

A Technical Response to the Report
“The Future of Island Line – Options Report”

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1. Executive Summary

This Report should be read in conjunction with Chris Garnett's Report "The Future of Island Line – Options Report". I have set out to discuss the issues raised in the Garnett Report mainly from an engineering and technical point of view.

My reports contains a detailed analysis of the various technical claims made the supporters of conversion of Island Line to a tramway and casts significant doubts as to the cost benefits claimed for the conversion of the existing railway into a tramway and the use of tram vehicles. I have also questioned the safety and legal aspects of the proposed method of operation of this tramway.

I have also sought to address a number of myths and rumours surrounding some of the technical issues relating to Island Line. Unfortunately some of these have found their way into Christopher Garnett's report and could be considered to be affecting its conclusions.

The last part of my report describes a possible alternative to a tramway which should cost less to implement and reduce day-to-day operational costs whilst securing the operation of Island Line within the National Rail Network.

2. Introduction

This document has been produced as a considered technical response to the statements and proposals put forward in the report "The Future of Island Line – Options Report" prepared by Christopher Garnett for the Isle of Wight Council in January 2016 [the Garnett Report].

As the author of this Report, I am a practicing railway engineer, with over forty years of experience mainly in traction and rolling stock engineering. For a time during my career I was responsible for the rolling stock and power supplies on what is now Island Line and I was one of the Project Engineers responsible for the conversion the 1938 Tube Stock to the Class 483 Units which currently operate Island Line. Therefore I have a wealth of knowledge regarding some of the technical issues which face Island Line.

This report is in two parts the first section addresses some of the technical aspects of issues raised in the Garnett Report and tries to dispel some of the myths surrounding Island Line, its engineering and operation. The second part describes a possible alternative solution which would make Island Line relatively future proof.

3. Part A - Review of the Technical Aspects of the Garnett Report

In this section I have commented on various technical issues which are raised in the Garnett Report. These comments are based on my experience of Island Line and information specifically sourced to support them. Generally, I will not comment on commercial or business matters unless they relate to engineering aspects, as these are generally outside my area of expertise. This section is divided up using corresponding headings and paragraph identifications to those used in the Garnett Report and should be read in conjunction with that Report. Where I have no comments to make the relevant section is ignored.

1. Executive Summary

1. I would not disagree with the fact that investment is now required in both rolling stock and track. However, do not get fixated on the fact that because the stock was built in 1938 it is necessarily well past its "sell by date". Rolling stock built at that time was designed to be fully repairable with effectively an "infinite" life, providing that it was effectively maintained and overhauled on a regular basis.

In the early 1990s when the 1938 Tube Stock was prepared for service on the Island, it was effectively rebuilt to almost new standards in quality terms, as the Island vehicles were expected to be required to last for in excess of thirty years, assuming effective maintenance. The original intention, when the stock was delivered, was that every ten years or so the vehicles would be returned to the mainland to a thorough body overhaul including corrosion repairs, interior refresh and exterior repaint. Ryde Depot would only be responsible for routine maintenance and mechanical repair/overhaul by component change. This enabled some reductions in staff and facilities at the Depot to assist with funding the necessary significant investment in the Depot's infrastructure to make it fit to maintain the Class 483 units in the 1990s. Prior to this the Depot was very much stuck in the 1960s with much manually operated equipment (jacks etc.) and little in the way of facilities etc. However the scope of work covered by the depot then was larger than it is nowadays and it had the skills and man power to undertake significant body repairs, rewiring, brake equipment overhauls, trimming etc. None of these tasks can now be undertaken on a routine basis at the Depot, due to lack of competent staff and equipment. It was the intention at the time the Class 483 vehicles were delivered, that Ryde Depot would not be required to undertake this type of work and it would be done by specialist on the mainland. It is unfortunate that this original plan was not carried out post privatisation, as this is one of the principle reasons why the vehicles have the appearance that they do today.

With regard to the track, this has been a source of general concern certainly all of my "railway life" and has to date never been adequately addressed. The cause as I understand it goes right back to when the lines were constructed in 1864.

For those not in the know, a railway track of the type used on Island line sits in "Ballast" which is supposed to restrain the track from longitudinal movement (reaction to train acceleration and braking), lateral movement (reaction to forces from moving trains on curves) and finally vertically (due to weight and acceleration forces from passing trains). Under the sleepers is a layer of "ballast" (usually 4-6 inches thick). This layer sits on a foundation of crushed and compacted chalk or similar material (called the formation). When the original railway between Ryde and Shanklin was built the owners were financially challenged and the contractor had to work to a very tight budget. Therefore the line was constructed to a minimal specification fit for the required purpose at the time. This effectively meant that they would be using vehicles with a maximum axle weight in the order of 10 tons with an un-sprung mass probably not exceeding two tons (a typical small steam locomotive of the 1860s). These figures increased in the late 1920s when the Southern Railway introduced heavier locomotives with a maximum axle weight of 15 tons¹. The un-sprung mass remained about the same as before. Significant work to track and structures was done to the route at the time to accommodate this increase in axle weight.

¹ Based on data for an O2 Class locomotive.

The “ballast” used was shingle, originally it was dredged from Bembridge Harbour, but this was later not found adequate for the heavier locos, so a change was made to quarried gravel from St. Georges Down. The ability of shingle to effectively act as a restraint can be witnessed by anyone walking in a shingle beach (poor restraint). Until the 1960s manpower was relatively cheap and therefore significant numbers of track maintenance staff were available to manually maintain the track line and level on a frequent basis. Also the suspension of former mainline vehicles is relatively forgiving of minor track misalignments, therefore prior to 1967 there were no significant issues with the track that could not be addressed by routine maintenance and occasional renewal.

In 1967 following electrification the first underground stock (Class 485) was introduced. This has a maximum axle weight of just over 10 tons, however the un-sprung weight was now about 3 ½ tons due to its axle mounted motors². Initially there were no significant issues with vehicle ride quality as the vehicles were newly overhauled and the suspension fairly basic. However after a few years the track staff noticed that issues were appearing at the rail joints which were being “hammered” and becoming dipped. It was established that this was due to the significant increase in un-sprung weight passing over the joints and a general increase in average speed due to the more rapid acceleration of the electric trains. Due to tight budgets and lack of manpower, little was done to address the issue beyond what was necessary to keep the track safe.

At around this time they started to introduce second-hand rails as a means of reducing the track maintenance budget.

In the 1990s the Class 483 vehicles were introduced to the Island and these were originally designed to give a very good ride on well-maintained track³. During test running on the mainland the vehicles showed no ride quality issues and comments were made by senior officers that the ride was as good as comparable more modern vehicles. However as soon as the vehicles arrived on the Island ride quality issues emerged and very quickly became an issue which led to delays in delivery of some of the vehicles whilst the cause was investigated and remedies identified. The BR track and suspension experts from the Railway Technical Centre at Derby quickly found that the issues were due to poor lateral and vertical alignment of the running surface of the rails. It was established that this was due to the extensive use of second hand rail causing frequent and rapid lateral displacement of the wheels leading to a phenomena called “cyclic side wear”. This effect causes the wheels to effectively zigzag along the track rather than roll in a straight line. This side to side movement of the wheels was then being amplified by the light reactive suspension of the vehicles leading to a very uncomfortable ride.

The poor vertical alignment was due to the formation failure caused by poor rail joint maintenance over a protracted period. With jointed track there is a slight gap between the ends of each rail (for expansion purposes) and this causes a discontinuity in the running surface of the rails (the narrow contact strip between the wheel and the rail usually about 5-10mm wide with good rail and wheel profiles). When the wheel reaches the end of a rail it will drop slightly into the gap before rising onto the next rail. This causes the click noise and the slight vertical judder that is experienced when travelling on rail vehicles over

² Data from author’s contemporary notes.

³ At the time of delivery to the Island, LUL staff considered the 1938 tube stock to be some of the best riding vehicles they had.

jointed track. However the rise and fall of a wheel at a joint produces a hammering action as it hits the end of the next rail. The force of this hammering increases with the un-sprung weight and the speed of the wheel. These forces are transmitted downwards into the formation, which if inadequate will break-up and fail. If the problems are not rectified it will eventually lead to the formation being unable to adequately support the bottom ballast, which is in turn supporting the sleepers and then the rails. Concerns were also raised about the ability of the gravel ballast to provide adequate support to the track in general, especially with a failing formation.

Network South East decided to tackle the issue on two fronts, we were to look at ways in which the suspension could be made more forgiving of track irregularities, and the track engineers would look at ways in which the alignment of the rails could be improved. On the stock the bogies were modified to allow greater lateral movement and this was then controlled by large rubber springs. To try and reduce the vehicle bounce hydraulic dampers (shock absorbers) were fitted to the bogies. The track engineers meanwhile started a programme of enhanced joint maintenance and also removing alternate joints by welding two rails together. Granite ballast would also be used in place of the gravel to support the joints. Once the rail ends were better aligned they brought over a rail grinding machine to cut a new profile on the head of the rail to allow a straighter running surface. Unfortunately no attention was given to the to the damaged formation, as this would require extensive work to be effective, and the use of granite ballast was considered to be an adequate "fix" at the time. These elements, at the time, whilst they improved the ride significantly, they were not considered the final answer to the problem. In the later days of NSE we did investigate fitting more modern bogies to the vehicles and considerable investigation, computer simulation and design work was undertaken by "the experts" at the Railway Technical Centre in Derby. However, whatever potentially suitable design of newer bogie was tried on the simulation, the ride was always worse than the existing bogies with their modified suspension. In the end it was decided that the vehicle suspension was a good as it was reasonably possible to get for the nature of the track over which they were operating. What has happened since privatisation is that the experienced track engineers have retired or left the industry and most of the original documentation, reports, studies etc. lost. So with the advent of contractor style maintenance there is no knowledge or experience in local issues and their significance. This has allowed the track's line and level to deteriorate due to there being a lack in investment in the necessary enhanced maintenance required. As with most loss making lines the passenger's influence is minimal when it comes to spending money. Therefore without the operator being forced to improve the ride quality by the relevant government authority, it makes financial sense for them only to undertake work to maintain a safe railway, rather than spending significant additional money (adding to their losses) to have a comfortable railway. This matter could have been addressed by the relevant franchising authority at any time since privatisation, but it has always been ignored.

With regard to Ryde Pier the superstructure it was last rebuilt in 1963-6 when the entire steel superstructure (above the pile caps) was renewed with the exception of the platform section in Platform 1 at Ryde Pier Head. Since this time minimal maintenance has been undertaken. Some track and conductor rail was replaced about 5 years ago. Also some work was undertaken at Ryde Esplanade a few years ago when the former down platform section

that was on the pier structure was removed (the section on land was retained). I also recall that about 20 years ago the steel work in Platform 1 at the Pier Head was repaired and painted and other general repairs and painting of the rest of the structure was carried out at that time.

Given that the pier superstructure is now fifty years old it would generally be considered as life expired. However its duty these days is significantly less onerous than that for which it was designed, so this may have had the effect of increasing its life. The current pier structure was designed to support steam trains. The Class 483 vehicles which now operate on the pier are significantly lighter in overall weight than their older equivalents.

There is no mention of Ryde Tunnel in this section of the Garnett Report. This may be because there should be no significant issues with it currently. Historically it has never given much of a problem apart from occasional flooding which does not appear to have caused any lasting harm to the structure. The only section which could have been a potential source of problems (i.e. the metal supported section under the end of Dover Street) was totally renewed a few years ago to avoid placing weight restrictions on roads in the area.

2. Whilst I accept that replacement of the existing underground trains (Class 483) by more underground trains will not significantly reduce costs. Other than accounting for the cost of conversion and refurbishment work, I fail to see how they would increase costs of Island Lines day to day operation. In the Garnett Report he says this will be due to the "heavy rail standard of investment that is required". Certainly in the time of my involvement in Island Line it has never been maintained to mainline standards, in fact the District Engineer in the 1990s used to refer to it as his "40mph siding". With regard to the difference between "heavy rail", "Island Line" and "light rail/tramway" track maintenance standards there is a myth perpetuated mainly by tramway enthusiasts, that Island Line is maintained to "heavy rail" standards and therefore excessively expensive. They also suggest that tram track is cheaper to maintain. The fact is that if Island Line track was maintained to "heavy rail" (i.e. mainline) standards then there would be no ride quality issue and the passengers would experience similar ride quality to any mainland train. The truth is that Island Line set their own standards for track maintenance commensurate with what they can afford and the requirements for a safe ride. Therefore, if the track budget were to be further reduced then the ride quality would further deteriorate, assuming that tram tracks and railway tracks are of a similar construction, which they generally are, except for street running sections of tramway. So to me the argument that a tramway would be cheaper to maintain does not stand close scrutiny. (Also see paragraph 3 below).

In the Garnett Report he mentions that no potential replacement underground vehicles will be available until 2027. This presumably relates to the replacement of the existing Bakerloo Stock by the new "Tube Train for London". This stock was built in 1972 and is of similar size to the existing Class 483 vehicles used on Island Line (see Table 1). Incidentally a bogie design very similar to that used by the 1972 Tube Stock was one of those used in the vehicle ride simulations done in the early 1990s. The simulation suggested that the ride quality given by these bogies would be significantly worse than that of the modified Class 483 bogies, unless significant modifications to the suspension were to be undertaken.

To utilise the 1972 Tube Stock on the Island would require a similar scope of modifications to that given to the 1938 Tube Stock in the 1990s to create the Class 483 units. As the

Garnett Report says this would not be cheap, but if the specification was to be structured correctly and the budget sufficiently large, then it may be possible to create a vehicle with an expected technical life of 30 years or so.

The current Piccadilly Line stock (1973 Tube Stock) is presumably what is being referred to in the Garnett Report when he says “Any more modern LUL stock would be longer..”. However this is not actually correct, as some builds subsequent to 1973 reverted back to the shorter length similar to the 1938 and 1972 tube stocks (e.g. 1992 Tube stock). Table 1 shows comparative dimensions for some of the rolling stock discussed in this report.

In regard to the last part of the last sentence in this paragraph of the Report it states “.. too mechanically complicated to run on the current line.” I fail to understand what is meant by this, as all the Tube Stock discussed in either report is mechanically similar to the existing Class 483 vehicles. The statement can’t be alluding to vehicle length as this was mentioned specifically earlier in the same sentence. It may be alluding to more complex and advanced electrical traction systems used by the 1992 Tube Stock, but the 1972 and 1973 stock has traction equipment which is just a more modern and up-rated version of that fitted to the Class 483 stock. The 1992 Tube Stock has electronic traction control, but this would be straight forward to train in for the existing staff, as has been done in many rolling stock depots throughout the country.

Table 1 Comparative Dimensions of Rolling Stock

Stock Type	Vehicle Length	Centre Height	Width, extreme	Cant Rail Height
LBSCR Steam	16460	3594	2438	3169
SECR Steam	16480	3581	2547	3200
Class 485	15675	2896	2610	2248
Class 483	15945	2896	2599	2299
1972 TS	16090	2875	2642	Note 1
1973 TS	17473	2888	2629	Note 1
1992 TS	16256	2870	2616	Note 1
BR 508	19812	3618	2820	3080
BR 455	19842	3774	2820	3137
T69 Tram	24360 (2)	3700 (4)	2480	2400 (3)

All dimensions have been converted to metric (mm).

Note 1: Dimension not currently known, believed to be similar to Class 483.

Note 2: Unit is made in in two articulated sections approx. 12180 long.

Note 3: Actual dimension not currently known, estimated from pictures.

Note 4: Does not include clearance required for overhead line equipment.

- As an alternative approach to the replacement of the existing Tube Stock by more Tube Stock, the Garnett Report recommends using a tram system as it will have much cheaper operating costs. However, I fail to agree that this would necessarily be so. Especially as the tramway will require track maintenance standards significantly higher than that necessary for a railway operating at the same speed. This is based on a statement made later in the Garnett Report⁴ where it is reported that the ORR say that the maximum permitted track twist is significantly lower for a tramway than for a railway. Track twist is one of the most

⁴ Garnett Report p11 para. 8.2.1.

complex and therefore more expensive elements of track geometry to maintain. Failure to maintain it within required limits can result in the derailment of a vehicle.

I also fail to see how an overhead catenary system is cheaper to maintain than conductor rail. Island Line's conductor rail has received almost no maintenance since 1967 apart from some localised replacement on the pier due to salt water corrosion. An overhead system will require occasional attention both to masts and wire tension etc. Also it is less robust in the event of vandalism or high winds. It is common knowledge that conductor rail if not affectively treated, is susceptible to heavy frost, snow and hail. 750v DC overhead systems also suffer from snow and hail (icing) and there is no effective way of de-icing the wire like there is for the conductor rail. Overhead systems can also suffer from damage in high winds on exposed stretches. It is also necessary to ensure that the track remains within a reasonably tightly tolerance position with regard to the overhead conductor wire. Third rail systems do not require this, as the rail is effectively attached to the track and therefore moves with it.

There are a few second hand trams available, but one has to ask why they have been replaced by their previous operator. In the case of the T69 Centro Tram mentioned elsewhere in the Garnett Report, it is believed to be due partly to unreliability, lack of spare parts and they are considered as life expired⁵. Therefore it is likely that an extensive (and expensive) scope of work would be necessary to make redundant tram vehicles fit to operate on the Island for a period of 15-20 years (given that the current stock has now been here over 25 years). Lastly getting a T69 tram plus overhead wire through Ryde Tunnel and under some bridges will be a significant challenge. The T69 being almost as high as a "standard" BR carriage. See Table 1 and Appendix 1.

4. If it were done, single line operation and "line of sight" operation would undoubtedly be cheaper than the existing system. Currently the Line has elements of double track and minimal signalling sufficient to keep the trains segregated and from colliding on the single line sections.

Whilst reducing the track to a single line with one passing place would be straight forward in engineering terms, I would suspect that the tramways operational performance would be very susceptible to late running ferries and other delays. This is because there would be no facility for delay recovery, as the trams will only have one place to pass, thereby causing the late running tram/train to similarly delay the other service, given that generally a tram's maximum speed is about 40 mph compared with the Class 483's capability of 60mph. Acceleration and braking rates are very similar between the two types of stock, therefore there is little scope for recovery. Turn-round times at the Pier Head and Shanklin are currently minimal and would be unlikely to significantly change assuming that a one hour cycle time is retained (this being the most cost effective for rolling stock utilisation).

"Line of Site" operation means there are no signals as the tram driver can see if the line ahead is obstructed. In the case of single line operation that means that he must be able to see to the far end of the single line section so as to make sure no tram is coming in the other direction. Quite how this would work in the case of Island Line I don't know, presumably it would require the tram driver to see from Ryde Pier Head to Brading and from Shanklin to Brading! I would doubt that the Office of Rail and Road, as the UK Safety Authority for rail

⁵ Based on various contemporary press reports available on the internet.

(and trams) would be very happy with this arrangement, as the potential for head-on collisions would be quite high. Current safety legislation⁶ would effectively prohibit operation without some form of signalling and its associated train protection system. Under the regulations Island Line would still be a Railway and would not comply with the requirements for it to be legally classified as a Tramway⁷. A Train Protection System (such as train stops or TPWS) is a system which is operated to prevent a train passing a signal at danger and gaining unauthorised access to a section of track, which could potentially lead to a collision between two trains. If it was desired to abolish trackside signalling then other modern radio based cab-signalling systems are available (such as ERTMS) could be provided. In the last sentence of this piece of the Garnett Report he mentions a 15 minute service frequency. This would require a number of passing places such as Ryde Tunnel, Mile Post 4 (between Brading and Smallbrook) and the retention of the passing loop at Sandown. This would result in a more complex railway/tramway than currently exists.

5. Whilst I consider the business case to extend the IWSR to Ryde St.Johns Road extremely flawed. I would suggest that the second track in the Ryde St.Johns Road area would be necessary if it was desired to operate a 15 minute frequency service as mentioned in the Report. However the abolition of a stop at Smallbrook would assist in easing the current tight section timing between Smallbrook Junction (not station) and Sandown. I fail to see how Network Rail could legally give away an asset (land and track) to the IWSR, but then I am not a politician!
I also would hope that an Island Line franchise would not be awarded to an organisation that did not have sufficient technical knowledge and ability to undertake the supervision of any significant changes to the infrastructure. Network Rail, if they continue as land and asset owner will also have a significant say in the specification and design of any passing loop. If the railway is converted to a tramway, then IWSR do not have any experience in tramway works. Therefore I believe that whilst it may be good politics for the IWSR to say they will help, providing they benefit from the deal, I believe that in reality they will be of little assistance and would be unlikely to benefit from any deal either.
6. As a user of Island Line it makes perfect sense to me to retain Island Line within the national rail network with through ticketing, revenue allocation, timetabling, information etc. However the cost of these facilities to Island Line when it was an independent franchise was significant, as they were required to make a contribution to the overall (national) costs of supplying these benefits. To a large operator these would not necessarily be so significant, but to an independent Island Line one would have to question the commercial viability of these benefits. If Island Line continued to be part of a much larger franchise, as now, then these benefits are available at no additional cost, as they are part of SWT's overheads, being just 8 of the 184 stations where they are the Facility Operator.
7. I would agree with the sentiment of the statement in the Garnett Report. Bidding for and letting rail franchises is not a cheap past-time. For a franchise the size of Island Line each

⁶ Railway Safety Regulations 1999 Regulation 3.

⁷ A "Tramway" means a system of transport used wholly or mainly for the carriage of passengers and employing parallel rails which – a) provide support and guidance for vehicles carried on flanged wheels; b) are laid wholly or mainly along a street or in other places to which the public have access. (RSR 1999 Schedule).

bidder would expect to part with possibly £50-100k just in undertaking due diligence assessments and preparing a bid document. The DfT could be expected to part with similar sums in assessing the bids, undertaking final negotiations and preparing the final contract documentation. The DfT have many civil servants occupied on rail franchising full time. If the IWC were to undertake this aspect then they would be almost totally reliant on consultants and could expect to see the £100k figure at least double.

8. I agree with Christopher Garnett that if Island Line were to become a “tramway” then there is no precedence for it remaining within the existing SWT franchise, or being part of the National Rail Network. I would suspect that government would require it to be treated in a similar way to other railways that have been converted to tramways i.e. removed from the national railway with associated loss of network benefits (discussed in 6 above), removed from the scope of passenger rail franchising by the DfT and transferred to local authority control. This is what has happened where railway routes have been converted to tramways as in Manchester, Birmingham and London.
9. As it is said in the Garnett Report, if Island Line were to remain as “Heavy Rail” then there would unlikely ever to be any scope for expansion. It may still be possibly extend to Ventnor along the original rail route, if a suitable business case could be established. I doubt that there is any realistic chance of any extension if the railway became a tramway either, given that any extension would have to be financially justifiable and that UK Tram are currently quoting the average cost of building a tram track as between £12.2m and £26m per kilometre⁸.

2. Introduction

I have no comment on this section.

3. Current Operation and Franchise

When Island Line was initially privatised and the original lease terms for the 25 year lease were drawn up it was very similar to a typical landlord-tenant arrangement used for domestic and industrial property. Generally in this type of arrangement, the tenant (Island Line) is responsible for maintaining the asset value (i.e. maintenance) and the landlord (Railtrack then Network Rail) are responsible for asset renewal and major works. There were a couple of exceptions to this arrangement, which from memory were Ryde Pier and Tunnel which were solely the responsibility of then Railtrack, now Network Rail.

The process described in the Garnett Report⁹ for undertaking infrastructure work is, I suspect, that for major work, not routine day-to-day maintenance. This would then make sense as with any major infrastructure work there are elements of maintenance and renewal, also there may be an element of enhancement. The maintenance cost element would be a direct charge to Island Line, the renewal element a direct charge on Network Rail, and any enhancement could by negotiation be charged to the beneficiary (usually Island Line). This enhancement charge would be paid for by Network Rail and then costs recovered from Island Line by enhanced lease payments.

⁸ UK Tram are a “trade body” to support the development of Tramways and Light Rail Systems within the UK. This figure was obtained from their website.

⁹ Page 4 paragraph 3.1

The processes described above were those originally envisaged when Island Line was privatised and I was involved in supporting one of the bids for the original Franchise. At various meetings this lease arrangement was discussed at length with both Railtrack and Strategic Rail Authority representatives, as it did then (as it still does) form one of the major areas of Island Line operational costs. However in the last twenty years various details of the lease may have been revised by mutual agreement.

4. Local Transport and Planning Policy

No comments on this section.

5. Issues

I am not surprised that neither Network Rail or SWT wish to comment on the current state of the infrastructure as this could be considered as politically and commercially sensitive information and would be subject to un-qualified interpretation and ill-informed comment. I do agree that it is imperative that a condition survey of the entire line's infrastructure is undertaken. If I were First Group this would be the most significant matter concerning Island Line, as potentially it could end up costing them several millions of pounds more than they may have bargained for in the last couple of years of the leases life, when theoretically the infrastructure will have to be returned to 1996 condition as part of the "hand back" arrangement at the end of the lease. SWT obviously are more aware of the infrastructure condition. It would be interesting to know if First Group have been supplied with a copy of the NR/SWT infrastructure report as part of their due diligence assessment of the SW Franchise.

Current Service

No comment on this section.

Condition of Track

5.5 No comments.

5.6 (marked a 5.5 in original Report). The reason for the 450mm dimension is a technical one, as this effectively marks the boundary between the ballast and the formation (as discussed earlier in Section 1 of my report). This removes the responsibility for embankments, bridges and the formation from Island Line.

If there is any debate on this contractual boundary of responsibility then it probably relates to formation failure which is damage caused by train operation (mostly historic), but the root cause is historic inappropriate track joint maintenance. The rectification of this issue which was applied before privatisation is discussed earlier in this report, and I suspect that a similar method is still used today. This process would cross the responsibility boundary between Island Line and Network Rail hence the debate.

Island Line have a depot at Ryde St.Johns Road station for the staff and light materials used for infrastructure maintenance. Since privatisation the infrastructure maintenance staff have been employed by contractors (such as Colas) who had long term maintenance contracts for the track with Island Line.

Rolling Stock

5.7 There are a number of reasons why the current rolling stock does not meet the requirements of the Rail Vehicle Accessibility (Non-Interoperable Rail Systems) Regulations 2010 (RVAR 2010). With effect from 23/3/15 the DfT no longer published guidance on the application of these regulations to rail vehicles. Full compliance with these regulations is required by 1st January 2020. Note that stations are also covered by these regulations and have the same compliance date.

The following are the main areas of the trains which will require modification to achieve compliance (based on previous guidance):

1. Body side doors used by the public will need to be painted in a contrasting colour to rest of the vehicle side.
2. Doors will require fitting with audible warning devices that sound when the doors are released for opening and are closing.
3. Internal passenger door controls will require to be changed for a compliant type of button.
4. Doors may require to be modified to have auto-reopen facility. Given that this will be technically difficult to fit to the type of door fitted to Class 483 vehicles and that the trains are conductor operated and relatively short it may be possible to gain derogation against this aspect of the Regulations.
5. The access steps to the vehicle require specific illumination.
6. Doorways will require fitting with handrails.
7. Internal handrails will require to be painted a contrasting colour and be fitted with a slip resistant surface.
8. A fully compliant Passenger Information System will be require to be fitted which makes audio and visual announcements.
9. A designated wheel chair space in each vehicle requires identification and a “call-of aid” facility installed.

Works of a similar nature are currently being undertaken on older rail vehicles through-out the country. However the Isle of Wight stock does not currently feature in any of the implementation plans. Presumably this is because it is expected to be withdrawn from service before the compliance date.

RVAR compliance work to address the issues listed above could be easily included in any vehicle refurbishment/body overhaul scope, when it could be undertaken at minimum cost.

5.8 With regard to staff passing between trains, a number of modifications were undertaken when the vehicles were refurbished at Eastleigh in the early 1990s to make it safe for staff to pass between the vehicles whilst they were moving. The practice was accepted as safe by Safety Authority (Her Majesties Railway Inspectorate) and staff representatives at the time. The relevant basic safety regulations have not changed since this time, therefore there needs to be an understanding as to what the real issue is, before a means of resolution can be found.

Signalling

5.9 The signalling is very basic and a mixture of mechanical and colour light signals all controlled from one signal box located at Ryde St.Johns Road. This signalling is the minimum that the

regulatory authorities (currently the ORR) will permit for the type of operation that Island Line runs. Some signals are fitted with Train Stops to meet the requirements of the Railway Safety Regulations 1999.

It is difficult to see how the Office of Rail and Road as the Safety Authority for both railways and tramways, could relax these requirements any further given that the operation does not fundamentally change (you would still be operating rail mounted vehicles as speeds of up to 45 mph on a single track railway/tramway).

Any reduction in signalling or train protection would almost certainly require a reduction in maximum speed from the current 40 mph to 25 mph to maintain compliance with the various safety regulations¹⁰. Service operation at 25 mph would require a doubling in the service train fleet from two trains to four trains and the installation of additional passing loops. It would probably also be a significant deterrent to potential passengers due to the significant increase in journey times south of Ryde St.Johns Road.

Power Supply

5.10 As someone who was responsible for the Power Supply system in the Island in the late 1980s, I am at a loss to understand some of the statements made in the Garnett Report relating to this subject. When the system was installed it was designed to support a 12 minute frequency service of seven coach trains. Since this time there have been no changes to the system which affect the supply to the conductor rail. The only change which has affected the track supply voltage is the removal of the former Down Line track between Brading and Sandown. To mitigate this, the original conductor rail from the removed track was left in position to assist with the running rail return resistance in this section. When the Class 483 units were introduced we undertook track voltage tests as Shanklin with six and eight car formations to ensure that the power supply was capable of supporting normal and emergency operations. It was only with 8 car operation that voltages similar to those quoted in the Garnett Report were measured and then only when all eight vehicles were trying to drawing maximum power. From memory, I don't think that a Class 483 vehicle will operate with a track voltage as low as 350v as quoted in the Garnett Report. Its low voltage protection should prevent the vehicle from operating at this sort of voltage. Also 350v is way below the minimum voltage Network Rail are required to maintain in accordance with Railway Group Standards. If track voltage is as low as 350v under normal operating conditions, then there is obviously a fault which must be urgently rectified by NR, as they are responsible for the power supply system and its equipment, not Island Line, as a track voltage this low has safety implications. The sub-stations are largely as built, with only routine maintenance being undertaken on the power equipment since 1967. Some of the supervisory/control equipment has been renewed over the years due to changes in the method by which the sub-stations are controlled by the mainland based Network Rail electrification control rooms. The HV (33kV) supplies to the sub-stations and the associated switch gear are owned and maintained by Scottish and Southern Electricity, as the local electricity distribution authority. It is my understanding that the recent power supply system failure was due to a supervisory/control issue, not the actual power side of the system.

¹⁰ By operating at maximum speed of 25mph a Railway is exempt from the requirements of the Railway Safety Regulations 1999, specifically Regulation 3 requiring the use of a Train Protection System.

Ryde Pier

5.11 (identified as 5.10 in Report) There were some works undertaken on the pier about three to five years ago. From observation this involved replacing rails and sleepers on No.1 Track and the shortening of the No.2 Track platform at Ryde Esplanade by removing the section which was actually on the pier structure, leaving the section positioned on land.

The pier superstructure consists of a mixture of reinforced concrete and steel/iron structures. Network Rail only own the section of pier on which the railway operates and this effectively starts at the glass screen segregating the Wightlink waiting area from the station platforms, it also includes both station platforms. The supporting structure for these areas is built from reinforced concrete. It is separate from the structure which supports the track on which the trains operate, which is built from steel on iron piles.

The condition of the concrete part of the pier is unknown, although it is noted that Wight Link have undertaken some repairs recently on their section which is of a similar age. The steel superstructure of the "railway" pier was totally replaced between 1963 and 1966 with the exception of what is now No.1 platform track. This last section was replaced some years later, as it was newer than the rest of the original superstructure.

6. Consultation

It is noted that there does not appear to have been any formal contact with the current operator of Island Line or Network Rail. This may be due to the sensitivity of the franchise process or the possible contentious nature of the Garnett Report which could make uncomfortable reading for either party. However it would have been helpful to the process and the accuracy of the Report, if both SWT and NR had agreed to participate

7. Options for the Future

7.1 When analysing costings for Island Line one has to consider exactly what is being quoted and more importantly what is not being quoted.

Most publically quoted revenue figures are direct revenue and attributable revenue. In addition to these there is also local revenue.

Direct Revenue is a portion of any fare paid on the Island which relates to the portion of the local journey on Island Line. Note that unless the whole journey is on Island Line, Island Line will only receive a proportion of this money for the Island Line part of the journey, this will be significantly less than the equivalent advertised fare for the same Island Line only journey. This is due to the method of proportioning the total fare to the different operators involved in providing the whole journey.

Attributable Revenue relates to tickets purchased at stations on the mainland or through agents etc. where Island Line provides part of journey. Island Line receive a portion of these fares, but again the proportion received is less than the advertised fare for the same Island Line only journey.

The difference between advertised local fare and the money Island Line actually receive when the same journey is part of a through trip, probably is the cause of the apparent discrepancy in reported revenue that various parties are using as a reason to question Island Line revenue against passenger numbers. Both figures are calculated nationally by a

nationally appointed contractor who manages the UK Rail ticketing system. The revenue from each ticket is then attributed to each operator in accordance with nationally agreed procedures overseen by the ORR and the DfT. It would not be easy for Island Line or SWT to adjust these figures to suit their own agenda. This is presumably the £1m revenue figure quoted in the Garnett Report in paragraph 7.2, which does not sound unreasonable given the current passenger figures and taking into account the various factors discussed above.

- 7.2 When Island Line costs are quoted they are usually direct costs i.e. those directly attributable to Island Line alone. Therefore they include cost of staff based on the Island and the cost of materials to run the railway and maintain stations, track etc. where they are not purchased as part of a larger contract covering other parts of SWT. This is presumably the £4.5m figure quoted in the Garnett Report. However, it is not known what, if any, of this £4.5m figure relates to support services, administration, management and technical support that Island Line benefits from as part of SWT. My guess is that looking at some of the figures estimated by Akins in their report¹¹ for the IW Council, there are not many of these overhead costs included. The £4.5m figure does presumably include the £2.093m leasing cost¹² from Network Rail.

These overhead costs are not significant either to Island Line or SWT whilst Island Line remains an integral part of the SW Franchise. If it were to become a stand-alone business then the additional cost of these services would be significant adding several million pounds to the operational cost of the railway. When Island Line did operate as a stand-alone business (1996-2007) it was rumoured within the industry that Island Line was costing between £5m and £8m per year to run, although no meaningful figures were ever published. One also has to remember that at this time (1996-2007) the business operated under the watchful eye of Stagecoach, who are not exactly known for wasting their money. So one must consider that an independent Island Line, was a reasonably lean operation and not wasting money on unnecessary expenditure. Costs of this sort of magnitude were probably the main driver for the inclusion of Island Line within a larger franchise so as to enable these overhead costs to be absorbed by the larger franchise and thereby reduce the total cost of operation.

It is noted that the projected expenditure budget for Island Line for 2015/16 is £5.75m of which nearly half is paid to Network Rail under the lease arrangement¹³.

- 7.3 Transferring Island Line to the IWC would have legal issues surrounding the council's competency to operate a railway. They would have to employ managers and engineers with the relevant competencies to run the railway and this would add to the overall costs. This requirement would be the same regardless of whether it was a railway or a tramway¹⁴. Whilst a £5m annual loss to the IWC is not big in their overall budget of (£325.5m)¹⁵, questions would be asked by residents as the Council currently struggle to supply mandatory services and discretionary services are slashed.

¹¹ Island Line – Technical Advisory, Atkins September 2015

¹² Letter from SWT Finance Director to David Pugh 2/2/16, published by KILF.

¹³ Letter from SWT Finance Director to David Pugh 2/2/16, published by KILF.

¹⁴ The Railway and Other Guided Transport Systems (Safety) Regulations 2006.

¹⁵ IW Council web site.

7.4 Spending decisions on Island Line for the next franchise period will be the responsibility of the franchise competition winner. Presumably Stagecoach and First Group will be undertaking condition assessments of the infrastructure to identify their liabilities as part of their due diligence process, whilst formulating their bid for the SW franchise. However in the “big scheme of things” they may have assumed that any liability relating to Island Line is inconsequential when compared with some of the other factors affecting their bid. e.g. the total cost of the replacement of Island Line trains and infrastructure would be insignificant when compared with the potential costs (loss of revenue, passenger compensation and fines) associated with getting the train service into Waterloo wrong during the remodelling planned for 2017.

With regard to the condition of the track there is no ambiguity as to who is responsible for ensuring that it is safe. That responsibility lies with Island Line as both Train Operator and Infrastructure Controller¹⁶. However when discussing vehicle ride quality (passenger ride experience) there is a significant “distance” between what is considered comfortable, what is acceptable on an occasional basis, and what is technically safe. Whilst the quality of the ride experienced on Island Line is probably nearer the minimum limits for safety than those for a comfortable ride, as discussed earlier, the work required (and hence costs) to make significant improvements in ride quality would appear to be beyond what the franchise operator is prepared to pay, especially as they are only required in law to maintain a safe railway. The existing, and probably the next franchise, is unlikely to place any obligation to make significant improvements in ride quality on Island Line. In fact given that the current lease arrangement with Network Rail is set to only last two more years, it could be reasonably assumed that any investment in track maintenance will be absolutely minimal, until the future arrangements for the infrastructure responsibility are finalised. Any investment by either Island Line or Network Rail in infrastructure or trains will also be minimal until the DfT make a decision on the long term future of Island Line. Given that this final decision is not likely to be implemented before the end of the next franchise period, it is unlikely that there will be any significant changes to the infrastructure, or the rolling stock of Island Line.

Whilst surveys are useful tools to inform decisions, in the case of railways, they can only be effectively interpreted by relevant experts, as to be of any use they will be complex, detailed and technical documents (and very expensive). Therefore the requirement and specification for any surveys should be the responsibility of Island Line, NR, ORR or DfT. Almost certainly the IWC do not possess any experts in-house with the relevant experience either to specify a survey or interpret its results.

I would suggest that most of the issues with the current Island Line infrastructure are well known about by Island Line/SWT and Network Rail and that it does not need “rocket science” to resolve them, only time and especially money.

7.5 With regard to the rolling stock on Island Line, it is the writer’s considered technical opinion that the existing rolling stock could be kept operational until the end of the next franchise period (7-10 years). However it will require some investment in the vehicles to achieve this. Given that the next franchise period could end in 2024 to 2027, then would be the time to

¹⁶ Terms with defined responsibilities under “The Railway and Other Guided Transport Systems (Safety) Regulations” 2006.

consider replacing the rolling stock with something more modern. It also gives time for decisions regarding improvement of the infrastructure to be made and implemented and some return on the investment in the existing rolling stock. If it is decided to replace the rolling stock with further tube trains because the cost of infrastructure works is too expensive, then it would be worth waiting for the 1992 tube stock from the Central and Waterloo & City Lines to be available. This is currently scheduled to be immediately after the Bakerloo Line stock according to TfL sources (c.2032¹⁷). The 1992 tube stock is not only 20 years newer than the 1972 Stock, it is much more technologically advanced. However it could well be 40 years old by the time it is refurbished for Island use, but that is better than 55 years of the 1972 stock when it becomes available.

Christopher Garnett is correct when he says that the longer Piccadilly Line stock would cause issues at Ryde Esplanade. This is due to the need to comply with legislation regarding the stepping distance between the train and the platform (for public safety). Ryde Esplanade platform is located on the outside of a very tight (in railway terms) curve of 7.57chains (153.3m). To get longer vehicles around this curve would require the track to be moved further from the platform, therefore increasing the distance between the train and the platform at the doorways. These are located at approximately 1/3 and 2/3 along the length of the carriage.

- 7.6 Forecasting potential costs for conversion of any tube train vehicles for Island Line is difficult, especially when the expense is unlikely to take place for another 10-15 years. However we can make a realistic guess at the content of the technical work required to make the vehicles suitable for operation on Island Line in two –car sets. All LUL underground trains operate on a 4 rail DC electrification system. They can be converted to operate on 3 rail systems as used by Network Rail by re-wiring and technical modifications.

The 1972 tube stock is currently technically capable of operating in a minimum of a three car formation. Which is the same as the 1938 Tube Stock was before it was converted for Island Line. Therefore the technical scope of work to convert these vehicles to two car units (similar to Class 483 units) is very similar. As with the Class 483 units the electrical equipment (compressor) will have to be removed from the centre trailer car and fitted to one of the end driving cars. This will replace one of the two auxiliary power supplies (MA sets) as a two car unit will only require one set. Other changes will be the installation of in inter-car HT jumper and the removal of the collector shoe gear from the trailing bogies together with the fitting of axle earth returns and the removal of the negative shoe gear. This work will be done in conjunction with the rewiring of the vehicles which will almost certainly be required given their age. Although these units will be over-powered for their required duty, they can be down rated to increase the life of the traction equipment as was done with the Class 483 vehicles. The traction equipment on both the 1972 and 1973 Tube Stock is very similar to the equipment used on Class 483 units, just uprated to cater for four motors in place of the two on a Class 483 vehicle.

1992 Tube Stock used on the Central and Waterloo and City Lines is basically similar, although they operate in different train lengths. Each train consist of a number of

¹⁷ There is some uncertainty as to what this date represents, as it is relating to the completion of the whole project of line up-grading, of which rolling stock provision is only a relatively small part. Therefore it is possible that the new rolling stock could be delivered earlier and hence the 1992 tube stock may be available prior to this.

permanently coupled sets of two vehicles. Two sets being coupled using automatic couplers to make a train formation of four (W&C) or eight (CL) coaches. All vehicles are powered and each train is formed to have a cab at its outer ends. At the opposite end of each two-coach set to the cab fitted vehicle, is a vehicle which is fitted with a driving position within the passenger saloon that can only be used for shunting.

To make these vehicles into units suitable for Island Line they may need to operate as two car sets in service. It would be necessary to undertake a feasibility study to determine which was cheaper, either to modify an existing driving cab fitted vehicle to replace the vehicle fitted with the shunt driving position, or to modify this vehicle to have a full cab. It would also be worth considering these costs against the costs of routine operation of four coach trains. The four car sets would then be split for maintenance purposes, as is done with this stock on the Waterloo and City Line. This would avoid very costly alterations to the train maintenance depot at Ryde which would be required if longer trains were introduced. Assuming the traction power supply is capable of meeting its original loading specification, I would not anticipate any problems with supplying sufficient power to either the 1972 or 1992 stock operating a 15 minute frequency service with four car train formations with a similar performance specification to the existing vehicles.

Both the 1972 and 1992 tube stock have maximum power ratings (acceleration and braking rates) in excess of those of the current Class 483 vehicles. This is because they are designed to run in tunnels with dry rail conditions, therefore they can accelerate and brake faster than trains operating mostly on the surface. The 1972 or 1992 tube stock vehicles will have to be significantly de-rated in acceleration and braking terms to permit safe and economic operation on the Island (as was done to the Class 483 vehicles after they left LUL). In electrical load terms, a converted 1972 tube stock will probably have a similar load to the existing Class 483 vehicles, assuming that its heating is up-rated to be similar to a Class 483. The operation of a 1992 Tube stock set should be significantly more economical, as it has electronic traction equipment which does not waste electricity in starting resistances. Also it can be configured to use regenerative braking allowing train to slow down by generating electricity which can be fed back into the national grid. This would lead to a significant reduction in traction electricity consumed and more economic operation of the trains. However significant alterations would be necessary at the sub-stations for this to work.

- 7.7 In Appendix 1 I have illustrated a diagram which shows the profile of some of the potential replacement vehicle types overlaid on some typical Island Line Structures. I have not included tube train vehicles as they all have similar profiles from 1938 Tube Stock (Class 483) to 1992 Tube Stock. The diagram has been constructed from BR structure information with some relevant vehicle profiles overlaid.

In addition to the static profile clearance, allowance has to be made for curvature (throw-over) and kinematic movement (suspension deflection and wear). These will enlarge the static profiles shown in the diagram, reducing clearances.

As Christopher Garnett says in his report the introduction of replacement tube trains is unlikely to significantly alter the finances of Island Line, although a drop in rolling stock maintenance cost should be experienced due to more modern vehicles. If 1992 tube stock is introduced with regenerative braking a significant reduction in traction electricity costs should be seen.

8. Adopting a Positive Approach

Whilst it is right that tramway conversion should be considered and the costs carefully considered. It must be done using proven costs, not hypothetical figures supplied by vested interests.

- 8.2 1. As stated in the Garnett Report, the Network Rail track standards permit too much twist for the safe operation of tram vehicles¹⁸. To reduce the permitted track twist to levels tolerated by trams would require a significantly higher standard of track maintenance than would otherwise be afforded if the track were to be restored and maintained at an acceptable level for train operation.

If as stated in the Garnett Report all the points and crossings would need replacement¹⁹, this would also add to the cost. It would also probably prohibit the operation of any of the IWSR vehicles on the tramway due to incompatibility. It is difficult to see how these additional costs would assist in reducing operating costs of a tramway.

2. If the ownership of the Island Line infrastructure remains with Network Rail, and they “take more of an interest in track maintenance” as required by the Secretary of State²⁰, then it will be up to them to decide who undertakes any work on the track and to what standards they work to. Whilst NR do not have standards for Tram track, they do have for Light Railways.

3. If the track were to be singled between Ryde St. Johns Road and Ryde Pier Head this would reduce line capacity sufficient to prevent the 15 minute interval tram service advocated in several places in the Garnett Report. Singling the track between Smallbrook Junction and Ryde St. Johns Road would remove most of the ability to recover the train punctuality in the event of an incident or late running ferry.

3A. Releasing the remaining land at Sandown may seem like a good idea, but it is an odd shape and contaminated with asbestos and heavy metals due to having been used to dump steam loco and workshop waste for many years up to the mid. 1960s. Any financial benefit from the disposal would go direct to Network Rail as the owner. Island Line would only see a minimal drop in lease charges. It would make Island Line completely dependent on the IWSR for delivery of materials. This would also include rolling stock, which may not be compatible with the IWSR’s infrastructure. In cost-benefit terms for Island Line, the author does not consider this a sensible way forward and it leaves Island Line and Network Rail seriously exposed to the whims and volunteers of the IWSR.

3B. Whilst it is accepted that there would need to be a negotiation regarding the movement of materials, no financially astute business is going to commit to moving an unspecified amount of material at their own cost, to a number of locations. If Island Line were to be converted to a tramway then it is unlikely that the IWSR possess any compatible rail vehicles with which the materials could be transported.

Apart from the use of transferring materials to and from Island Line, what benefit would an interconnection between the two railway systems be? All of the apparent benefit would appear to be for Island Line and relate to free material deliveries. It would be of no benefit to the IWSR, as their trains would be too heavy and out of gauge to operate on Island Line

¹⁸ Garnett Report P11 paragraph 8.2.1

¹⁹ Garnett Report P11 paragraph 8.2.1

²⁰ Interview with Claire Perry in IW County Press 11/9/15.

(either as the current railway or a tramway).

3C. The installation of a passing loop near Brading by the IWSR volunteers is unlikely to be acceptable from a staff competency and safety perspective by both Island Line and Network Rail. The passing loop for a 15 min (or 30 minute) interval service would have to be located a 4 Mile Post north of Brading. The ground works here will be the most significant part of the cost of the project as the site is located on a single line embankment near where Network Rail have already spent several million pounds trying to stabilise the track due to slippage, with limited success. To make the embankment fit to support twice the current weight and maintain line and level to safely support point work will require the embankment to be completely stable.

3D. It would make sense for both railways to share specialist equipment, however the likelihood of both railways requiring the same piece of specialist kit at around the same time is unlikely, especially as the scheduling of projects that would make use of such equipment has to be operationally timed for the maximum benefit at the minimum cost. To get a coincidence of two suitable projects would probably require significant compromise by one party or the other and inevitably lead to an increase in associated costs. The only real saving in sharing equipment between suitable projects would be the equivalent of a return ferry fare and other transport related costs to and from the Island (possibly in the order of £2k).

4. (Nothing in Garnett Report)

5. Second hand trams may seem like a good option, but one has to ask why have the vehicles been replaced by their current owners? A quick trawl of the internet would suggest that unreliability and obsolescence of components may be two factors in the decision a few years ago by Centro to replace the T69 Trams with new vehicles. However, Centro did spend significant sums of money on improving the vehicles. There were sixteen vehicles of this type built and if the decision is made that these are the vehicles of choice for Island Line, I would suggest that all those available are purchased with surplus vehicles being used as a source of principle spare parts as these vehicles are unique among trams and obsolete.

I have made various comments above on the potential of a 15 minute interval service and the implications on the requirement for provision of passing loops etc. I have done some work on possible scheduling of an even interval 15 minute service²¹ and it would suggest that it would be achievable with five trains and would require the following alterations to the current infrastructure:-

- a) A second platform at Shanklin
- b) The retention of the passing loop at Sandown
- c) A passing loop at 4MP (also required for a 30 min interval service).
- d) Retention of two tracks between Smallbrook and Ryde St. Johns Road (for recovery purposes)
- e) Retention of two tracks as a passing loop between Ryde St. Johns and Ryde Esplanade.

Many years ago in the early days of electrification a 15 minute interval service was operated using seven coach electric trains. Therefore the existing power supply should be capable of supporting such a service as it is unlikely that a two coach train/train would require as much power as the seven coach trains of the original electric stock. However rationalisation of track and signalling currently physically prevents such a frequency of service being operated.

6. As can be seen from Appendix 1 significant work would be required to enable a T69 Tram

²¹ See Appendix 2 of this document.

to pass through Ryde tunnel, especially as an allowance for overhead electrical equipment will have to be added to the height of the vehicle shown in the diagram. The structures shown in this diagram are as they were in about 1988 relative to the running rails.

7. Just because a different type of vehicle is being operated, it does not change the requirement for safe operation, namely vehicle separation to prevent collisions²². “Line of sight” operation is what it says i.e. the train driver can see sufficiently far enough ahead to avoid colliding with the tram in front. This system is only normally used on street operated sections of tramway where the speeds are very low (about 25mph) and where all trams are going in the same direction on that track. It would be both dangerous and an operational headache to try and impose such a system on a single line tramway with passing loops and a required line speed of 40 mph. Island Line’s signalling system has already been rationalised down to the minimum commensurate with safe, legal and effective operation. If it were desired to abolish line side signalling then there are modern in-cab signalling systems available (such as ERTMS). If Island Line were to utilise ERTMS then there may be some development funding available from Network Rail to assist with its installation on the basis of a trial installation.

8. As mentioned earlier in this document, the traction power supply should be capable of supporting further underground trains. I believe that the current track voltage is 700-720 volts. It has never been 630 volts, this is a myth perpetuated by “train spotter” books and based on the fact that the original underground trains (Class 485) operated on the LT 630v four rail system. The Island Line 3 rail system has always operated in excess of 700 volts. The current sub-stations should be capable of supporting a third rail system capable of powering up to a fifteen minute interval service. Where it may struggle would be to power an overhead system of similar length. This is because there will be an increased voltage drop in the overhead conductors, that will need to be addressed by additional large section positive cable being laid alongside the track and connected to the overhead conductor wire at regular intervals. However, the sub-stations and their transformers and switch gear are now fifty years old so may be considered as “life expired” and not worth further investment.

9. To obtain an even interval 30 minute service the location of the passing loop will be in the vicinity of 4 Mile Post which is north of Brading and just south of Rowbrough Bridge. At this location the current railway runs on a shallow single track width embankment. There is also an undertrack bridge at 3m 76ch so the ideal location for a passing loop will be south of this to avoid its rebuilding costs. Ideally a “dynamic passing loop” would be provided where the trains can pass without stopping, however these have to be fairly long to cater for the variations in precise train operation, and probably the cost of ground works would be prohibitive compared with a shorter loop and the small cost of stopping one service to allow the other to pass it. This would probably increase the journey time in one direction by about three minutes. If the loop is fitted with power operated points and proper signalling (unlike the current installation at Sandown) then there should be no reason for the other service to have to reduce speed when passing through the loop.

Economically it makes no sense to speed-up the service significantly as currently one train completes a round trip in just under one hour, therefore an hourly service requires one train, an half hourly service two and a 20 minute service three. However when four trains per hour are operated, so much time is lost in standing and waiting to pass other trains, that it is

²² See Page 9 for a detailed discussion on “Line of Sight” operation and the potential safety issues.

difficult to achieve a round trip in less than 32 minutes (plus 5 minutes turn-round) meaning that a fifth train is necessary together with an additional platform at Ryde Pier Head or Shanklin to accommodate it. Under these circumstances it may be worth investigating funding track speed up-grades to avoid the need for the additional train set and associated crews.

The stop at Smallbrook station does not make significant difference to the schedule as the lost time caused by stopping there can be often be recovered by using the enhanced performance of the Class 483 units when operating with dry rails and also by shortening station dwell times. However stopping at Smallbrook would be more of a burden, if the 4 Mile Post passing loop were to be installed.

If the IWSR took-over the former Up Line (west side track) between Smallbrook and Ryde St.Johns Road then the current dynamic passing loop provision between Ryde Esplanade and Smallbrook would be lost leading to unreliability in the service timekeeping, as there would be now be nowhere to pass trains in the northern half of the railway. Admittedly there should be no requirement to pass trains in this part of the Railway on a 30 minute interval service, if trains ran exactly to schedule (to the second). However trains are easily delayed by vagaries of weather, driving technique, passengers, other members of the public and ferries, so realistically some slack is required to be built into the infrastructure to allow trains some recovery ability to enable them to "catch-up".

10. The operation of a fifteen minute interval service would require the retention of double track in the Ryde area, the retention of the passing loop at Sandown and a second platform preferably at Shanklin. With reference to Appendix 2 of this document, it can be seen that with this service pattern, trains/trams would be scheduled to pass between Ryde St.Johns Road and Ryde Esplanade, however if the service to Ryde was more than three minutes late then they would need to cross south of Ryde St.Johns Road to avoid delaying the service from Ryde.

There would be no room for a passing loop south of Ryde St.Johns Road if the IWSR occupied the west side track, as the east side track is against the slope of a hill for most of this section. It may be possible to extend the existing siding at Ryde St.Johns Road into a passing loop, but if it is to be of an effective length to avoid stopping at least one service then extensive earth and bridge works will be required, certainly negating any benefit from surrendering the west side track to the IWSR.

11. Data from LUL comparing the costs of operation of trams against trains is largely going to be theoretical and any cost models not reflective of the type of operation experienced with Island Line.

12. There is currently a continent wide shortage of overhead line engineers with the experience necessary to design and install overhead line equipment, hence the problems with the Great Western, Midland and Northern electrification projects. This situation is unlikely to change in the next five years. Therefore it may be easier to stick with the conductor rail system currently in use and fitting collector shoe gear to the trams. The cost of installing eight and a half miles of overhead electrification equipment will not be cheap., with masts and associated foundations required every 50 m or so. Then the associated insulators, support wires and conductor wire. If the sub-station spacing were to remain as now, then additional positive reinforcement cabling would probably be required to ensure that the conductor wire voltage did not drop too far causing loss of supply to the

trains. This phenomena is due to the difference in cross sectional area between conductor rail and overhead conductor wire. The reinforcing cable would have to effectively make up the conductor wire to a similar cross sectional area to the conductor rail, allowing for the difference in resistance between high conductive steel and copper. There would also be an increase in cost due to the copper conductor wire having an extremely limited life when compared with conductor rail.

8.3 I would support the assertion that the IWC would not be in a position to operate or manage the franchising process for Island Line regardless of whether it was a railway or a tramway.

8.4 I would argue that Island Line receives significant benefits from being part of a larger organisation, such as back-office and overhead support, also operational, engineering and contract management services as well as other headquarters support services such as finance and human resources. Island Line currently have only two low grade local managers one for operations and one for the rolling stock depot. This would have to be significantly enhanced if Island Line ceased to be part of a larger franchise. Some of the potential cost implications of this were discussed earlier in this Report (see 7.2).

I suspect that any existing railway management could operate a tramway without too much of a problem. Certainly the current franchise operator (Stagecoach) operate tram systems elsewhere in the UK (Sheffield). Most of the day-to-day operational issues are similar for a tramway as those experienced by Island Line. Engineering differences could be addressed by the relevant training.

However the main changes that would be brought about by changing from a train to a tram are political, namely it would be the only tramway that was part of the national rail network and supported through the DfT franchising process. I believe that it would also be the only Tramway subject to the closure requirements of the Railways Act 2005. To avoid any conflict with other existing tramway operators, I suspect that in the event of Island line becoming a tramway the DfT would seek to have it removed from the National Rail Network with the associated loss of network benefits such as through tickets etc. Island Line could then seek to become an agent (as are Wight Link) selling National Rail Tickets from Portsmouth Harbour. This arrangement would then enable Island Line to retain 100% of their own ticket price. However it would remove the ability of mainland passengers to book through to Island Line destinations.

If Island Line were to be stand-alone franchise the cost of a performance bond²³ and insurance would be significant additional cost burdens that would be incurred by Island Line. These would be necessary to support the requirement for the “operator of last resort” and other performance undertakings given by the franchise operator.

To include a tramway within the scope of the Railways Act 2005 would probably require some amendment to the legislation and this would probably be opposed by other tramway operators. However, Island Line would not meet the legal definition of a tramway²⁴, even if it were operating tram vehicles, so this may be a point of negotiation.

²³ A financial bond normally required to support undertakings given by a franchisee to the DfT to cover such issues as poor performance and the cost of the DfT agent (Directly Operated Railways) operating the services should the franchisee fail in their obligations.

²⁴ See page 9 of this report.

8.5 On the basis of experience of Island Line in the 1996 to 2007 period, the stand-alone organisational model is not financially sustainable. Island Line gains very significant benefits from being part of a similar much larger operation in areas such as management, technical support, and overhead costs. However, Island Line does not necessarily have to be part of SWT, it could be part of the GW or GTR franchises, but from an historical and geographic perspective, SWT would be the best franchise for it to be an integral part of.

9. What Type of Franchise

9.1 As mentioned above Island Line operating as a separate franchise is economically not sustainable in the long term. Given that the driver for change for Island Line is the Government's deficit reduction policy supported by their devolution of power policy, the DfT must have short memories, as they were one of the leading proponents of incorporating Island Line within SWT so as to achieve significant overall savings.

If Island Line were to be let separately from SWT, then the DfT and potential bidders would be required to fund the bidding process. These costs for the DfT and the winning bidder would be recovered from Island Line revenue.

9.2 As Island Line does not cover its operating costs and passenger numbers are stagnant, the operator is only going to spend the minimal amount to comply with their franchise obligations. If there is no requirement within the franchise terms to make specific changes/improvements, then they are unlikely to happen. Short term franchises are also a disincentive to investment, due to the short time frame in which any investment can be repaid.

As Christopher Garnett says Island Line has been a separate cost centre for many years, even going back to the Southern Railway days. However, this cost centre only covers direct expenditure and revenue for Island Line. No attempt has ever been made to capture all relevant costs associated with Island Line as many of these are difficult to identify, quantify and proportion. Probably the most accurate costings for independent operation would be those for the period 1996-2007, however even then, Stagecoach Group provided a number of back-office functions such as finance and accounting for Island Line.

9.3 Given the cost of the lease for Island Line²⁵, I would have expected Network Rail to play a more active role in maintaining the infrastructure. Personally I don't think Island Line currently get good value from the existing arrangement. There is no evidence to suggest that Island Line gain any benefit from the various subsidies that the government pay to Network Rail directly. It is understood that historically, this is because when the lease was set up in 1996 most government funding for the railway was channelled through the train operators using the franchise process. Railtrack, as it was then (now Network Rail), recovered infrastructure maintenance and enhancement costs through changes to the track access charges paid by the operator. This financial model ceased to be used some years ago. Now a significant amount of funding is paid direct by the Government to Network Rail²⁶ to fund their costs. However, it would appear that no equivalent change has been made to the Island Line lease.

²⁵ £2.187m per year from 1/4/15.

²⁶ The Network Grant

- 9.4 No paragraph in the Garnett Report
- 9.5 Island Line receives about the same level of promotion as any other rural branch line of SWT. The decision that Island Line would not carry SWT branding was a specific decision in an attempt to promote the heritage aspect of the railway (along with the Lymington Line at the time). Therefore it received new old style signs and the trains were painted in a livery depicting their heritage. Island Line passengers can usually benefit from various SWT promotions and special ticket prices, although the Wight Link factor can sometimes impact on special reduced fare offers.
- 9.6 I accept that a franchisee with sole responsibility for Island Line would enable them to focus more on the railway. I would doubt that they however would have the resources to enable significant promotional activity though. Investment in promotions, offers etc. do have to be paid for by increases in passenger numbers (fare revenue). It could well be considered that Island Line already conveys the maximum number of passengers with a desire to use its services, given that passenger numbers have been fairly stagnant in recent years, and that any small scale promotion is unlikely to change this.
- 9.7 I don't agree with the statement that a single franchisee can't operate both a large railway network and a tramway. Most skills required are the same or very similar, even in the engineering aspects where the differences are greater. However operating both railway and tramway systems would cause a minor increase in headquarters costs as in some cases two sets of standards and procedures would be necessary. Island Line is already effectively a Light Railway which is approaching the operational characteristics of a tramway but the without street running, and has the ability to operate to its own set of standards (unlike the National Rail Network).
- 9.8 It would not make financial sense for a tramway or railway the size of Island Line to maintain its own operations specialists and engineers as suggested by Christopher Garnett, as they would be significantly underutilised. The access to such professionals is one of the benefits of being part of a larger organisation. It is probable that the successful bidder for the SWT franchise would already possess suitable experts within their other operations that could be used to support an Island Line "tramway". However experienced tramway experts will probably have to travel from further afield than the current railway experts do.
- 9.9 These network benefits would place a significant financial burden on an independent Island Line. It is possible that an independent operator would seek to reduce their costs and increase revenue by removing Island Line from the national revenue attribution system allowing them to retain 100% of the revenue they generate.
- 9.9 (again) Performance guarantees and protection all cost money. If Island Line were a separate franchise (as 1996-2007) it would have to provide and fund its own performance bond to the DfT. This bond would probably be in the order of £2m and usually has to be in place from day one of the franchise operation. It is then returned at the end of the franchise if all obligations have been met.

4. Part B – A Possible Alternative Long Term Option.

There are really two separate issues facing Island Line, one the method of business operation i.e. franchising and the long term future of the line as a transport business, the other issue is the rolling stock and infrastructure. When reading the Garnett Report it appeared to me that a conclusion of the conversion to a tramway had already been decided by the author, and that his report set out to justify this. Only two options were considered in his report either more tube trains, or conversion to a tramway.

In this part of my Report I will look at a possible alternative to a tramway that has the potential to reduce day-to-day costs and secure the long term future of Island Line. The probable cost of the infrastructure works would be slightly less than those necessary for a tramway and it would remove the reliance on yet another batch of second-hand obsolete rail vehicles.

My idea is to adapt the infrastructure of Island Line to take “standard” main line rolling stock. The type of vehicles used would then be the same as, or very similar to, those currently used on the London suburban services of SWT or other suburban rail services within the UK. This proposed scheme has the potential for significant long term economies in rolling stock procurement and maintenance costs. It would also allow Island Line customers to benefit from rolling stock of a similar standard to that provided for mainland commuters.

Looking at Appendix 1 it would appear that the amount of physical work necessary to alter the infrastructure to be compatible with the rolling stock is very similar between a T69 tram and a mainline train (Class 455 or 508 for example). This is not quite that case though, a tramway will require additional clearance for the overhead line equipment, and a mainline train will require additional clearance work of a different nature due to the vehicles being longer. Both would require some work to be undertaken on the track, however given the comments from the ORR on track twist in the Garnett Report, I suspect that the amount of track rectification work necessary for a mainline train (still operating at 45mph) will be significantly less than that required for a tramway. Also mainland third rail electric trains are compatible with the existing Island Line electrification system.

The use of either trams or mainline EMUs would require extensive alterations to Ryde train maintenance depot and although the changes required are different, the probable costs would be similar.

If main line vehicles were to be used, then significant opportunities would exist to benefit from the size of the overall fleet when it comes to procurement, overhaul and refurbishment as the vehicles could be considered as part of a much larger fleet, with vehicles being transported to the mainland when heavy work is required. This would lead to economies of scale being applied to the costs of such works.

As the vehicles would be common with a much larger fleet, stock holdings of spare parts could be significantly reduced with parts being supplied from the mainland on an as required basis. It would also be possible to reduce the Island Line fleet size to the operational requirement, plus one maintenance spare, as long term maintenance cover could be supplied from the mainland fleet. All train parts would be current and any obsolescence issues would be addressed and the cost of any modifications spread across the whole fleet, rather than specific to Island Line.

Due to a difference in the rate at which trains would accumulate mileage between Island Line and mainland operations, an operator would probably wish to swap vehicles around between the two operations to even-out the mileage accumulation rates. It would therefore be essential to maintain a facility where vehicles can easily be transferred between road and rail. Given the extremely restricted access to the cramped depot site at Ryde, this facility would be best located at Sandown, or as part of a redeveloped site at Ryde St.Johns Road for the Steam Railway.

As part of the infrastructure and signalling changes it would be necessary to make Island Line the same as the National Network i.e. remove the train stops and fit TWPS. Also GSM-R radio fixed equipment would need to be installed to allow the driver to communicate with the signaller/controller. These are standard systems on the mainland, but have never been used on Island Line. It would also be necessary to lower the track in platforms to give a 3ft height above rail level (back to where it was prior to 1967). For the operation trams the track would have to be raised in stations, as the T69 is a low-floor tram with a platform height of around 300mm (1 foot). Therefore the cost of alterations will be similar.

Alteration of the Island Line infrastructure to “mainland gauge”²⁷ would also make it possible for steam trains to access Island Line and justify the interconnection of the two railways and the sharing of some track maintenance equipment.

To me as a railway engineer, if you are prepared to spend many millions of pounds on upgrading the Island Line infrastructure, and if the costs are proven to be comparable, then there would be better long term benefits by conversion to “mainland gauge”, rather than to a tramway that will be continue to be reliant on other organisations cast-off, obsolete vehicles.

When it comes to fleet replacement average costs of an Electric Multiple Unit (EMU) vehicle are higher than a tram car. However, when you take the cost of an EMU vehicle procured as part of a large fleet of say 3-400 vehicles and then compare it with the cost of a tram supplied as part of a ten tram contract, then almost certainly the EMU vehicle would be significantly cheaper due to the economies of scale.

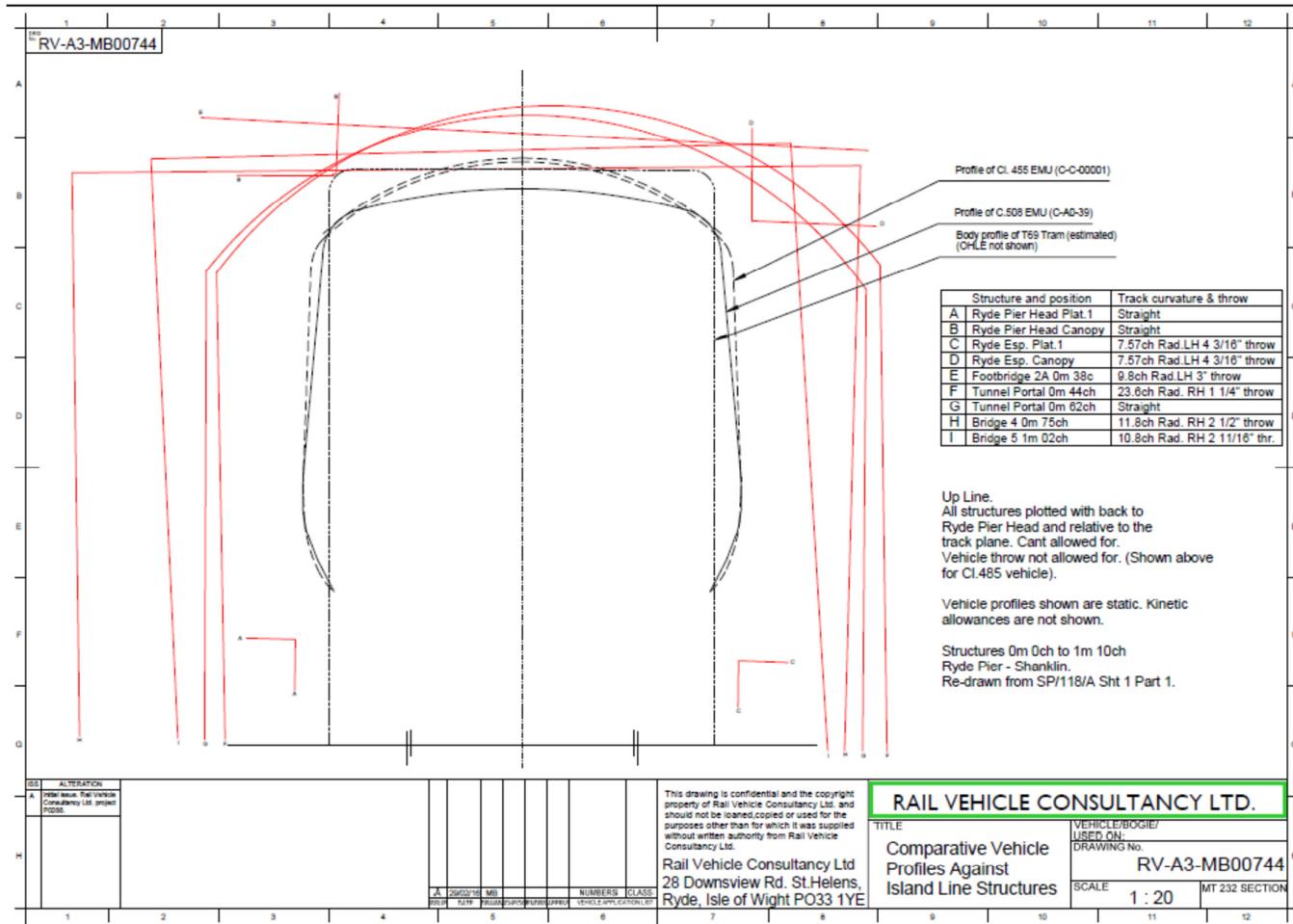
Suitable vehicles could be made available for Island Line operation by minor adjustments to current rolling stock cascade and procurement programmes. The decision on exactly which vehicles and from where they should be sourced should be left up to the operator of Island Line and the DfT. However, it should be possible to obtain and refurbish Class 508 vehicles from Mersey Rail which would then be very similar to the Class 313 stock operating on the Western Coastway services between Portsmouth and Brighton and a number of other suburban units in the London area. Alternatively SWT could add additional vehicles to their existing order for Siemens EMUs for London suburban area, releasing Class 455 and 456 units for Island Line. So suitable rolling stock could be sourced fairly quickly, if it was desired.

²⁷ Standard Vehicle Gauge “PG1” as defined in Railway Group Standard GE/RT8073 issue 3 and its equivalent structural gauge.

Appendix I Comparative Vehicle Profiles Against Island Line Structures.

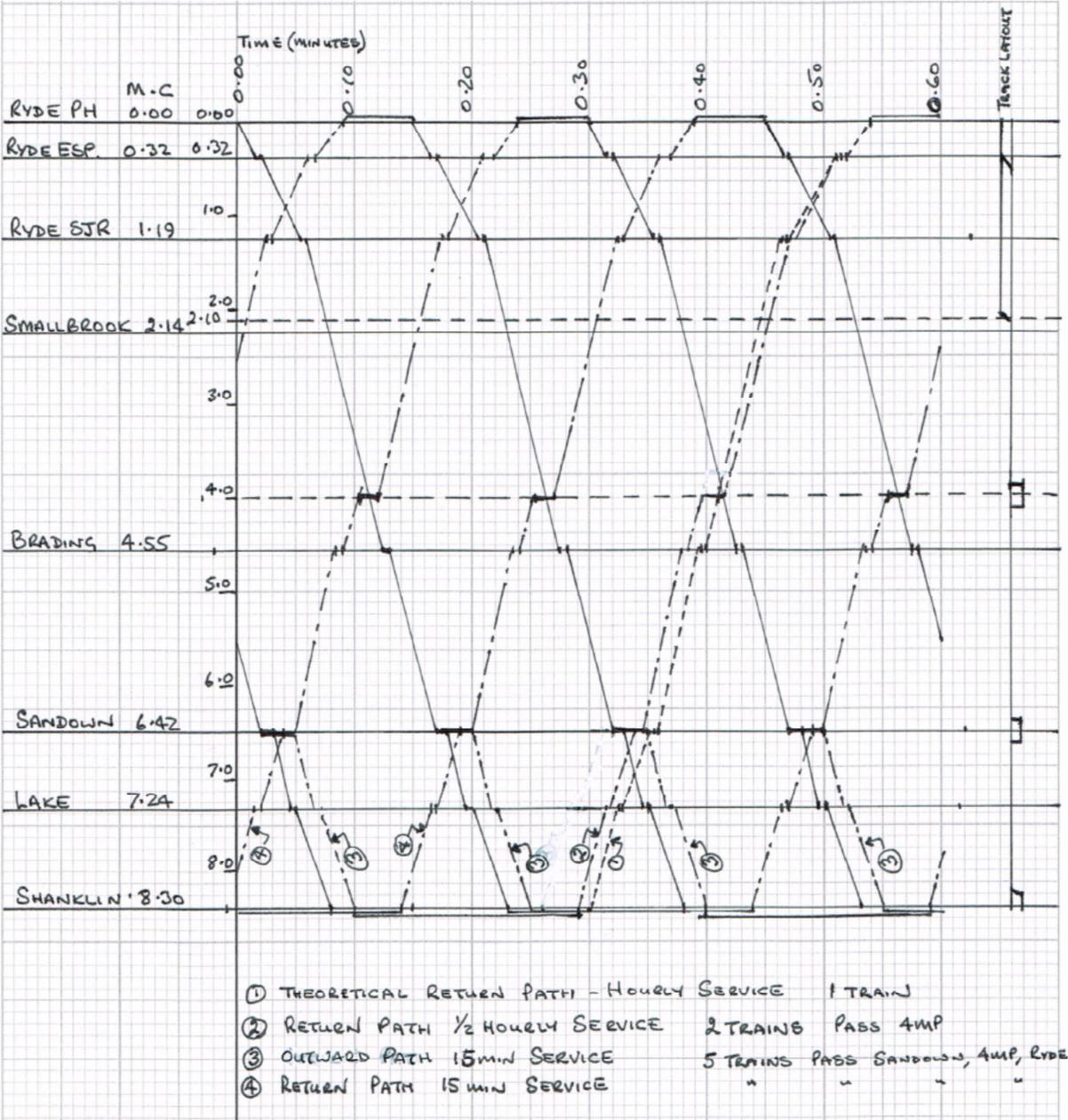
This drawing shows the profiles of a T69 Tram, Class 508 EMU and Class 455 EMU overlaid on the profiles of the structures between Ryde Pier Head and Ryde St. Johns Road stations on the Up (West) Line as an example of typical structures found on Island Line.

Note that the T69 Tram profile is sketched from the leading dimensions and makes no allowance for the overhead collector gear. Class 508 and 455 EMUs are compatible with the existing third rail collector system.



Appendix 2 Potential Pathing Diagram

This graph shows potential train paths for hourly, 30 min and 15 min regular interval services.



Version History:

- 1.00 - 2/3/15 Original issue.
- 1.01 - 12/3/15 Correction of several minor typing errors.