Structural Feasibility Report

St Ignatius College, Riverview
Master Planning Proposals

March 2015
1.0 **EXECUTIVE SUMMARY**

Whilst individual buildings have some detailed planning constraints around structure, these are generally not problematic with regard to the masterplanning proposals. The exception is the Wallace Building, which has a column grid which is not conducive to either flexibility in layout or generous learning and circulation space.

This report recommends further investigation of the condition of the Therry building, however this is expected to be only for the purposes of maintenance planning and is unlikely to result in major development constraints.

It is recommended that the Regis West Wing has further investigation to confirm the nature of the structure in the south wall however the findings are not expected to constrain proposals. These investigations would be to determine compliance issues, construction methodology and cost. Regis also appears to need additional fire protection to floor structure.

The Administration Building appears to have condition issues which may affect its long term viability, however it is understood that it is recommended for demolition in current proposals.

This executive summary is presented in tabulated form below.

**WALLACE BUILDING**

**Opportunities**
The northern side of the building and the east end have good provision for flexibility in layout and adaptive re-use.

**Constraints**
The southern colonnade and central spine have a very closely spaced column grid, which is not suitable for either a flexible layout or an open layout other than a very linear arrangement.
The western end of the building has a tightly spaced column grid associated with circulation and stairs and is also not suitable for flexible layout or open plan layout.

The north facade has serviceability issues with the brick infill panels below windows, which appear to relate to both brick growth and wind loading. It is recommended that this façade have remedial attention within a time frame of two years which could involve complete replacement of the brick infills and window system.

In light of this and the closely spaced column grid it is recommended that further analysis is undertaken to compare the costs associated with structural alteration to suit the current masterplanning proposals with demolition and reconstruction.

THERRY BUILDING

Opportunities
The building looks to be quite suitable for the masterplanning proposed.

Constraints
Further investigation by archive research, cover meter and carbonation testing is recommended to check condition of concrete in the original Therry Building external facades. This investigation would be to ensure its long term viability and allow ongoing maintenance planning. This is not major work and is precautionary only.

Detailed planning will need to allow for existing structure and existing and future floor and wall joints, however these are not seen as major issues.

VAUGHAN BUILDING

Opportunities
The building looks to be quite suitable for the masterplanning proposed.

Constraints
There is an internal column grid that will need to be accommodated, however this does not appear to be a significant constraint.
O'NEIL WING/SCIENCE BLOCK

Opportunities
The building looks to be quite suitable for the masterplanning proposed.

Constraints
Embedded within this building are the original eastern ends of both Therry and Vaughan buildings. They contain columns and potentially beams that will need to be incorporated into the planning. These are not expected to be major issues.

EXTERNAL STAIRS

Opportunities
Proposals for stairs all appear structurally feasible.

Constraints
The footings may encounter in-ground services, however it appears likely that these could be readily bridged by appropriate footing structures.

The feasibility of stairs at the north end of the Doyle Wing is based on the assumption that the Administration Building will be demolished.

ADMINISTRATION BUILDING

Opportunities
Since this building is proposed for demolition there are considerable planning opportunities, potentially in conjunction with the Wallace Building site.

Constraints
The building appears to have long term condition issues associated with cracking in the external precast wall panels. It is understood however that this building is proposed for demolition in masterplanning.
REGIS WEST WING

Opportunities
The building looks to be quite suitable for the masterplanning proposed.

Constraints
The south wall structure needs further investigation for detailed design and code compliance purposes.

The floor structures appear to need fire rating upgrade by cladding to exposed steel beams.

In-ground services (primarily electrical) to the south of the building will need accurate location and coordination in detailed design.

In-ground services (primarily storm water and sewer) to the west end of the building will need detailed coordination with final detailed design.

There are remedial works required to cracked masonry arising from corrosion to lintels in the west wall. These require attention regardless of masterplanning.

REGIS NORTH WING

Opportunities
Some adaptation of this building is quite feasible.

Constraints
This building appears to already have had substantial internal alteration at the lower level. If further substantial structural alterations are proposed it may prove more cost effective to re-construct the building to suit new use.

This would be highly dependent on future use proposals for the lower level and the potential for overall staging of works at the Regis site.
LOAD CAPACITY OF EXISTING FLOOR STRUCTURES

**Vertical Capacity**
This will be checked in detailed design to current codes however there is no expectation, based on current drawing review and inspection, that the masterplan will be constrained.

**Lateral Capacity**
This will be checked in detailed design to current codes however there appears to be opportunity for upgrade to comply with current codes if considered necessary.

**FIRE RATING**
This will be checked against current codes in detailed design, however, with the exception of Regis, no fire rating issue to structures are apparent at this time.

If areas of non-compliance exist then fire engineered solutions may be needed.
2.0 **INSPECTION DETAILS**

2.1 **Inspected By:** Simon Wiltshier, structural engineer and Divisional Director of Mott MacDonald.

2.2 **Inspection Method:** Visual inspection of accessible areas to assess structural form and general structural condition. No opening-up works, excavations, materials testing or geotechnical investigations have been carried out. Where structural drawings were available they were utilised to assess structural form and likely load bearing capacity.

2.3 **Purpose:** To provide a high-level overview of feasibility and potential constraints associated with the current master plan proposals prepared by PMDL in 2014 and 2015.

2.4 **Documents Reviewed:**

PMDL Masterplan drawings (a selection of) prepared between May 2014 and January 2015.

Hughes Trueman drawings 00S303 SS01 to S20 prepared in 2001 for works to Therry and Science Buildings.

Ian Chapman and Associates drawings 1183/3 to 18 and 20 prepared in 1988 for works to Wallace and Therry Buildings.
3.0 STRUCTURAL DESCRIPTION

3.1 Therry Building
The Therry Building is a three storey concrete framed building. The ground floor (RL 35.5) is a slab on grade, the first floor (RL 39.0) is flat slab whereas the second floor (RL 43.0) is a ribbed slab spanning north/south.

The current building has been constructed in two stages with the southern section constructed in 1988 and the northern section constructed in 2001/2002. The second stage construction included lowering the original ground floor and introduced new cross walls. The exposed external concrete has an off-form boarded finish with a paint coating. There is evidence of patching to external faces of spandrel beams and columns. This may be repair of earlier spalled concrete.

There is no substantial evidence of current damage or spalling, so it is assumed that previous damage has been adequately rectified.

There is no significant patching to the newer northern section.

3.2 O’Neill Wing
Science Building
The Science Building is predominantly a three storey reinforced concrete framed building, however the north end has an additional part floor making it a four storey building.

The building incorporates the east end of the first stage of the Therry Building.

The south end of the Science Building joins the east end of the Vaughan building.

The ground floor of the lowest level is at RL 31.5.

The building was constructed in 2001/2002 coincident with the northern extension of the Therry building.
3.3 **Vaughan Building**

The Vaughan Building was originally a two storey reinforced concrete building with a three storey section at the east end where the ground fell away to the east.

Its original construction is expected to have been commensurate with the first stage of Therry, however it may have been constructed slightly earlier or slightly later.

It has the same off-form boarded external finish.

A later upper floor library has recently been added in steel frame with a curtain walling system.

3.4 **Wallace Building**

The Wallace Building appears to have been constructed in two stages, with the first stage being an east/west orientated reinforced concrete framed four storey building with a closely spaced grid of columns.

Subsequently, around 1988 two further sections were added including:

3.4.1 A new northern section to the full length of the north side, with a grid spacing of three times the span of the original wing.

3.4.2 A southern three storey colonnade structure following the same closely spaced grid as the original wing. Although externally the structure appears to be arched brickwork, the structural drawings show a reinforced concrete structure which was then clad in brickwork.

This southern colonnade shares the original building's closely spaced column grid.

3.5 **Administration Building**

This building is a two and three storey building with reinforced concrete flat slabs with a single row of internal columns with drop panels and, what appears to be precast reinforced concrete external wall panels.

The slabs show a pattern of fine cracks which appear to be flexural cracks.
The precast panels show crazing cracks to a render finish and also a line of horizontal cracks near roof height on the west facade.

These cracks do not necessarily, in themselves only, indicate any structural inadequacy however remedial works may be needed after further more detailed examination.

3.6 Regis Building

3.6.1 Regis Building North Wing
The North Wing is a two storey building with a simple pitched roof.

No structural drawings were available at the time of inspection, however the lower level appears to be constructed with load bearing masonry supporting a flat reinforced concrete slab.

There appear to have been modifications made throughout the lower level with installation of steel beams and columns to support the upper floor.

It is not clear if any or all of these steel structures are original, however they appear to be re-support structures after removal of earlier load bearing masonry walls.

The upper floor has masonry external walls however internally the roof is supported by a series of steel posts supporting a steel ridge beam and steel purlins running the length of the building.

There is localised minor settlement cracking and very minor movement attributable to lintel corrosion.

3.6.2 Regis Building – West Wing
The West Wing is a three storey building with a simple pitched roof.

Structural drawings were not available at the time of inspection, consequently structural construction details are not certain.
The southern external walls appear to be loadbearing masonry, however it is possible that steel columns exist within a brick cladding envelope.

Floors are one way spanning reinforced concrete slabs supported by masonry cross walls and by steel cross beams.

There are two rows of concrete columns to the north side of the building, being situated either side of an external walkway.

There is the potential that these concrete columns are concrete encasing structural steel.

Cross walls between classrooms have openings in them which are currently closed up with lightweight infill panels.

On the south side the building is set into the ground along most of its length. The nature of the retaining wall structure to this south wall is not known.

The structure appears to be in sound condition except for lintel corrosion to windows in the west wall at low level. This lintel corrosion is jacking up the brickwork causing cracking.
4.0 EXISTING FLOOR LOAD CAPACITY

AS 1170 Part 1 recommends floor load capacities for schools as follows;

<table>
<thead>
<tr>
<th>Area</th>
<th>Capacity (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classrooms</td>
<td>3.0</td>
</tr>
<tr>
<td>Stairs</td>
<td>4.0</td>
</tr>
<tr>
<td>Corridors</td>
<td>4.0</td>
</tr>
<tr>
<td>Kitchens</td>
<td>3.0</td>
</tr>
<tr>
<td>Plant areas</td>
<td>5.0</td>
</tr>
<tr>
<td>Balconies</td>
<td>4.0</td>
</tr>
</tbody>
</table>

These loads have changed little over the years.

Drawings for the Wallace Building by Ian Chapman and Associates do not show live loads.

Drawings for the Therry and Science Buildings by Hughes Trueman give the following live load capacities;

<table>
<thead>
<tr>
<th>Area</th>
<th>Capacity (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>0.25</td>
</tr>
<tr>
<td>General Floor Areas u.n.o</td>
<td>3.0</td>
</tr>
<tr>
<td>Stairs and Corridors</td>
<td>4.0</td>
</tr>
<tr>
<td>Balconies</td>
<td>3.0</td>
</tr>
<tr>
<td>Storage Areas</td>
<td>5.0</td>
</tr>
<tr>
<td>Plant Areas</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Based on these loads, the existing floors are assessed to be generally suitable for the adaptive re-use proposed.

Localised Heavy Loads

Where adaptive re-use proposes heavier loads e.g. library shelving, compactus, heavy plant and equipment, heavy filing or installation of new solid masonry partitions, it is recommended that floor loading is analysed on a case by case basis.

Where structural drawings are not available this might necessitate local opening up works and slab scanning to check slab depth and reinforcement disposition. In modern
schools the need for compactus storage and high shelving is progressively diminishing with increased electronic storage.
5.0 PROPOSED WORKS AND FINDINGS

5.1 Therry and Science Buildings

Level 31.5
Proposed Works
- Chapel, Support, Drama, Outdoor

Issues Arising
1. No significant impediment to proposals

Level 35.5
Proposed Works
- Adaptation of existing GLA’s
- Faculty installation
- House and Amenities installation
- New GLA’s
- New stairs at west end

Issues Arising
1. No significant impediment to proposal
2. Downstand beam 930 deep will need to be accommodated in ceiling space of second GLA on north side as will a 600 deep cross beam.
3. Minor accommodation of existing columns in new wall line.
4. Review of in-ground services (none noted)
5. New columns will be needed at south edge of new GLA, existing columns unlikely to carry extra load
6. New GLA west end will be onto existing slab on grade area with slab joints to be accommodated in finishes or may need a new slab depending on existing drainage and moisture control.

Level 39.0
Proposed Works
- Adapt existing GLA’s
- Construct new GLA’s to north
• Construct new GLA’s to west
• Adapt GLA’s for Amenities and Faculty
• Adapt existing laboratories for new laboratories
• Fit new stairs
• Eastward projection

**Issues Arising**

1. No significant impediments to proposals
2. Downstand beam 930 deep will need to be accommodated in ceiling space of second GLA on north side as will a 600 deep cross beam.
3. Minor accommodation of existing columns in new wall line.
4. New stairs at west end
5. New columns will be needed at south edge of new GLA, existing columns unlikely to carry extra load

**Level 43.0**

**Proposed Works**

• Adapt existing GLA’s
• Construct new GLA’s to north
• Construct new GLA’s to west
• Adapt GLA’s for Amenities and Faculty
• Adapt existing laboratories for new laboratories
• Fit new stairs
• Eastward projection

**Issues Arising**

1. No significant impediments to proposals
2. Minor accommodation of existing columns in new wall line.
3. New stairs at west end
4. New columns will be needed at south edge of new GLA, existing columns will not carry load
5.2 VAUGHAN

Level 35.5
Proposed Works
- Adaptive re-use of Sports Store and Recreation Room for House
- Adaptive re-use of Student Office and Council Rooms for House
- Adaptive re-use of stairs, Chaplains Office and other offices for Faculty

Issues Arising
1. Adaptive re-use of Sports Store will expose structural columns to be incorporated into the House area.
2. Works within the student office will encounter old upstand beams and columns. The columns (2No.) will have to be spatially managed.
   The upstand beam appears to be an old balustrade. It has not been confirmed if it has a structural function. It is assumed at this stage that it needs to be retained and investigated in detail. This may potentially impact planning in the west side of the House Space.
3. Stair infill can be achieved with a reinforced concrete infill slab.

Level 39.0
Proposed Works
- Adaptive re-use of existing GLA’s for new GLA’s.
- Adaptive re-use of existing GLA’s for new Faculty and House facilities
- Adaptive re-use of Chemistry Preparation Room as a laboratory
- Adaptive re-use of a laboratory as a Faculty facility
- Close in stairs to create circulation space

Issues Arising
1. Circulation space will need to include existing columns
2. New laboratory space will need to incorporate existing columns
3. Otherwise no significant impediments
**Level 43.0**

*Proposed Works*
- Adaptive re-use of existing GLA’s for new GLA’s.
- Adaptive re-use of existing GLA’s for new Faculty and House facilities
- Adaptive re-use of Chemistry Preparation Room as a laboratory
- Adaptive re-use of a laboratory as a Faculty facility
- Close in stairs to create circulation space

*Issues Arising*
1. Circulation space will need to include existing columns
2. New laboratory space will need to incorporate columns
3. Otherwise no significant issues

**Level 46.5**

*Proposed Works*
- Enlarge Library to include existing work rooms

*Issues Arising*
1. No significant impediments

### 5.3 WALLACE

**Level 31.5**

*Proposed Works*
- External stair installation

*Issues Arising*
1. No significant impediments other than avoidance of in-ground services with footings