My summary was that 15 of the 41 counted all, 2 others counted more than half, and 9 did not count at all.

Additionally, 25 out of the 41 Chief Traffic Officers reported that they used these counts as "warrants" in the decision making process. Strange, but the South African Road Traffic Signs manual (1971) did not even have numerical "warrants"! I cannot remember if this had been asked as a "trick question". My Memorandum had clearly said that there were no numerical warrants. Report RF/1/79 later stated that the warrant for these type (i) facilities was "of a subjective nature and no volumes are mentioned." With some additional comments, 35 of the 41 Chief Traffic Officers reported that these facilities do not provide adequate pedestrian protection. Only 3 of them said "Yes".

Following up on the previous question, 19 out of the 41 Chief Traffic Officers opined that they ought to be abandoned, to which 1 added "Yes in the downtown, no in the suburbs"; 6 added "Yes, if street blocks are not too long" and 1 added "In 90% of cases, they can be abandoned". Other comments on this question varied from asking for better enforcement, physical barriers, better legislation, and signalization with the "green wave".

The next question, asking for additional suggestions to improvements, also varied between signalization, yellow flashing lights, synchronization, strict enforcement "which is nearly impossible due to a lack of personnel", preferring the old zebra crossings, "use only at schools where peak hours exist, and with control by pupils or officers" and the like. In some comments, the frustration of these people shone through, as if they felt that they did not have the tools to do their job. (I read that between the lines!)

About the type (iii) facilities, those existing pedestrian crossings at schools, that were "patrolled" at certain hours of the day, the Chief Traffic Officers shows a substantial difference in approach" whether these facilities were worthwhile. Once again, there was no correlation between the number of these crossings and the size of the city/town. In fact, the numbers they reported in their jurisdiction were very different from those in the magazine ROBOT from July – August 1976. That publication had reported 747 in all of South Africa, but how could their 194 for Johannesburg jive with the 186 that the Chief Traffic Officer reported? Or the 68 vs. 167 for Pretoria, the 33 vs. 52 for Cape Town and the 19 vs. 40 in Bloemfontein? From the 41 municipalities in my research, 766 of these facilities had been reported, more than the 747 from ROBOT magazine. When reporting both sets of numbers, I asked myself: "Who is actually fooling who?"

Anyway, 28 of these 41 Chief Traffic Officers reported that they considered these facilities to give adequate protection to pedestrians. Additional comment ranged from "No serious accident since 1940", "if properly trained and disciplined", "if on secondary streets with careful investigations", and only 2 Chief Traffic Officer said "No." in an outright way, and 3 others quoted things like "sometimes, the stop sign is being ignored by drivers", "because pupils have already been hit at these facilities", and "not in use, we use point duty."

The next question, asking who actually served at these facilities, brought up a whole range of responses between municipalities: These were sometimes manned by pupils only, with periodic inspection by a

traffic officer; sometimes mainly point duty by traffic officers. Pensionaries in uniform were also appointed, or ladies who were appointed as honorary traffic officers. "The cost of this is relatively low, R2 per hour of service, and uniform." At various other non-school locations, point duty also occurred. The use of black well trained traffic officers for scholar patrols or other point duty was also mentioned.[141]

The question whether quantitative warrants for scholar patrol pedestrian crossings would be appropriate, was supported by 30 of the 41 Chief Traffic Officers. One of them commented; "Yes, besides other considerations. Each crossing should be considered on its own merits." Another commented; "We have a local policy that takes into account speed, vehicle volumes and surface widths. If certain numbers are exceeded, a traffic officer must control the pedestrian crossing." But 8 of the 41 Chief Traffic Officers said: "No", and another commented "like block crossings", (*for which no quantitative warrants existed!)*

Additional comments were reported in Report RF/2/77 and ranged from using barriers lie at railway crossings), the dichotomy between the poor location of schools in the downtown, threatening the safety of (elementary school) pupils from the suburbs, the difference between the street width and the length of the pole that the pupil had to handle, and the use of yellow paint stripes, to show the difference from other pedestrian crossings. Two others pointed to pressure on teachers and schools to have proper oversight.

Questions about type (ii) signalized pedestrian crossings drew favourable responses. The larger cities used them, the smaller ones did not, except Newcastle, which was an industrial growth point at the time. In 11 of the 41 municipalities, data was available to support the existing warrants for their installation. Of course, in 20 municipalities, the Chief Traffic Office wrote "does not apply". Later, 14 of the 41 said that the 1971 Manual had been used, while 3 Chief Traffic Officers said that the warrants were used to deny applications for their installation. My conclusion was that for 141 out of 168 type (ii) installations, the 1971 quantitative warrants had been used.

Up to this point, I have not mentioned what those quantitative warrants actually were:

"The installation of traffic control signals will be warranted when … the number of pedestrians crossing a street during each of any 4 hours of a normal day exceeds 200 per hour at places further than 150 m from any signal controlled pedestrian crossing and the vehicular volume in both directions exceeds 400 vehicles per hour during each of the same 4 hours."[142]

Further comments varied considerably, and I distinguished between jurisdictions who used type (ii) installations and those who did not, without any intent to sift the wheat from the chaff. The Memorandum had suggested revised warrants – see below, untranslated – and this idea was favourably received by about 16 of the 21 Chief Traffic Officers in the first group, while nobody said "No" and the other five had some questions. Within the second group, 9 were in favour, 7 had no comment and 4 were wishy-washy.

The lighting set-up, (green, yellow and red for vehicular traffic; red and green symbols for pedestrians) was considered adequate by 11 of the 21 in the first group, and by 14 of the 20 in the second group. Some additional comments dealt with the lens size; some suggested that green for pedestrians ought to have remained yellow[143], some requested flashing (red) lights for pedestrians, or even a flashing green before changing to red. One comment from the second group was "Go to any city and see how the pedestrian subjects himself to the signal: Either he totally ignores the signal, or he stands on the roadway. The existing facilities are efficient, the pedestrian is not."

[141] This was likely for point duty in the black neighbourhoods, still within municipal jurisdictions (see next page).
[142] Quoted from Report RF/1/78, and it is noted that Report RF/2/77 had mentioned this in Afrikaans as Art. 157(b).
[143] Yellow may have been in use in South Africa prior to 1971. I cannot remember ever seeing one in that colour, but North American practice may also have used yellows at one time.

Three additional comments were interesting. One of them was that "The signalized pedestrian crossings are the responsibility of the City Engineer." A similar one: "The majority of questions contained in your questionnaire concern matters which fall within the purview of the City Engineer." The third one: In Cape Town, several block crossings are supplied with a pedestrian operated red flashing light. When it is not in use, there is no light to oncoming vehicles. The effect of a red flashing light that suddenly appears, is very effective; reaction to it is very good. The pedestrian gets no indication when he may cross, and waits till traffic in both directions had stopped before he enters toe crossing."

Report RF/2/77 contained two full pages of text on Chief Traffic Officers' additional comments. While 14 of 42 of them did not utilize the opportunity, most others gave me comments, an attachment or a cover letter. They were almost universally against pedestrian underpasses, and a little less vocally opposed to pedestrian overpasses – "except on freeways". One Chief Traffic Officer suggested crossing at "first floor level", which is exactly what I became used to a year later, in downtown Calgary, Alberta's very novel +15 system that was still being expanded more than twenty years later.

Although various comments were received that stated "Pedestrian bridges and underpasses are a solution, especially where there is a large number of pedestrians. But they are very expensive." A very specific general thought was "There is only one solution: A person must have a fear to trespass, not a fear for the result of an accident. All of us know that we are going to die at one or other stadium of our lives, and we accept that! But nobody wants to suffer while he lives. Can we try that point of view?" The impossibility of taking pedestrians to court, who did not have a registration plate or a drivers licence, and who did not need to carry an identity document, and which the Courts gave meaningless fines of R2 or R3, showed to me how these Chief Traffic Officers, as "pillars of the society" wanted to vent their absolute impotence, to me, a person who had already made up my mind that "it is impossible to find a solution to this problem."

During that time, I had an opportunity to visit a few traffic departments within reach of Pretoria, and remember the visit to Johannesburg, where a huge wall map of the City shows all the "black spots", meaning locations with high accident rates. These were obviously not in the black neighbourhoods.

The NITRR had an absolutely amazing in-house female "language buff" who dotted all the i's and crossed at the t's before Report RF/2/77 was finalized. This petite Afrikaans lady was just brutal, and I had to fight for keeping what I thought to be the "hard essentials" in the text, which she wanted to "soften". We sat quite some time in her office (next to the library) about this. While reviewing the many comments on enforcement aspects from the Chief Traffic Officers, I also obtained advice from the in-house lawyer on our floor, **Mr. Theuns Botha**, (he worked under Dr. J.R. Odendaal, the Head of "Human Factors"), who provided five paragraphs of text on the pedestrian's priority at pedestrian crossings, agreeing that yes, there is an anomaly between Sections 127(2) and (3), and Section 128(3). As translated in his summary paragraph:

"Since motorists and pedestrians should know what their own rights as well as the rights, privileges and duties of others are as prescribed, and that they should act accordingly on public roads, the said contradiction creates problems for the road user, the law enforcement officer and the judicial process, which is not conducive to road safety at all."

In legal terms, those words brought back **reality**: the specific South African pedestrian traffic problem.[144] To round off the content of Report RF/2/77, an inspection tour in the area within reach of Pretoria noticed the lack of conformance with the 1971 Traffic Signs Manual. There was no consistency of signage

[144] See the pages of the IMIESA magazine (March 1979) **below**, in which Mr. A.J. Jobson PrEng (in English) refers to my work under the headings of "Opinion Survey", "Pedestrian barriers" and "Pedestrian crossing facilities".

between municipalities (or even within a municipality), yellow-green and red-yellow pedestrian lights existed (instead of red-green), even the former red and yellow crosses and the sign "Cross on yellow X only" (black letters on yellow background). Checked road markings fared similarly poor: Unsignalized block crossings and striped crossings were both used for scholar patrol crossings: some with and others without stop lines, some with and others without centre line markings, some with and others without parking prohibition markings. Even the block widths were sometimes wider than 600mm. Some older type zebra markings also existed, and in a few cases had not been obliterated well so that they shone through. It was very confusing indeed.

Referring to the Alabama Choir, exactly where and why did things in South Africa first go wrong? In hindsight, it was perhaps by the cumulative effect of legislative and administrative changes since the first diamond was found near Kimberley and the first gold was discovered on the Witwatersrand, and a total **impossibility** to reverse that trend. By 1975, when some already people knew (deep down in their hearts) that things could no longer easily be changed back, my father-in-law gave me his copy of a book called "Native Housing in South Africa" (1955), the slightly revised and updated "Thesis approved for the degree of Doctor of Architecture" at the University of the Witwatersrand, Johannesburg, 1953. The author was Dr. D.M. Calderwood, an architect and employee of the National Building Research Institute (CSIR). His "Introduction" describes the rapid "urbanization" and "industrialization" of South Africa, and lists the various Acts of Parliament since WWI, that had all attempted to control or regulate a new and increasing "permanent urban Native population" – which had not even existed by the turn of the century.

From page 1: "In 1923 the Native (Urban Areas) Act was passed and the responsibility for housing urban Natives was rather vaguely pushed upon the shoulders of the local authorities. The Act has been amended from time to time and was consolidated in 1945. The powers invested in the local authorities allowed for the establishment of locations, and laid down regulations for their control. Housing was to become the responsibility of local authorities. The result was the establishment of good and bad locations depending upon the responsible authorities, who unfortunately had nothing to guide them. Springs commenced a model township, and this was soon copied by Benoni, but both failed owing to the lack of amenities, the rather sudden stoppage of work which was brought about by the losses incurred, and the limited land available at that time. Other local authorities learned much from these experiments and both Johannesburg and Krugersdorp established locations. Orlando, a rather monotonously laid out town, was begun in Johannesburg and by 1936 had a population of 10,000 persons; as the second world war commenced, Pretoria was completing a very good Native Township at Atteridgeville and Port Elizabeth was commencing a full scale programme of housing Natives, while both Bloemfontein and Maritzburg were embarking upon ownership builder schemes."

The **Foreword** to Dr. Calderwood's book, (dated 16 August 1955) was written by William Holford, Professor of Town Planning in the University of London, and President of the Housing Centre. Prof. Holford refers to himself as "born and educated in South Africa and since then a student of housing in many countries of the world". Yet tragically, both he and Dr. Calderwood (in this thesis / book) seem to have ignored one specific South African societal peculiarity – that of the fact that there are Zulus, Xhosas, Sothos, Tswanas, Swazis and a few other indigenous "nations" in South Africa, and that the Thesis had ignored that by only referring to "Natives" and nothing else. Nothing in the book even hints at "ethnic diversity" among the black nations. This is what the urban blacks in the United States of America lack, and although they were liberated from slavery, they never regained their former (African) ethic identities.

Now read and understand the gist of an article on page 4 of the Brakpan Herald of Friday 1 June 1955 reported (next page). This was when the approval of my father-in-law's design project of a black urban neighbourhood was announced to the Town Council. Lower down in the article, this Mr. H.A. Verster is quoted as explaining to Town Council under the heading "**ON ETHNIC BASIS**":

"I have pleasure to announce that the grouping of "Tsakane" on an ethnic basis, depicted in the different colours on the plan before you, has already been approved by the Minister. What has been submitted for our approval this evening is the internal planning of Tsakane as a township for our Native population."

So, Government policy had already changed by 1955 – and I remember that when I worked for the City of Pretoria (1968-1969), Mamelodi East was being planned on an ethnic basis. An area for the Zulus, an area for the North Sothos, an area for the Xhosas, etc. Was this better? Tsakane was obviously my father-in-law's concept and design – the ultimate ramifications of which he no longer believed in 1975, a mere twenty years later! How ultimately tragic! Moreover, my father-in-law's "Memoirs" state that the plan of Tsakane was later displayed in the office of Dr. H.F. Verwoerd (then the Minister of Native Affairs) in the Union Building in Pretoria, as "an example of future development". Lydia's father's name (he was "**the Town Engineer**" mentioned in the right hand column on the next page) is not shown in this article, but his hand-written notes on planning / design parameters were inside the flyleaf of the book, on the back of 5 little calendar sheets.

THE BRAKPAN HERALD FRIDAY, JUNE 1, 19

PLANS FOR NEW "TSAKANE" LOCATION PASSED BY COUNCIL

PROVISION MADE FOR MODEL URBAN BANTU TOWN

10,432 HOUSES, PARKS AND HOSPITALS AND OTHER CENTRES TO BE BUILT

The complete and final plans for the new Brakpan Location "Tsakane" (pleasant living) were laid before the Town Council meeting on Monday night. The plans which cover a location built on 1,056 morgen, are the most modern in the country. The location will be "a model one" and will comprise of wide streets, 10,432 houses, fifteen business centres and garages, churches and hospitals, parks and sports fields. Every feature of a complete up-to-date town have been included. According to Mr. H. A. Verster, the Chairman of the Non-European Affairs Committees of the Council the new location "will be able to boast at being one of the best planned residential areas for an urban Bantu commuity."

a post office and a police station and a beer hall.

"The total length of streets come 78.5 miles and the surface thereof t up 200 morgen of ground (24% of whole location) 32.5 morgen has l set aside for parks and playgrounds.

"The plan has been compiled by Town Engineer and his staff and is l on details furnished by the Manager European Affairs in respect of e grouping, street naming and the ge requirements of a large native commu

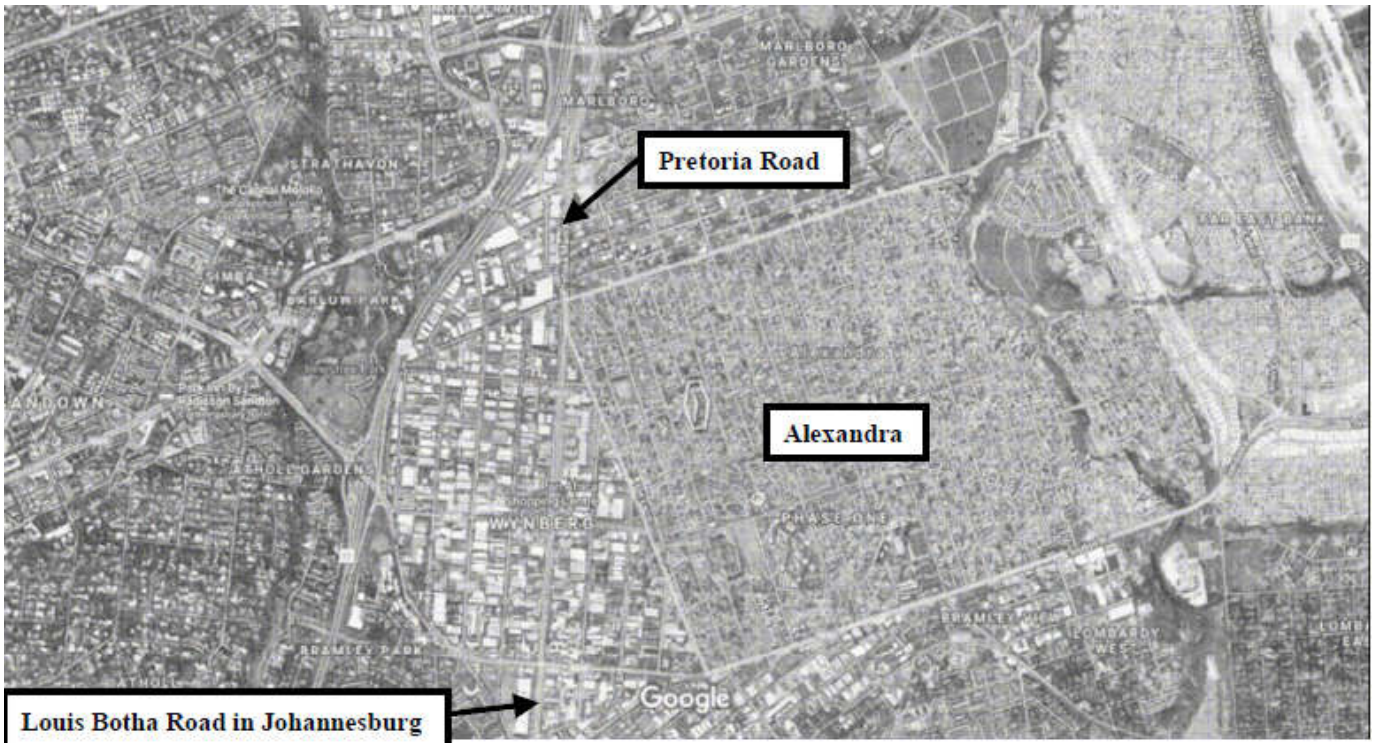
ALL REQUIREMENTS.

"Full cognisance has been taken of the requirements and stipulations of t Department of Native Affairs. All t principles applicable to modern tow planning have been observed and incor orated in respect of siting of public build ings, and the laying out of transport fa cilities.

"In my humble opinion this plan will meet all the requirements of the Bantu in our town and I have no doubt whatsoever that they will also approve thereof. When "Tsakane" is fully developed the Town Council

I would hereby like to claim that "Native Housing in South Africa" had ignored the intrinsic centuries-old tribal "culture of warfare" between the Zulu and Xhosa and Swazi and Sotho and Tswana and Bavenda and Ndebele peoples, plus some others. In these "older" black townships, there had always been much inter-tribal fighting and crime. Young single blacks had come to the industrialized areas (like the PWV)

and had become "detribalized" within a generation or two, not knowing what their actual heritage was – and there are quite some important linguistic and cultural differences between the above nations. The English people in South Africa, being colonizers over the centuries, oceans and continents, normally ignored that. The majority of the Afrikaans people, being an indigenous nation itself, had always recognized this, and that is why the defeat of the SAP Government in 1948 by a coalition of the National Party and the Afrikaner Party had been so crucially important.



Bill Cameron and I had an occasion to go into Alexandra Township, on the very north limit of Johannesburg.[145] But we first stopped at the Police Station (which was actually in a commercial area just outside Alexandra, on Louis Botha Drive / Pretoria Road) and asked the uniformed black constable about the traffic and road safety situations he normally had to deal with. Because that location of that Police Station was outside Alexandra location (pun intended), traffic accidents for Alexandra were included with those of Randburg, which was an entirely white municipality! Over the years, "the Government" had built many hostels for single males in Alexandra, not distinguishing between tribal ethnicities, and it was a high crime area, so what about traffic accidents?

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[145] Alexandra was in fact outside the City of Johannesburg. I had always guessed (without having proof) that in 1944, the Transvaal Peri-Urban Health Board must have taken it under its wings, but I was wrong: A slide presentation called **"Alexandra Urban Renewal Project and Neighbourhood development: An unanswered question?"** by George Onatu & Aurobindo Ogra, Department of Town and Regional Planning Faculty of Engineering & Built Environment, University of Johannesburg, states on slide 8 of 23 that: **The township of Alexandra was established in 1912 on land originally owned by a farmer, a Mr. Papenfus, who tried to establish a white residential township there, naming it after his wife, Alexandra, and is located close to Johannesburg. Because the township was proclaimed prior to the South African 1913 Land Act, it was one of the few urban areas in the country where black people could own land under a freehold title. However, in 1916 the Alexandra Health Committee was appointed to manage the township but was not allowed to collect local taxes, nor was the Johannesburg City Council willing to take responsibility for an area that it claimed fell outside its jurisdiction, leading to a lack of resources and proper management. When the National Party came into power in 1948 and started to implement its policy of apartheid Alexandra was put under the direct control of the then Department of Native Affairs.** (my underlining.)

We were stunned by what we then heard from this older black constable. He told us that the situation was very bad indeed. Some taxi drivers from (say) tribe A did not give a hoot about small children from any of the other tribes (B, C, D or E), and he was aware that various children had been hit by them, and the vehicle had just driven off. Then another taxi driver from tribe E had retaliated. He told us that all the streets in Alexandra (except the "main drag" which was "paved") were gravel or dirt, without any sidewalks or stormsewers, and that there were ditches where the terrain is steep, and he did not know where the pedestrians, young and old, actually had to walk. So we only drove down into Alexandra (a long main road in an easterly direction), and returned. On the way back to Pretoria, Bill and I did not say much to each other, but I thought: "Is this an engineering problem – or not? Is there an engineering solution – or not? What type of solution is there?" **Or – and this was the alternative in my mind – is there none?**

Now reading these things, dear reader, do you perhaps understand why (particularly) the Directors of the 22 Bantu Affairs Administration Boards had such a hard time with my questions? Like the black constable in Alexandra, they knew the problem intimately, (although not personally) and perhaps they also knew some or other way to try their honest best to improve traffic safety, but they did not have the authority to do most things, and did not have the money either. Like the Director who responded and had two of his Regional Managers co-sign with him – as a joint "cry for help" – **to whom?** – as follows:

"As a result of no legal action on traffic issues, this Council has the following problems:

1. Maintenance of existing signs and paint lines.
   a. In the Bantu towns, there is a great deal of willful damage to road signs, which cannot be repaired by ourselves. However, we will replace signs as needed.
   b. Since the new Manual came into force in 1971, no painted lines in the towns have been added to the new standards. In some urgent cases, existing lines that became dull, have been painted by us without permission from the Local Authority.
   c. This year, the main roads in the Bantu towns were resurfaced with pre-mix asphalt. The lines and markings that are now covered with it may not be repainted by us, and we must wait for the Local Authority to do the work at our expense.

2. Adding new characters and painted lines:
   a. Since road construction has also been carried out in recent years, there has been a need for traffic management (signs and lines) in various sections, which, according to the Local Authority, will only be investigated by them at our Council's expense.
   b. Added to this is the problem of obtaining funds as no license fees or fines accrue a to this Council.

3. Traffic control in the Bantu worship areas.
   a. A significant danger to pedestrians is created because little if any speed control measures are applied in the Bantu towns. Due to the fact that additional roads, especially main roads, are built annually, it can be expected that problems will increase. The same applies to the disregard of the traffic signs in which they are.
   b. The general impression is that although the Local Authority is responsible for traffic control in the Bantu areas, there is no real implementation of them, while collecting funds from residents of these areas, in the form of license fees and fines."

But how **awfully poor** were the statistics really? My Report RF/2/77 had not mentioned any – but only (in the Introduction): "The high percentage of pedestrian accidents in South Africa is something that ought to be of concern to anybody who takes traffic safety to heart." (The numbers may have been in the Memorandum to Chief Traffic Officers.) Mr. J.A.N. Breytenbach's Report RF/12/78 (see below) gave

the number of fatalities as 2 878 for 1977, and continued: "Pedestrians killed and injured formed 31 per cent of the total road casualties in 1977; of the 6 420 people killed on the South African roads, 45 per cent were pedestrians." This number of 6 420 was confirmed on page 419 of the 1982 Official Yearbook of the Republic of South Africa, for 1977. However, several tables with statistics for 1977 in the 1982 Yearbook mention "Republic of Transkei excluded for 1977" and the like, because Transkei had become an independent republic on 26 October, 1976, just as Bophuthatswana would become an independent republic in October 1977, Venda in September 1979 and Ciskei on 4 December 1981. So one cannot really believe the 1977 numbers, even that in 1978, 6 550 people were killed and in 1980, 6 037 people were killed, because the land area of South Africa changed in those years. During one coffee break, one in the group of researchers from our floor mentioned that Transkei would no longer be included in South African statistics, and that this would also affect traffic accident records. I could not restrain my ability to think logically, and concluded succinctly to them that "this change means that the current percentage of pedestrian traffic fatalities will likely soon reach 50% instead of the current percentage" (which would be the most recent one we had, for 1975 or 1976, for the whole country). My colleagues did not understand what I meant. Some of them were at that time doing research on compulsory seat belt legislation, or the results of the first few years of voluntary seat belt use (not all South African province changed over at the same time), and I continued to explain to them that "if wearing seat belts can really save lives, they can only do that on the (say 25%) of traffic accidents that can actually save people's lives; wearing seat belts can have no impact at all on almost half of the traffic fatalities who are pedestrians. So increased seat belt use must increase the percentage of the pedestrian fatality rate." [146]

In early 1984, the Whitehorse Public Library, in Yukon, Canada, did not want to display or use the above Official Yearbook. Sanctions toward South Africa had started in earnest! Lydia worked there, and was offered this valuable resource, (for free). On page 910, (reflecting on occurrences that had happened in 1980), I found the following statement: **"Introducing the National Road Safety Amendment Bill in Parliament the Minister of Transport said the RSA had one of the worst road accidents records in the world and these accidents cost the country about R 600-million a year."**

Obviously, I was not the first person at the NITRR who had tried to identify the real pedestrian traffic safety problem. Mr. Wium had mentioned it in a paper to the SAICE Convention in 1963.[147] My colleague, Mr. P.W. Nel, had written Report RU/1/76 about it – "Pedestrian behaviour in six South African cities." From memory, I remember that he had confirmed a long held suspicion about the fact that young coloured males in Cape Town were over-represented in South African pedestrian fatalities – those who wanted to show off to their girlfriends that they could just cross the road in front of this oncoming car or bus. As a result, what could be done to prevent (or avoid) that kind of "accident" to happen? What type of physical feature (using the word "engineering" in its broadest sense) might possibly be effective in Cape Town? So I continued with a second research project, as a follow-up study on one specific aspect. Might barriers, to separate pedestrians from vehicular traffic, be appropriate?

How and where does one properly locate at-grade pedestrian crossings, which is an engineering problem? Is it possible to cross safely, somewhere other than at a traffic signal? The idea of separating vehicular and pedestrian traffic flows (on the same horizontal level) obviously makes one think about the term physical "barriers". Why? Pedestrian overpasses were considered "OK", particularly if somebody else would pay for the facility, and if enforcement could be proven as feasible, and saying nothing at all the application of warrants. But pedestrian underpasses or tunnels were definitely "taboo", due to all the perceived or actual horror stories about them. My Introduction to Report RF/2/77 had made that clear.

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[146] In 1991, while in South Africa, I re-visited the NITRR and heard that the percentage had increased by a lot!

[147] His Afrikaans paper to the SAICE Convention in 1968 titled "The Roads Engineer and the Reduction of Vehicle Accidents" (tr.) only mentions the word "voetgangers" (= pedestrians) **once**, on page 4.

So if vertical separation[148] was definitely out of scope, horizontal separation is all that's left to consider, and I wrote RF/4/77, as **"Recommendations for Urban Areas"**, which I drew from a Literature Search on "what is being done in other countries?" with the obvious idea of "how can this or that idea be used (or amended for use) in South Africa's urban areas?"[149], and "let's work with your Chief Traffic Officer, Mr. City Engineer." Strange, but (in 2018 hindsight!) I seemed to have forgotten the "environment" when recommending the erection of pedestrian barriers, and also the cyclist. If one of my colleagues, Mr. W.M.J. Sator, had reviewed my Report RF/4/77, he would likely have wrapped me over the knuckles; he wrote various reports – one on "Pedal Cycle Conspicuity" numbered RV/1/79. Check the bottom sketch on page 2 of Mr. Jobson's article in the IMIESA magazine, which originated in my report. I did not even consider something that I learnt very soon after my arrival in Canada, the important concept of "shy distance" between a travel lane and a kerb/curb. Shame on me!

At this time, I wrote down some numbers from an Afrikaans newscast (SAUK = SABC) on 1977-06-21. Is was reported that during 1976, 41% of qualified architects had lost their job, and 38% of unqualified architects. Also, during 1976, there had been 40% less commissions from the public sector, and 29% less commissions from the private sector. I felt fairly confident that these numbers were indicative of the civil engineering industry as well, and that leaving MB&S had been a "good decision".

When RF/4/77 was completed, (see next page for the Summary in VIA of March 1978) I had already been approved for immigration to Canada, based on an offer of employment from the Calgary, Alberta office of Reid, Crowther & Partners Limited. Our health certificates (from Rome) were issued on 30 June 1977, our immigration visas (from London) were issued on 22 July, and valid until the end of the calendar year.

RF/4/77 VOETGANGERVERSPERRINGS: AANBEVELINGS VIR STEDELIKE GEBIEDE

(PEDESTRIAN BARRIERS: RECOMMENDATIONS FOR URBAN AREAS)

J.A. de Raadt September 1977, 32 pp

Note: Text in Afrikaans

The various requirements – physical, legal, aesthetic – with which pedestrian barriers must comply if they are to be effective are discussed. The suitability of different construction materials is evaluated. Examples of the use of pedestrian barriers in cities overseas are shown. The procedure that should be followed by a local authority in South Africa when erecting pedestrian barriers is indicated. Co-operation between the City Engineer and the Chief Traffic Officer is emphasized.

I did not have much time left. But, "trapped in research work" for the next few months, I did two things:

(1) I wrote a paper for the SAICE Convention that was to be held in Durban in July 1978, with as topic "**The Civil Engineer and Pedestrian Safety.**" A draft summary of this paper had already been sub-

[148] During my visit to Calgary in April 1975, I had seen a long and narrow pedestrian underpass at the McLeod Trail and Glenmore Trail single-point interchange (see Chapter 2.) (North of the single point, under McLeod Trail.)
[149] This Report RF4/77 is also mentioned and summarized (in English) in the IMIESA magazine (March 1979).

mitted to Mr. Wium in the fall of 1977, just after my return from "visiting my grandmother" in the Netherlands. He accepted the idea and the content of the one-page summary – which was sent to the Organizing Committee, and after a few weeks, we received a response letter that this paper had been placed on the Agenda for the Convention. After he had died (see below), Mr. Jobson was also comfortable with the idea of this paper. I then started writing – once again in Afrikaans – summarizing all the various research projects that the NITRR had already completed in the past number of years on pedestrian safety, ending with the two recently completed Reports RF/2/77 and RF/4/77 and mentioning current research (see below). The fact that the venue of the Convention was in a mainly English-speaking city, did not bother me; it was my chance to get important things off my chest and into the public domain. The final text of my paper was "approved" just before I announced that I wanted to leave the employment of the NITRR, that my family and I already had visas to go to Canada, and that my last working day would be around the middle of November 1977. Mr. Jobson was so kind to offer that he would present the paper at the Convention – which he actually did, and afterwards he sent me a hardcopy of the Proceedings, with a letter in which he said that the content and tone of the paper had been very well received. I do not know if any questions were asked at that occasion.

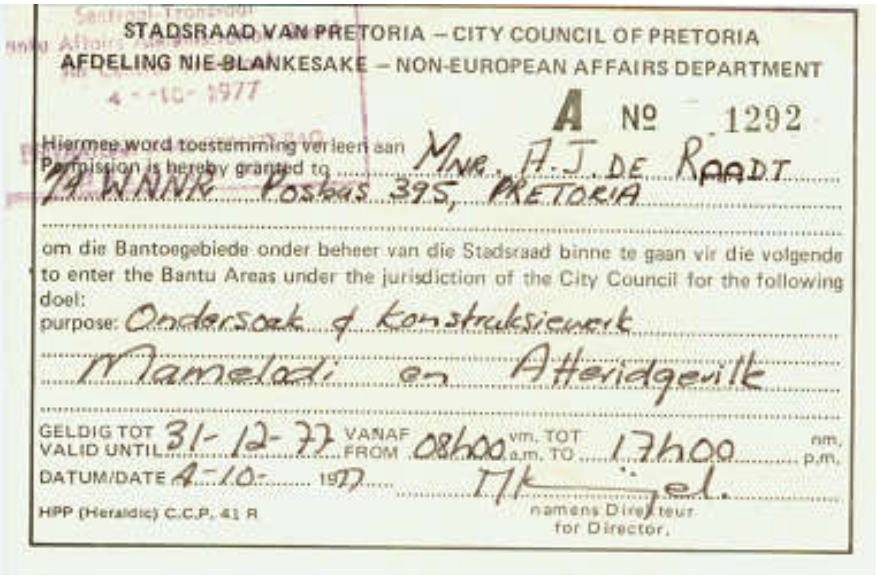
On freeway between Pretoria and Witbank

(In the winter of 1977, I went to Witbank on a work related trip – while setting up my next project (see below) – and I saw an atrocious **mortar grouted rock ditch**, directly next to the wide outside asphalt of the National Road. In this, an east-bound vehicle had been trapped, causing quite some undercarriage damage. This, I believe, was the kind of error that had been built into the project (see above under the McAlpine court case) – but had this a **design** error, a **construction** error or a **supervision** error? (Systems analysis at work in my brain.) This was the "traffic safety" that could be enhanced by "**engineering**" and in particular, highway engineering design.)

(2) I also started a third research project, one that dealt with "How to improve the existing warrants for existing signalized mid-block pedestrian crossings, those that the Chief Traffic Officers had considered inadequate in Report RF/2/77? Would improved warrants result in **more safety** for the pedestrian?" This project selected 45 existing crossings (namely 15 of each: type **(i)** "signal-controlled", **(ii)** un-controlled", plus an additional category **(iii)** for "surveyed crossing points where no pedestrian facilities are provided". These were all in various municipalities within reach of Pretoria, (i.e. the PWV area), but **unfortunately, none in a black township**. I tried to have some included, but it was not approved: see the permit to enter Atteridgeville on the next page. Traffic signage and markings were also to be checked, to see if these met the existing requirements. We used video techniques to count vehicles and pedestrians, including their behaviour while near and at these crossings.

A normal Volkswagen kombi was fitted with video equipment that we would call "extremely dinosauric" today – shown on 6 pages at the back of the report. Nothing like this had been done in South Africa, with a pneumatic telescopic camera pole, a pan and tilt head assembly, a Sony camera and Hitachi video time lapse recorder, video recorder and remote control panel – and power supply from a trailer-mounted generator, in order to reduce vibration. This was all long before what we have today. The installation was built in the workshop directly below our offices, and the field work was done by one of the technicians whose name I forgot; he was quite excited of using a technique that had not been used before.

As noted, Mr. Wium died quite suddenly in the winter of 1977. Mr. Jobson became **Acting** Head of "Road and Traffic Factors", which also changed its name into "Safety Engineering" during that period. I do not know if Mr. Jobson needed to apply for Mr. Wium's position, but I know from a Report RF/4/79 – Accidents at urban intersections tee versus cross intersections – that Mr. R. Fieldwick was still head of the Safety Engineering Group in September 1979.



STADSRAAD VAN PRETORIA – CITY COUNCIL OF PRETORIA
AFDELING NIE-BLANKESAKE – NON-EUROPEAN AFFAIRS DEPARTMENT

4-10-1977

A Nº 1292

Hiermee word toestemming verleen aan / Permission is hereby granted to MNR. A.J. DE RAADT
74 WINK Posbus 395, PRETORIA

om die Bantoegebiede onder beheer van die Stadsraad binne te gaan vir die volgende doel: / to enter the Bantu Areas under the jurisdiction of the City Council for the following purpose: Ondersoek & konstruksiewerk
Mamelodi en Atteridgeville

GELDIG TOT / VALID UNTIL 31-12-77 VANAF / FROM 08h00 vm. / a.m. TOT / TO 17h00 nm. / p.m.
DATUM/DATE 4-10- 1977

namens Direkteur / for Director.

HPP (Heraldic) C.C.P. 41 R

On 4 October 1977, I applied for a permit (**at left**) to visit Mamelodi and Atteridgeville Townships for this project. I had never entered those areas when working (1968-1969) for the City of Pretoria. Bill Cameron went with me, remaining very dedicated to actually see what these South African black townships actually looked like. [150]

Note that my initials are shown wrong, that I did not go to see "Construction Work", and that we had to be out by 5 p.m. But our exploratory visit to Atteridgeville bore no fruit, no research was allowed.

There were some things we enjoyed at the CSIR. There was a beautiful recreational area for picnics and a swimming pool on the south side of Scientia, and (as townhouse dwellers) we often went there on Saturdays. The Medical Scheme was good; discussions with many colleagues was something I missed later. Though my salary had already been increased to R 12 500 per annum in October 1977, (merely as a sign of inflation, or did I receive a merit increase?), it was with a very heavy heart that I handed in my resignation to Mr. Jobson in mid-October. We were successful in selling some of our personal belongings to colleagues – even to those working in other "Institutions" close by, though some CSIR advertising publication (of which I do not remember the name). In one building (and I do not remember whether it was Building Research or Hydraulic Research) I re-met Mrs. Goodspeed, who had previously worked at MB&S. She told me that she had for quite some time purchased a single Krugerrand every month, as an investment. So I also purchased some South African proof sets and gold coins. Theo and Plonia were able to complete their Grade 3 and Grade 2 at Murrayfield Laerskool respectively. Sara had been in a playschool in Meyerspark that year, a few blocks north of our rented townhouse. We sold our Mazda 1600 pick-up truck but not our Mercedes-Benz 280S. We sold many things that we later regretted to have sold. Our visas to go to Canada stipulated that we had to arrive in Canada before the end of the year.

So we booked our air tickets, with special 30 kg/person luggage allowances for six immigrants to Canada, and left South Africa by South African Airways on 26 November 1977, on a flight to Amsterdam, where we planned to stay over for about 10 days before getting a direct CPAir flight to Calgary. This would result in a Calgary arrival of 6 December 1977. Our SAA plane (**see photo next page**) was called the "Lebombo" and our CPAir plane was called the "Empress of India". I celebrated my 35th birthday on the SAA flight and on arrival in the country of my birth. During the flight, we faced a strange situation with the alternating "non-smoking" and "smoking" rows of seats, and although we had seats in a non-smoking row, Sara had asthma from cigarette smoke emanating from other passengers (and the upholstery?) Over

[150] In April 1979, he presented a paper "The Rationale behind the Transport Planning Framework developed by the NITRR". He wrote many papers over the years, of which some are available on the internet.

1977-11-26 – Departure at Jan Smuts Airport.

and above the profuse and very polite apologies by the whole cabin crew, Lydia and I were then offered a bottle of champagne! For Sara…?

On our arrival, oom Aart and tante Elly Siebel suggested that we rent a suite in vacation motel "De Witte Raaf" near Noordwijk for ten days, and a light blue rental Open Kadett, (essentially too small) was at Schiphol already, so that we could visit many relatives that week. They all treated us (but particularly our children) very well, as it was Sinterklaas. We also went to the de-erted beach by a stroll through the dunes. On our last day in the motel, Lydia melted down all the children's chocolate that had been given to them by relatives they had never seen before, but particularly by oom Aart and tante Elly (who lived in nearby Zandvoort). All six of us were over-loaded with hand luggage on both arms, and it was quite a sight at the departure gate of Schiphol! They gladly did not weigh all of it…… and smiled.

Noordwijk, Nederland, 1977-11-30, en route to beach.

After our emigration, it took until July 1978 for the completion of my third research project, of which the results were documented by my suc-cessor, Mr. J.A.N. Breytenbach, whom I never met (and I do not know if he is or was a PrEng or not, because the report does not identify him as one). At that time, Mr. R. Fieldwick was Head of the Safety Engineering Group, and the report was written (in English) as Report RF/1/78, **"Pedestrian crossing facilities: A review of present practices in the Pretoria/Witwatersrand/Vereeniging area."** Its conclusion on the **next page** includes an acknowledgment that I had begun the project. Without trying be judgmental or cynical, it would appear that the gist of Report RF/1/78 was that **"more research is needed on a number of fronts"**[151], because all this high-tech videoing had done nothing else but prove that almost every municipality in the PWV area did its own thing in its jurisdiction, as it thought fit. **None of this research** had taken place in the black townships, due to the continuing **dualism of the economy**, which term the Driessen Committee had found on page 15 of a report called "Urbanization", a Sector Working Paper of the World Bank of June 1972. What follows is my "google-assisted" translation of a portion of that high-powered Committee – of which prof. D.W. de Vos had also been a member. I had bought the Afrikaans version of the Report for my graduate course at UP in January 1977, for **R 6-00**, and have often reread parts of it, to remind me what I had actually left behind in South Africa as it planned "Metropolitan Transport Boards" and toll roads, because municipalities could no longer afford all the things "down-loaded" on them by the Central Government. (Canadians have not been immune to this.)

[151] This is the typical conclusion of a research report, because it would allow the researcher some "job security."

7 CONCLUSIONS

The main finding of this study is that the present status of pedestrian crossing facilities between intersections in the PWV area is generally unsatisfactory. To obtain uniformity in the provision, location and layout of block pedestrian crossings, revision of the existing recommendations and warrants is essential. These revised warrants must be logical and quantitative when possible; consideration may have to be given to such factors as pedestrian safe gap acceptance, vehicle gap distribution, pedestrian crossing time, pedestrian and vehicle delays and cost benefit analyses. It is felt that these warrants should have some form of legal backing to ensure that crossings are provided only when the warrants are met; it is recommended that methods to achieve this end are investigated.

More attention must be given by the traffic authorities to the enforcement of uncontrolled pedestrian crossings and the co-operation of the country's Traffic Departments in this respect must be actively sought.

Improvements to the whole system of block pedestrian crossings might possibly reduce the number of pedestrian accidents, but it will be impossible to ascribe any such reduction to the improvements without a revision of the existing practice of accident reporting. It is therefore further recommended that an improved system of accident reporting be investigated.

8 ACKNOWLEDGEMENT

This project was started by Mr J.A. de Raadt, who emigrated to Canada in November 1977. All the work described in this report was funded by the National Road Safety Council.

3.4. Different Population Groups:

3.4.1 A unique feature of the socio-economic structure of the Republic is the existence within the national borders of different population groups with widely differing cultures, which are invariably incorporated into the more advanced or integrated modern economic sector. A less advanced or largely traditional sector is perceptible, which has a geographical connection with the Homelands as well as with certain other rural regions, where people still follow their traditional way of life. On the other hand, large numbers of Bantu, as well as most of the other non-Whites, have adapted themselves to the work and life patterns required by an industrialized and economically prosperous community. The distinction between such more and less advanced sectors is contained in the concept of a “dualistic economy”, which in essence still applies in South Africa.

3.4.2 As set out below, the urban transport problem in the Republic is affected in various ways by the “dualism” in the economy.

(i) The urban transport needs, and therefore also the urban travel patterns, of the White population are

completely different from those of the Non-Whites, as shown by, among other things, the high car ownership figures for the former compared to those for the latter (described in Section 3.3). Estimates of the travel volume in the seven major urban areas in 1970/71 show that cars were used for around 80 percent of Whites' urban rides and for only 13 per-cent of urban rides of non-Whites. Public transport is used for balance.

(ii) Non-Whites generally live in separate neighbourhoods, while their workplaces are largely located in white areas where they are mainly to be taken by public transport. It requires networks of urban transport services that are essentially separated and divorced from those for Whites.

(iii) In many urban areas, e.g. Durban, Pretoria, and East London, the Bantu residential areas are largely located in the Homelands, which means that relatively long work journeys have to be taken daily. It is estimated that more than 300 000 people are transported daily through public transport between the Bantu homelands and workplaces in white areas, and this figure is rising rapidly.

(iv) The conditions set out above, along with the fact that in the large urban areas other than Pretoria are more non-Whites than Whites, means that providing the necessary mass delivery facilities for non-Whites requires extremely large investments and provides special organizational and financial problems[152]. The costs are such that they cannot be borne entirely by the Non-Whites, especially in the case of the Bantu.

3.4.3 The calculation of the travel volume in the seven major urban areas shows that the average ride length for non-Whites is about 17 kilometers, which is almost double for Whites. The average distance for non-Whites ranges from about 6 kilometers in Bloemfontein to more than 21 in East London. It should be noted that these distances relate mainly to public transport, that is to say, on rail and bus services, which accounts for around 84 per cent of non-Whites transport in the above-mentioned areas, compared to only 20 per cent in the case of whites.

Emigration from South Africa was not really a strange phenomenon; we had known of some immigrants from the Netherlands returning there after a longer or shorter period. In the Netherlands, these people were called "**spijtoptanten**", and there were more than Australia then from other immigrant receiving countries in the late 1950's. I knew about friends of my parents (Piet and Miep Jongbloed) who did this, my father's sister and her family had returned in 1957, and my father's boss (prof. K.W. Gerritsma and his family) had returned to become professor at the Vrije Universiteit in Amsterdam. My father's cousin Leendert van Wijk in Manurewa, New Zealand, had once by letter suggested that we join them there, but that was when my father was unemployed in late 1956. In the Afrikaans section of society, however, leaving the country of one's birth was highly frowned upon. In March or April 1977, the Afrikaans radio service of the SABC aired a quite heated and acrimonious interview with Dr. Kobie Klopper, a music professor and composer of organ music from UOVS in Bloemfontein, whose performance of Händel's "Messiah" we had attended in Bloemfontein in 1973. I had somewhat known him as a music student at the PU for CHE in 1960 when he biked past our living room (in the "Old Professor's Residence at 108 Molen Street, currently the Totius Museum) to practice organ in the building next door. He was basically called a "**traitor**" (on-air!) for leaving the country with his wife and two children to Edmonton, Alberta, Canada. We later met the Klopper family in Edmonton, where he was church organist in a huge Anglican church, and taught at The King's College. He also composed organ music, and we attended an occasion in Calgary (1982?) to inaugurate a new church pipe organ. Later, we learnt that 1977 (the year in which we had left) was actually the first year with a net surplus emigration – which had always been a net surplus immigration. We discovered this in Whitehorse, Yukon, in the 1982 Official Handbook (mentioned already). Were they, like us, "traitors"?

[152] Par. 3.11.4 of the Driessen Report showed that municipal property taxes and charges had almost **tripled** in the five large municipalities between 1951 and 1971, while consumer prices had not quite **doubled**. Personal income taxes per capita (for the Central government and provincial administrations) had risen **fourfold** during this period.

In 1987, emeritus Professor Angus M. Gunn of the University of British Columbia (UBC) wrote a book titled "South Africa, a world challenged" (ISBN 0-9692269-1-8) about his views (as an expert on history and education) on South Africa. The back cover of the 134-page soft-cover book identifies the South African situation as the "**Challenge of the Century – Creating a multi-racial society in South Africa**" and quotes three individuals stating:

"Our goal is a free and multi-racial society in South Africa, but there is deep disagreement[153] about how to reach it" – President Ronald Reagan.
"If the nations of the world condemn us, they will only hinder the process of our emancipation from the bondage of history – Alan Paton.[154]
"Economic sanctions will not bring about internal change in South Africa" – Prime Minister Margaret Thatcher.

Professor Gunn himself had the following quote printed in front of his book:

Not wild Romance or Pride allured me here: / Duty and Destiny with equal voice **Constrained my steps: I had no other choice… / Something for Africa to do or say.** Thomas Pringle[155]

I have often read that book and more often mulled over these lines in my mind. What did I (like Thomas Pringle) have to **do** or **say** <u>for South Africa</u> – both **before** and **after** 1977?

Our son Theo de Raadt was once interviewed by a computer magazine journalist, and what that journalist wrote about the interview may have lead people to think that my concerns (as Theo's father) about the political situation in South Africa were about "the draft", meaning military service for my two sons, as if we were pacifists. I trust that these pages (meaning "Part 2" in its entirety) may prove to you, dear reader, that a single issue like "the draft" would be an understatement of our underlying concerns for South Africa. Our emigration was not an "escape", as we suffered much in our efforts to promote an amicable and acceptable solution. What we **did** and **said** during our first 15 years in Canada stands as proof of that.

The next two pages contain the article that Mr. Jobson wrote for the March 1979 IMIESA[156] Magazine, of which he mailed me copy in Calgary. It is obviously based on a well-translated summary of what I had written in my paper at the July 1978 SAICE Convention, not quoting my reports or those by many of my co-workers over more than a decade, but trying very hard to get a larger **"municipal audience"** for the tragic situation of pedestrian traffic fatalities and injuries. For doing that, I ought to commend my former colleague. I had been aware of his other research reports, like the one on "**intermittent** rumble surfaces."

[153] It is quite likely that this "disagreement" meant an internal political conflict within the USA.
[154] The author of "Cry the Beloved Country" later stated that he was very disappointed with what occurred in 1994.
[155] Inscription on the Monument, Grahamstown, commemorating the arrival of the first British Settlers in 1820.
[156] IMIESA = Institution of Municipal Engineers in Southern Africa. (The **I** and the **E** are supposed to be bilingual.) Mr. Jobson and Mr. Fieldwick also presented a paper at the Conference on Transportation at UCT in April 1979 – with the title "Safety on the Road – Current Civil Engineering Research in South Africa". None of the titles of the 26 papers contained the word "pedestrian".

PEDESTRIAN SAFETY MEASURES

Pedestrian safety measures are aimed at reducing the vulnerability of the pedestrian in urban road traffic. This can be accomplished by providing facilities to protect the pedestrian. One of the most effective methods is that of separating pedestrians from road traffic by providing traffic-free areas. Where it is necessary for the pedestrian to cross the traffic stream, various types of controlled or uncontrolled crossing can provide him with a degree of protection. In many cases it is necessary to provide pedestrian barriers to encourage the use of facilities provided for crossing the road. Signs, signals and roadmarkings assist the pedestrian by warning the driver of the presence of pedestrian crossings. Traffic control measures and facilities for pedestrians at bus and rail terminals are further ways of providing road safety for the pedestrian.

A brief review is given of the results of investigations into the engineering aspects of pedestrian safety undertaken by the National Institute for Transport and Road Research during the period 1973 to 1978 and financed by the National Road Safety Council.

Conditions at pedestrian accident sites

A study of pedestrian accidents which occurred in 1971 at some 44 sites in Pretoria and Johannesburg revealed that in many cases traffic conditions allowed few safe gaps for pedestrians to cross the road, and that engineering measures were seldom employed for pedestrian protection.

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Conditions at pedestrian bridges

An investigation of conditions at some pedestrian bridges in the Transvaal and Cape Province showed a need for pedestrian barriers to encourage the use of the footbridge. Without barriers it was found that usage of the pedestrian bridge was as low as 10 per cent.

Effect of engineering measures

An interim study of the effect of some engineering measures on pedestrian accidents over a four year period at 45 sites in Pretoria produced inconclusive results. Preliminary indications were that pedestrian accident risk is inversely related to pedestrian and vehicle volumes, but directly related to vehicle speeds.

Literature survey of pedestrian crossings

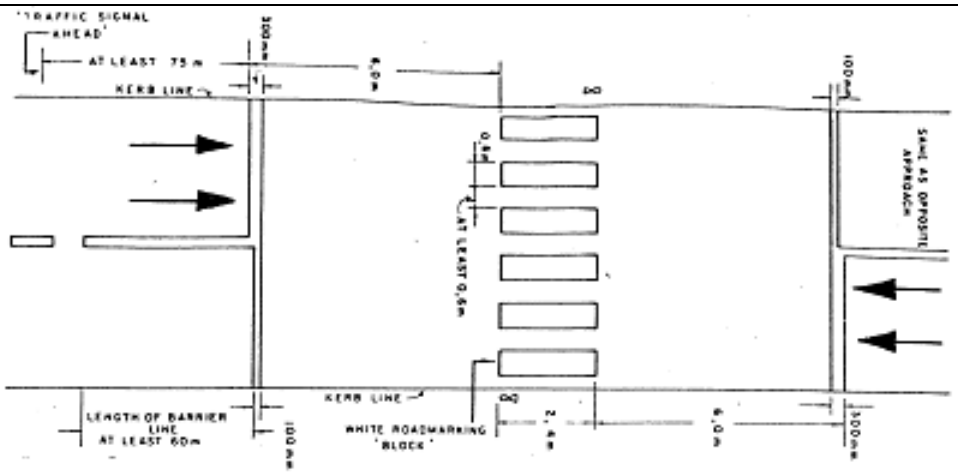
A literature survey of pedestrian crossings in various countries showed that pedestrian safety measures in South Africa do not differ much from those used overseas.

It was concluded that warrants for pedestrian crossings should be based on various pedestrian and traffic characteristics such as the delay which pedestrians will tolerate, the minimum traffic gap length that will be accepted and the average walking speed.

These characteristics should be determined for road users before the validity of warrants of pedestrian crossings can be determined.

Average delay to pedestrians

A study of six sites in the urban areas of Pretoria, Johannesburg and Kempton Park produced the following relationship between the average delay and vehicle flow:



Layout of signal-controlled pedestrian crossing.

$$D = 0,5 + 0,006\ V$$

where D = average delay per pedestrian in seconds
V = volume of traffic in vehicles per hour

It was concluded that the influence of other variables such as pedestrian characteristics, vehicle speeds and platoon flow of traffic should be considered.

Opinion survey

In an attempt to evaluate the effectiveness of pedestrian safety measures in South Africa, a memorandum and a questionnaire were sent to a representative sample of 57 Chief Traffic Officers of local authorities and to 22 Directors of Bantu Affairs Administration Boards during 1976/77.

The following results were obtained from a 72% response to this opinion survey regarding pedestrian safety measures:

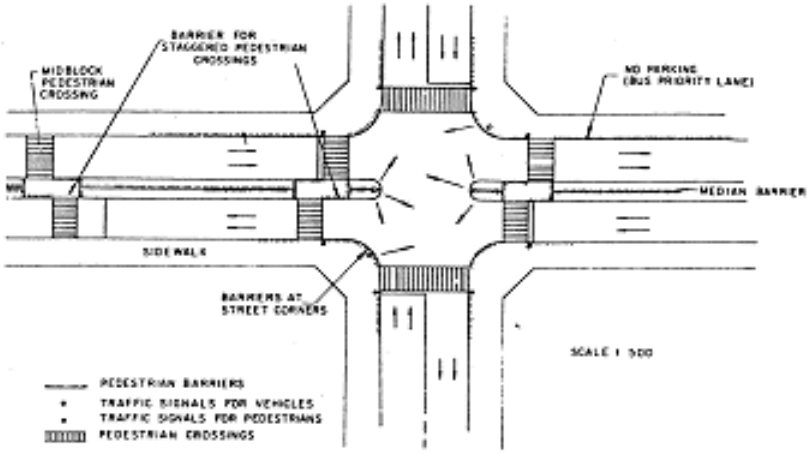
- Traffic officers are not satisfied with the degree of safety afforded by uncontrolled pedestrian crossings and these should not be provided in the midblock positions of relatively short street blocks.
- Pedestrian crossings in long street blocks should be provided with traffic signals, flashing lights or pedestrian barriers, together with stricter law enforcement.
- In general, scholar patrol crossings are regarded as reasonably safe, but warrants are required for their provision and control. To improve visibility, scholar patrol crossings should be marked on the roadway surface in the same way as pedestrian crossings are marked (Figure 1).
- There is a lack of pedestrian safety measures in use in the Black residential areas.

Pedestrian barriers

The purpose of pedestrian barriers is to encourage pedestrians to cross the street only at approved pedestrian crossing points, thus reducing jaywalking and improving safety.

Recommendations for pedestrian barriers in urban areas describe the

Pedestrian barriers at urban street intersections.



various requirements which barriers should fulfil such as location, length, height, strength, cost, convenience, appearance, visibility and legal requirements.

Suggested construction materials such as wood, steel bars, expanded metal panels, aluminium and concrete and natural vegetation have been described.

Tentative designs for pedestrian barriers have been proposed, together with suggested procedures to be followed by local authorities wishing to provide these facilities.

Layout of the road network

From a literature review of the influence of the layout of the road network on road safety it was concluded that the design of the road network should seek to minimise opportunities for conflict between pedestrian and vehicle.

This can be achieved in business districts and in residential townships by the use of T-junctions, one-way streets, the restriction of through-traffic from selected streets, integration of land use with a functional road network, restriction of direct access to major arterial roads, provision of safe access for vehicles and pedestrians from all erven, a road layout that discourages excessive speed, and by separation of the pedestrian and the vehicle.

Pedestrian crossing facilities

A survey of 55 midblock pedestrian crossing sites in the Pretoria/Witwatersrand/Vereeniging Area revealed that many crossings were poorly located.

Ten out of fifteen signal-controlled pedestrian crossings failed to meet the pedestrian/vehicular flow warrants recommended in the South African Road Traffic Signs Manual for the provision of such facilities.

It was observed that pedestrians often crossed the road against the red 'man' at pedestrian signals when there were acceptable gaps in the traffic flow.

It was concluded that revised warrants are required for pedestrian crossings.

Warrants should be based on pedestrian acceptance of 'safe' gaps between vehicles, distribution of gaps, pedestrian crossing time, vehicle and pedestrian delays and cost benefit analyses.

Acknowledgement

This article is published with the permission of the Director of the National Institute for Transport and Road Research.

Exactly four days after our departure, a General Election happened in South Africa. One of the very last **bilingual flyers** received at our townhouse was likely the one shown on the **left**, from a group called KVV that opposed the National Party's Program of Constitutional Reform, suggesting to keep the "status quo" with the "dualistic economy" that had existed for likely more than 150 years. Various "right-wing" groups already existed at that time, straining or even breaking families, business relationships and long-term friendships apart for years.[157] Following our emigration, the number of factions (some of them violent) rose, and unrest among other population groups also grew.

VOTING ON 30 NOVEMBER 1977

Dear Voter,

To vote for the National Party (NP) on 30th November will mean that you agree with the proposed new Constitution of the NP. This will amount to your saying:

1. **I agree that Coloureds and Indians should share in the governing of the White Man in the Republic.**
   (The proposed Joint Cabinets will consist of 7 white ministers and 7 non-white ministers with the State President as chairman. This new body will draft legislation on common matters and will not vote. In case of disagreement the State President will have the final say. **Beeld**, 11/10/77, p.5.)
2. **I am satisfied that the State President (who will have the final say over the Whites, Coloureds and Indians), can well be Indian or Coloured.**
   ("There is nothing to prevent a Coloured or an Indian from becoming State President" — Dr. Connie Mulder, **Die Vaderland**, 15/9/77.)
3. **I am satisfied that a Hindu or a Moslem can become State President of the R S A.**
4. **I shall be satisfied if eventually total integration of Whites, Coloureds and Indians take place in the R S A.**
   (If Whites, Coloureds and Indians share government, take decisions on common state affairs such as racial matters, civil service, external affairs, police, courts, finance, defence, internal affairs (e.g. marriage laws), transport, etc., how can thy eventually be kept apart in trains, buses, hotels, residential areas, churches, schools, etc.? Integration in sport is already far advanced.)

WHY IS THERE THIS UNDUE HASTE?

- Why was the draft Constitution hurried through NP congresses before the voters were properly informed?
- Why is there this undue haste in holding an election at the end of the year?
- Why is a referendum not held on such far-reaching changes in the Constitution of the R S A and then only after the voters had been properly informed and had been given ample chance to consider it, to discuss it and then to vote on it? In 1960 dr. Verwoerd granted people a reasonable time for consideration and only thereafter a referendum was held on the one and only issue of a Republic.

IS A NEW CONSTITUTION NECESSARY?

NO, not at all! The existing constitution can well provide for the interests of the Coloureds and the Indians.

HOW SHOULD I VOTE ON 30 NOVEMBER?

Vote for the candidate who stands for retaining our present Constitution until voters have had proper opportunity for reflection. In the absence of such a candidate, abstain from voting.

PLEASE COMPLETE THE FOLLOWING FORM AND RETURN IT TO: KVV, P.O. Box 3473, Pretoria, 0001.
(Delete YES or NO.)
Tear off — — — — — — — — — — — — — — —

1. I support the KVV (Committee for informing the People) in its stand against the new Constitution .... YES / NO
2. I support the KVV in its efforts to obtain a referendum on the new Constitution .... YES / NO
3. I include the amount of R..... to support the efforts of the KVV .... YES / NO
4. I shall help to obtain signatures for a petition demanding a referendum .... YES / NO
5. I herewith sign the petition form underneath .... YES / NO

PETITION

I the undersigned request the Government to publish the proposed new Constitution as a White Paper for the sake of the future of our country and our people, and to give White voters of the R S A the opportunity of voting for or against by way of a referendum.

Signature: .....

Name: .....

Address: .....

.....

Date: .....

Compiled by Dr. T. Schumann for distribution by the Komitee vir Volksvoorligting, Kerkrade Centre 303, Church Street, P.O. Box 3473, Pretoria. Telephone 48-3626 and printed by T. G. van Wyk Printers, 339 Blood Street, Pretoria, 0002.

Sunday Times 1976-12-05

Bad news for SA's eager emigrants

By JILL McILRAITH

EAGER South African emigrants are facing a distinctly rocky road to get to the Canadian Rockies.

And the obstacles in the way of settling near Australia's Blue Mountains are enough to fill some of them with deep gloom.

Officials at the Canadian and Australian embassies this week reported a noticeable increase in applications since the Angolan war.

But they also warned that applicants had to meet stiff qualifications, linked to labour needs, to get in.

And both countries are accepting fewer immigrants than in the past because of the world slump.

A Canadian Embassy spokesman said Canada had no quota system and South Africans were assessed on the same points system as all aspirant settlers.

At present, there was little demand for doctors, para-medics and teachers, but tradesmen, some engineers and technicians were needed.

People with close relatives in Canada were given some preference but still had to meet occupational criteria.

Requirements were stricter now than a few years ago and the number of migrants had dropped.

In 1974 about 218 000 people were accepted.

No easy exits overseas

This year the estimated intake was 140 000 to 150 000.

In Australia, priority is given to family reunion cases. Husbands, wives, parents and children are given preference, but not brothers and sisters.

Skills

The second category of acceptable immigrants are people with special skills needed in Australia, such as doctors, dentists, para-medics and some electrical, metal and building tradesmen.

Last year Australia had a net intake of 20 000 to 30 000 settlers. More than half came from Britain and Europe.

Of 57 033 people granted Australian citizenship in 1975, only 949 were South Africans. South Africa ranks 17th on the list of source countries.

Obviously, we did **not** vote.[158] Exactly a year before this, an article in the Sunday Times of 1976-12-05, **right side**, had given "**Bad news**" for those planning to leave South Africa.

By **not** heeding that advice, we had yet, **not** by my "skill" in metric highway design, **not** by any other human manipulation of quotas on immigration policy or other regulations, but **solely by God's grace**, been found acceptable to go to Canada. Why?

After 41 years, the only answer that Lydia and I are able to provide, comes from Scripture, with the rhymed text on the following page:

[157] Lydia's parents bore the brunt of opposition to our departure, from their brothers- and sisters-in-law. Some of them hardly talked for decades, until their own children started to leave South Africa. We were unaware of this for a long time. They did not tell us about political news in South Africa, we got it all from the SA Embassy in Ottawa.

[158] On 28 November 1988, (almost eleven years later), in Canada's General Election (the one with a single issue – "free trade"), I was the candidate for the Christian Heritage Party in the Electoral District of Yukon.

Blessed be the LORD who made us not their prey, / As from the fowler's net a bird may flee,
So from their broken snare did we go free. / Our only help is in God's holy Name;
He made the earth and all the heavenly frame. (Psalm 124, st. 3, Dewey Westra, (1931), revised.)

Almost eight years later, we received a copy of a brochure called "**South Africa – Mainstay of Southern Africa**" by the SA Department of Foreign Affairs. (ISBN 0 621 09721 7 – September 1985.) For many years, our main source of information about South Africa had been the SA Embassy in Ottawa, because our close relatives hardly wrote us anything about the politics![159] Two pages from that brochure are worth copying here, as they contain the view that South Africa was already "**proceeding actively with its reform programme**" at that time. Unfortunately, history since that time has shown that neither the European Commission for External Relations, nor the rest of the world (including Canada) gave any heed to all the good intentions of the South African government, and that the "**sanctions, disinvestment and boycotts**" that had already started before 1985 (and we were acutely aware of that in Calgary and Whitehorse) continued. Additional to that situation, the **"Border War"** about Angola and Namibia took its financial toll on the country; when that ended in 1989, the country was in much worse shape than when it had started in 1966.[160] The "brain drain" that had just started in 1977, was accelerating, with e.g. medical practitioners and other professionals leaving "en masse".

THE CHOICE IS YOURS
THIS:

STATEMENT BY THE SOUTH AFRICAN GOVERNMENT

Conveyed to the Foreign Ministers of Luxemburg, Italy and the Netherlands and the European Commissioner for External Relations on 31 August 1985:

If by "apartheid" is meant:

- political domination by any one community of any other;
- the exclusion of any community from the political decision-making process;
- injustice or inequality in the opportunities available for any community;
- racial discrimination and impairment of human dignity;

the South African Government shares in the rejection of that concept.

The South African Government confirmed that it is proceeding actively with its reform programme. This programme provides:

- for political participation of all communities at all levels in matters of national or common concern. This means co-responsibility for decisions on matters of national or common concern coupled with the protection of minority rights;
- for the creation of structures to give effect to the foregoing principle through negotiation between the leaders of all the communities;
- that the Government will not prescribe and will not demand. Give and take will be the guiding principle;
- that the Government will not prescribe who may represent the Black communities. The only condition is that those who participate in the discussions and negotiations should foreswear violence as a means of achieving political objectives;
- for a review of influx control. An amount of R1 000-million will be set aside to improve undeveloped towns and cities over the next five years.

The South African Government also confirmed that:

- the partial state of emergency will be lifted as soon as violence abates;
- the situation of detainees or prisoners will be reviewed as violence recedes and normality returns; and
- it is positively committed to and actively involved in contributing to the peace, stability and development of the Southern African region.

THE KEY TO THE FUTURE
OR

THIS:
SANCTIONS
DISINVESTMENT
BOYCOTTS

WHICH CAN ONLY RETARD
POLITICAL,
SOCIAL
AND
ECONOMIC PROGRESS

How much did it cost us to leave South Africa? Over the years, several people have asked us that, likely due to the fact that countless people came to North America with absolutely nothing in material goods. The next page may give an indication of various costs that we had to make in order to arrive in Calgary.

[159] Lydia's parents did this intentionally – but they came to visit us fairly regularly, even in Whitehorse, Yukon.
[160] I possess a copy of the book titled "The Border War" by Willem Steenkamp.

1. That we sold our house in Schoemansville at a fair price, without a real estate agent's commission, was likely good and in our favour, when seen in reflection. Who knows what the market might have become a few years later? We resided in an adequate townhouse for a year, sold our Mazda pick-up truck, but not the Mercedes until the very last week, and later had problems collecting the money.
2. It cost us a trip to Alberta in May – including four weeks of vacation – perhaps most of what I had accumulated at the NITRR at that time. The Canadian Consulate had told us that we might get visas for Canada, but only if I could obtain a firm offer of employment from either British Columbia or Alberta. Trying elsewhere in Canada would be useless. Was this "**discrimination**" by the Canadian government? Likely. Was it good, for us as a family? No wonder we have a bias against Ontario….
3. Our flights to Canada cost R 722,00 per adult and R 361,00 (half-price) per child, (total R 2 888,00.) We also rented a car (through Van Wijk, a reputable car rental organization at that time), and that cost us 9 days @ *f* 26,00 = *f* 234,00 + 18% tax = *f* 248,19 = R 99,52 minus 10% discount = R 89,50.


ALLIANCE INTERNATIONALE DE TOURISME
GENÈVE

LETTRE DE RECOMMANDATION
Letter of Introduction

délivrée par: *issued by:*

AUTOMOBILE ASSOCIATION OF SOUTH AFRICA
P.O. Box 477, PRETORIA

Nous certifions que le titulaire de la présente lettre est membre de notre club et prions toutes les associations membres de l'AIT de lui prêter assistance et protection.

We confirm that the holder of this letter of introduction is a member of our club and invite AIT affiliated clubs to extend to that person any assistance which he (she) may need.

Signature du porteur:

Travel insurance for all six of us cost the amount of R 24,89 for a 9-16 days trip, through Prudential Travel Insurance Company. These preferential rates were possible through membership since February 1965 of the Automobile Association of South Africa; I even received an interesting document (see **at left**) from them in both French (as the main language) and English (as the secondary language)!

4. To get our personal effects from Pretoria to the house we had just bought at **7536-39 Avenue NW** (before even moving in) cost us quite a bundle. We had a 2.00m x 1.24m x 1.56m wooden crate made for R 120,00 and personally filled this at Transvaal Cartage in Silverton. We also filled four 44 Imp. Gallon grease drums with all kinds of stuff. We sold off many household good, particularly the 120V 50Hz B&O stereo stuff that would not work in Canada. Buyers were mostly CSIR colleagues. We prepaid shipping from Pretoria to Vancouver (via the "Nedlloyd Kingston") and this cost R 2 304.50, paid before we left. This included insurance with a declared value of R 4 000.00, and this was done through General Accident Insurance Company South Africa Limited. The shipping was to be from Durban to Vancouver / New Westminster; we were told that it would be through Yokahama, Japan. The crate and drums obviously first went by train to Durban, where they sat till the end of December 1977. Nedlloyd's Bill of Lading of 30 December 1977 shows: Gross Weight: 2 490kg, freight prepaid: US$ 1573.37. The Marine Certificate of the insurance company is dated 1 January 1978. The ship arrived in Vancouver on 3 March 1978 and the Manager Terminal Billing Service wrote us an Important Notice dated 9 March 1978 (which we received on 13 March 1978) that politely stated:

> "If you live outside the Vancouver area you should contact a bonded carrier to act on your behalf. The carrier will require the original bill of lading (endorsed) and payment for Terminal charges. This carrier will deliver your shipment in bond to the nearest customs office for clearance. The attached invoice indicates the free time expiry date therefore it is important that you act on this notice immediately. If the free time expires before you take delivery demurrage charges will be assessed."

That really made us jump because the "free time" would expire on 16 March 1978! I directly got in touch with a firm called Allworld Shipping Ltd. in Calgary, paying them $ 394.70 on 16 March 1978 for **"All charges ex Vancouver (including dock charges) to delivered Calgary."** As said above, we had already bought a house with a garage (we did not want to have the personal effects delivered at our rental house at **7735 Bowcliffe Crescent NW** that did not even have a carport, and later move it all again. We made arrangements with the vendor of our house to allow us to occupy the double garage off the back alley when Allworld would arrive. And that is exactly what happened a few days later, before we moved ourselves with all the "personal effects" (valued $ 1,500.00) that we had taken

to Canada on 6 December 1977, plus other things that we had already obtained since. When we arrived, Calgary had a "garbage strike" and all kinds of things were possible to obtain "free of charge" in the back alleys! Moreover, the previous owners or renters of 7735 Bowcliffe Crescent NW had "gone back to Scotland" and had left many things behind – which were all in good shape and serviceable, like a skillet, a few garden hoses (buried in the snow), two children's bicycles and a multitude of kitchen utensils.

Our first local move (for the distance of **ONE POINT ZERO km**) cost us $ 7.00. (Yes, we paid U-Haul $ 17.00 on 1 April 1978 – our official date of occupancy" – and on return of the trailer, were refunded the deposit of $ 10.00. Lydia and I cannot remember who provided the **traction**, as we had yet to buy a Canadian Tire bumper hitch.) After that, we started to unload the crate and the eight drums.

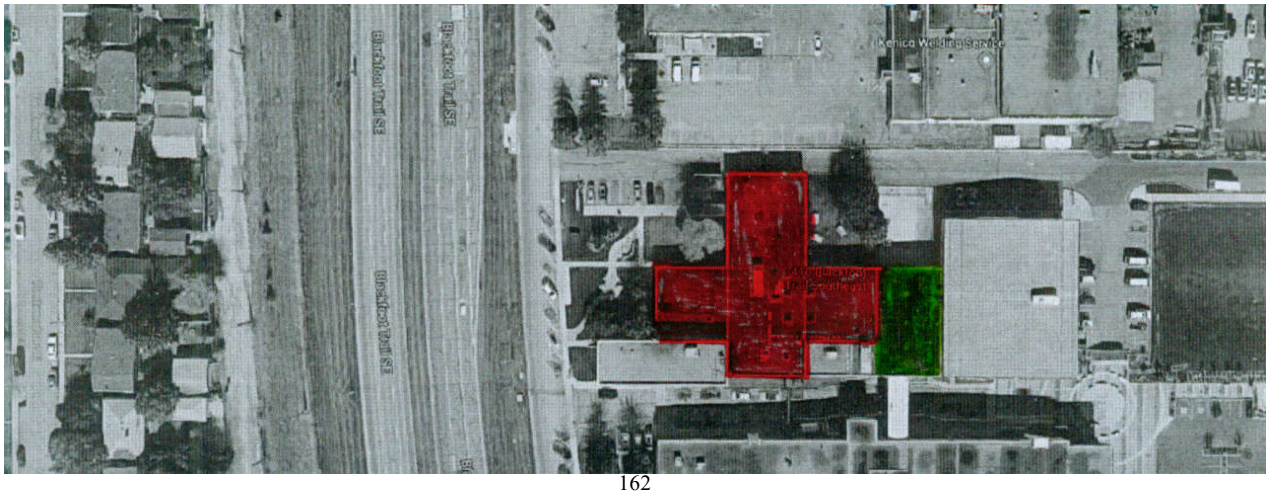
5. We had no Government Pension Scheme in South Africa. I had my MB&S pension fully returned and also my contributions at the NITRR Pension Scheme. We sold some shares that had been bought over the years, even in Clydesdale Collieries and Eddels Shoes in Port Elizabeth. We bought some 1977 proof sets and additional gold coins; we also bought diamonds (which I could later sell to my oom Aart Siebel in the Netherlands.) With my May 1977 trip, I had taken some money to another uncle in the Netherlands. (South Africans were not allowed to have foreign bank accounts at the time.)
6. We lost on a loan to a company called Pusani Dairies in Northern Natal. We had deposited money with a company Senior Finance in downtown Pretoria, which initially paid good dividends but then stopped, and we were unable to recover our principal. While in Canada, we were also unable to sell a residential property in Bedworth Park, halfway between Vereeniging and Vanderbijlpark, which we had purchased while living in Sasolburg. For not paying property taxes, we then lost it completely.
7. I probably relinquished much "**knowledge**" about the South African way(s) of doing professional civil engineering through the years, since my youth and studies and 12-year career. I was well aware that things would be "different" in Canada, but had no firm idea "by how much" and "in what ways" I would need to adapt. Reading foreign magazines (like Engineering News Record, ITE Journal and some other British magazines) had said very little about Canada, and if it were about Canada, it would likely have been about Ontario. I would need a lot of reading and adaptation to make myself useful. But I was probably still young enough, and not entirely "set in my ways" like others I met years later, like the Deputy City Engineer of Port Elizabeth, who came to British Columbia and was hired by the Greater Vancouver Regional District for a number of years. He probably had a harder time than me.
8. In all this, one ought to remember that the ZAR was worth much more than a Can$. This became clear when I tried to continue paying a SA life insurance policy premium and annuity through the Professional Providence Society and SANLAM. I discovered that it cost too much, and I could not afford to pay $ 1.80 for one rand. As we all know, this situation did not last long. I made local insurance arrangements, stopped paying PPS and got locked into an annuity, which I receive since 1997.
9. But coming to Canada did not cost us our Christian faith and the professional ethics that had been based upon our faith. I am convinced that this was the miracle of God's grace that needs to be seen.

The next pages cover my two weeks of work in 1977, concluding this "Part 2" period of "My Professional Career", which means the first ± 23% of my career years. Work in Alberta, Yukon and British Columbia, (all in Canada) and Arizona (United States of America) is to follow, even some work in Baja California Sur, (Mexico), but only **Deo Volente**. What follows, is just added "for completion sake".

Chapter 4 – Resident Engineer at Reid, Crowther & Partrners Limited – the start.

On the afternoon of 6 December 1977, Mr. Ed Tahmazian sent Richard James[161] to the brand-new Calgary Airport terminal to greet us there, on behalf of RCPL, as the firm was commonly known. Only six days later, on 12 December 1977, I became his colleague when I went to work at 7410 Blackfoot Trail, SE, a concrete tilt-up office building with a huge open area and some cubicles in the middle and some small private offices (for senior employees) along the outer edges. There was also a group meeting room and offices of administrative staff, all on one level, behind a berm next to the Blackfoot Trail / Glenmore Trail traffic interchange. This office was quite far from the house in the Bowness subdivision (NW) that we had rented on the day of our arrival, through Joe Boone, previously mentioned, who now was a realtor. So I needed to get to work with the used 1974 AMC Hornet Station Wagon which we had bought the day after our arrival. Through new acquaintances, Lydia was able to sort out the Christian School enrolment of Theo, Plonia and Sara (for kindergarten). Everything was new and strange, but not as much as I had expected; at work, it was a design environment, with layout tables where the detail design was just starting for the work on Deerfoot Trail, starting at 17 Avenue SE and ending at Heritage Drive SE.

But they were not actually ready for my participation. For the last two weeks of the year, I was put in a room with an outside window, where I was to design the utilities for a city-owned parcel of land that would be developed as an Industrial Subdivision. My supervisor, Mr. Avtar Gahunia, assumed that I was completely knowledgeable with City of Calgary design standards (also recently metricized) and I therefore endured a crash course. Was it more than two weeks? Not really: I worked about one week and on that Friday evening, there was a huge Christmas Party, at the Glencoe Club off Elbow Drive. I worked another week, and I got a week off (as the office closed between Christmas and New Year's). That concluded my 12th year in the engineering profession. So we went to Totem Lumber, buying all kinds of materials and tools, to make beds for all of us: Four identical single beds and a large Queen size bed.



162

In this building I worked for 21 months, and then joined another firm called Underwood McLellan & Associates Ltd., (UMA), but for that, dear reader, I would need to refer you to "Part 3" of these Memoirs.

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[161] He had come from Great Britain, and left RCPL fairly soon for the City of Calgary Transportation Department. From there, he joined the MoTH in Victoria, B.C., where I phoned him once in 1981 about an issue in Sparwood, and met him later that decade, (first when attending a WACHO conference and later when Lydia and I were at a Heavy Vehicles Weights and Dimensions Committee in BC's capital). I also shook hands with him when I worked for Chatwin Engineering in Nanaimo (on contract for Crippen Consultants, during an Open House for the Nanaimo Bypass project. I suggested that Nanaimo needed a "double bypass". He then started a consulting firm, specializing in traffic engineering.

[162] Recent GoogleMaps imaging of 7410 Blackfoot Trail SE; 1977 building in **red**, 1978 extension in **green**.