Saint Mary's Church
Rickmansworth

Statement of Need
Proposal to recast, augment and rehang the bells.
The Bell frame.

The current bell frame is of unconventional design, and in particular it lacks any diagonal bracing, as a result the frame will tend to flex horizontally when the bells are rung, which will affect the ease with which the bells can be rung. In summary, it works, but it is a long, long way from ideal. In addition, the layout of the bell frame is less than ideal, as it places the greatest dynamic loads in a north- south direction. In considering this, it should be noted that the tower at Rickmansworth is significantly stronger in the east- west direction, as recorded in a report / email by Andrew Nicholson, dated 8th August 2024

In addition, when considering an augmentation to a ring of 12; the current Bell frame would not leave sufficient space for additional bells from 10 to 12. A way round this would be to house some of the bells in an upper tier, however the argument against that would be that it would lead to acoustical problems, in particular the upper bells would be difficult to hear in the ringing chamber. Following on from these points when the peal is to be augmented to 12, with two additional semitone Bells to create a light peal of six or eight or 10 it is very clear that the best way forward would be to hang the bells in a new frame.
The last major work was done in 1913, when a new frame of the Dreadnought / battleship design was installed. This consists of steel plates and other sections held together with a mixture of rivets and bolts. The foundation of the Bell frame is only just adequate and the design is not one which has ever found favour.
The ringing fittings are mainly those installed by Warners in 1913. A partial overhaul was undertaken by Nicholson's in 2006 and that is the last major work on the installation. The basic 1913 design scheme of the ringing fittings, was rather hit and miss and, although there was some improvements affected in

2006 those improvements were limited in scope by the original design of the fittings. As a result, the bells will never go or handle as well as they might. Without work at this point in time, the condition of the bells will continue to deteriorate and we will have difficulty training new recruits, particularly younger ringers

The Bells

1.0. Historical.

The history of St Mary's Church is one of continual change, so that, though of ancient foundation, so much has been rebuilt over the centuries that all remains of the past are the tower, a Sanctus Bell, peal of ten bells and some of the memorials.

Appendix A.

- **The bells.**

The tower contains a Peal of 10 bells plus a small Sanctus bell.
Details.
1. Made by John Taylor in 1935. Wt. 5-0-0 in F#. Waist 26 7/8".
Inscription-To the Glory of God and in memory of my beloved mother, Harriet Alice Millet. A.E.M. 1935.

2. Made by John Taylor in 1935. Wt. 5-1-0 in E. Waist 28 ½".
Inscription-The people of Rickmansworth placed me here to ring out their thanks for the Jubilee Year. 1935.
Rev. W. B. Belcher. Vicar.

The treble and second were designed and tuned to have true harmonics and while the various harmonics are not particularly accurately aligned, they are sufficiently close to produce two bells which tonally are very good.

3. Made by Lester & Pack of London Fecit 1765 and recast by John Warner & Sons, London in 1913. Wt. 6-2-17 in D. Waist 31½".

Musically the hum note is a little sharp, the fundamental is approaching a semi -tone flat. The third harmonic is in line and the fifth harmonic is approaching a semitone sharp. Totally this Bell is currently quite fair and would be expected to respond well to further tuning.
This Bell is a little oversize with the treble and the second both being a little undersize.

4. Made by Lester & Pack of London Fecit 1765. Wt. 7-0-21 in C#. Waist 32".

Musically, the hum note is half a semi-tone sharp, the fundamental is two semi-tones flat, the third harmonic is in line and the fifth harmonic is slightly sharp. With such a significantly flat fundamental, it is no surprise to find that tonally this bell is only fair at best.

This bell has been tuned in the past in order to bring the unworn surface to the blow of its clapper

5. Made by Lester & Pack of London Fecit 1765. Wt. 7-3-20 in B. Waist 34¾". Inscription-Musick is Medicine to The Mind.

Musically the hum note is approaching a semi-tone sharp, the fundamental is an excess of a semi-tone flat, the third harmonica is virtually in line and the fifth harmonic is in line. The flatness of the fundamental is sufficient to have a serious effect upon the tonal quality of this Bell, which is currently only fair at best.

This bell was made with a cannon or supporting loops which have been removed. It was also made with a cast-in crown staple. The Crown staple was the part from which the clapper hung. The staple and its stump has been removed and the centre holes drilled to allow the fitting of an independent crown staple.

6. Made by Lester & Pack of London Fecit 1765 and recast by Mears London in 1964. Wt. 9-0-26 in A. Waist 36 ½" Inscription- a) Peace and Good Neighbour Hood and b) In gratitude to Frederick W. Elliott for many years Ringer and Tower Captain in this Church.

Musically, the hum note is an excessive a semi-tone sharp, the fundamental is in line. The third harmonic is significantly sharp and the fifth harmonic is a little over half of semitone sharp. The alignment of the fundamental to this bell is commendable, the bell only being let down by its sharp hum note.

7. Made by Lester & Pack of London Fecit 1765. Wt.12-0-13 in G. Waist 39". Inscription- Our Voices shall with Joyful Sound make Hills and Valleys echo round.

Musically, the hum note is approaching a semi-tone sharp, the fundamental is around half a semi-tone flat, the third harmonic is slightly sharp and the fifth harmonic is approaching a semi-tone sharp. Both the fundamental and the hum note to this bell are significantly closer to the ideal than we so often see, though both are sufficiently misaligned to have an adverse effect upon the tonal quality of the bell.

Construction; this bell like the fifth and the fourth, was made with a canon which has been removed. It was also made with a cast-in crown staple. However, the staple and its stumps have been removed and a centre hole drilled to allow the fitting of an independent crown staple.

8. Made by Lester & Pack of London Fecit 1765. Wt. 12-0-13 in F#.
Waist 41 ¼". Inscription-Ye Ringers all that prize your Health and Happiness be sober Merry Wise you'll the same possess.

Musically, the hum note is somewhat in excess of a semi-tone sharp, the fundamental is just over a semitone flat, the third harmonic is virtually in line and the fifth harmonic is well over a semi-tone sharp. Totally this bell is badly let down by its flat fundamental and as such it is currently only fair.

This bell is similar to the seventh, the fifth and the fourth made with cannons or supporting loops which have been removed.

9. Made by Lester & Pack of London Fecit 1765. Wt. 14-0-20 in E. Waist 44 ¾". Inscription-In Wedlock Bands all ye who join with Hands your Hearts unite so shall our Tuneful Tongues combine to laud the Nuptial Rite.

Musically, the hum note is approaching two semi-tones sharp, the fundamental is a little sharp. The third harmonic is slightly sharp and the fifth harmonic is slightly sharp. Totally this bell is currently quite fair, despite its sharp hum note which undoubtedly affects the richness and power of the bell.

10. (Tenor) Made by Lester & Pack of London Fecit 1765 and recast by John Warner & Sons in 1913. Wt. 20-0-20 in D. Inscription- a) From 1765-Stephen Salter. Henry Wankford. Dan^{L} Parrot. Churchwardens 1765.

- **From 1913-I was recast at the expense of Dame Gertrude Dugdale 1913. C. M.O. Parkinson. M. A. Vicar and Rural Dean.**

Musically the hum note is in line, the fundamental is two semi-tones sharp, the third harmonic is half a semi-tone sharp and the fifth harmonic is half a semi-tone sharp. At two semi-tones sharp the fundamental to this bell is sharp to an extraordinary degree and in musical terms is little more than a semi tone away from the third harmonic a semi-tone being a very discordant and unpleasant interval. It is hardly surprising to find that despite its in-line hum note tonally this bell is pretty poor. **Given that it is the tonal quality of the tenor of a ring of bells more than any other single bell which determines the musical quality of the whole peal, the woefully poor musical qualities of this bell are all the more unfortunate.**

Tenor H = 147.5 F=333.5 T= 362 F=453.5 N=591

Total Weight of 10 bells – 97cwt – 2qrs -11lbs.

Sanctus. Believed to be made in 1552 and was recast in 1654 by W. Whitmore.

None of the Bells are listed by the Council for the Care of Churches as being particularly worthy of preservation.

The current bells are a mixed peal, having been made by four different founders. The following notes are those made by us in a report drawn up following a detailed inspection in 2005. These observations remain fully relevant;

Consideration of the diameters and weights of the bells shows that they are not particularly well graded, the third arguably being a little over size and the treble and second both being a little under size.

All the bells have been heavily machine-tuned in the past, by the original founders respectively of the treble, second, third, sixth and tenor, and by John Warner in the case of the remaining bells. The frequencies of the principal and main partial tones of the ten bells are as follows all rounded to the nearest half hertz;

Tonal analysis report for: Rickmansworth, St Mary the Virgin

Keltek Trust Ref.: 25064

Partial frequencies in Hz

Bell / Partial	Tenor	9th	8th	7th	6th	5th	4th	3rd	2nd	Treble
Nominal	591	658	742	784	882.5	993	1118	1180.5	1326	1495.5
Octave Nominal										
Superquint										
Quint	453.5	510	604.5	613	684	745.5	843	923.5	973	1130.5
Tierce	362	397	440	472	542	588.5	664	704.5	796.5	886.5
Prime	333.5	334.5	347	383.5	441	457	496	567.5	665.5	744
Hum	147.5	180.5	202	216.5	239.5	260.5	286	300	333	372.5

Tenor keynote: D+11 cents International Pitch

Estimated accuracy for frequency analysis: +/- 0.5%

Partial ratios

Bell / Partial	Tenor	9th	8th	7th	6th	5th	4th	3rd	2nd	Treble
Nominal	DATUM	1.1134	1.2555	1.3266	1.4932	1.6802	1.8917	1.9975	2.2437	2.5305
Octave Nominal										
Superquint										
Quint	0.7673	0.7751	0.8147	0.7819	0.7751	0.7508	0.7540	0.7823	0.7338	0.7559
Tierce	0.6125	0.6033	0.5930	0.6020	0.6142	0.5926	0.5939	0.5968	0.6007	0.5928
Prime	0.5643	0.5084	0.4677	0.4892	0.4997	0.4602	0.4436	0.4807	0.5019	0.4975
Hum	0.2496	0.2743	0.2722	0.2761	0.2714	0.2623	0.2558	0.2541	0.2511	0.2491

For a perfect *True Harmonic* tuned bell the Hum is 0.25, Prime 0.5, Tierce 0.6, Quint 0.75 with reference to the Nominal.

Equal Tempered Scale: Errors in cents compared to true-harmonic tuned bells

Bell / Partial	Tenor	9th	8th	7th	6th	5th	4th	3rd	2nd	Treble
Nominal	DATUM	-14	-6	-11	-6	-2	4	-2	-1	7
Quint	40	57	143	72	57	2	9	73	-38	14
Tierce	36	10	-20	6	40	-21	-18	-9	2	-21
Prime	209	29	-116	-38	-1	-144	-207	-68	7	-9
Hum	-3	161	148	172	142	83	40	28	8	-6

Errors in cents (100 cents = 1 semitone)

Just Intonation Scale: Errors in cents compared to true-harmonic tuned bells

Bell / Partial	Tenor	9th	8th	7th	6th	5th	4th	3rd	2nd	Treble
Nominal	DATUM	-18	8	-9	-8	14	15	-2	-5	21
Quint	40	57	143	72	57	2	9	73	-38	14
Tierce	36	10	-20	6	40	-21	-18	-9	2	-21
Prime	209	29	-116	-38	-1	-144	-207	-68	7	-9
Hum	-3	161	148	172	142	83	40	28	8	-6

Errors in cents (100 cents = 1 semitone)

Comparison with tuning scales - errors in cents

Scale	Tenor	9th	8th	7th	6th	5th	4th	3rd	2nd	Treble
Equal Tempered	DATUM	-14	-6	-11	-6	-2	4	-2	-1	7
Just Intonation	DATUM	-18	8	-9	-8	14	15	-2	-5	21
Kirnberger III	DATUM	-7	8	-9	-3	8	15	-2	6	21

Rings of bells can be tuned to many different scales. Two of the most common are Equal Tempered and Just Intonation.

Details of weights, diameters, notes, founders and dates of casting

	Tenor	9th	8th	7th	6th	5th	4th	3rd	2nd	Treble
Weight (cwt)	20-0-20	14-0-20	12-0-13	9-3-14	9-0-7	7-3-20	7-0-21	6-2-17	5-1-11	4-3-23
Weight (kg)	1025	720	616	502	460	403	365	338	272	252
After tuning (cwt)										
Diameter (in.)	49.25	44.75	41.25	39	36.5	34.75	32	31.5	28.5	26.88
Diameter (mm)	1251	1137	1048	991	927	883	813	800	724	683
Note	D+11	E -3	F#+5	G+0	A+5	B+9	Db+14	D+8	E+10	F#+18
Founder	John Warner & Sons	Lester & Pack	Lester & Pack	Lester & Pack	Mears & Stainbank	Lester & Pack	Lester & Pack	John Warner & Sons	John Taylor	John Taylor
Date	1913	1765	1765	1765	1964	1765	1765	1913	1935	1935

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Scale	Tenor	9th	8th	7th	6th	5th	4th	3rd	2nd	Treble
Equal Tempered										
Just Intonation										

Detailed information about the sound of bells including the description of partials, tuning scales and true-harmonic tuning may be found on our web site.

Consideration of the nominal or principal notes makes it clear that the basic pitches of the bells are only approximately in line. It is the alignment of the various partial tones or harmonics which determines the tonal quality or timbre of any musical instrument, bells being no exception. The alignment of the fundamental is the most critical to the tone of a bell and should be an exact octave below the

nominal or half its frequency, a sharp fundamental making a bell sound very acid and a flat fundamental imparting a sour quality to the sound.
The hum note is the next in importance and should be two octaves below the fundamental or one quarter of its frequency, sharp hum notes tending to reduce resonance and fullness of tone, flat hum notes being mercifully rare. The third harmonic should normally be a minor third above an accurately aligned fundamental although some sharpness of this harmonic can be a benefit as it imparts brightness to the sound. The fifth harmonic is generally very weak in amplitude and not normally a major cause for concern.

Sources Consulted.

Email: Nicholson Engineering Ltd to MPLK on the 8th of August 2024.
Quotation from Nicholson engineering Limited dated the 28th of October 2024
Report from Andrew Nicholson dated 29th September 2005.
Extracts from O & M Manual in process of preparation by David Hibbert, Tower Captain.

mk 8.7.2025
mk 20.7.2025
mk 18.10.25
mk 15.11.25