The Problem

- Long-term review of Mount Vernon Centre for Cancer Treatment is to "MOVE TO HATFIELD (25 MILES EAST OF EXISTING SITE) IN LESS THAN 10 YEARS"
- Meanwhile: 4 old linacs need replacing.
- Bunkers for 3 of these are not suitable for new linacs
- More linacs needed to cope with increase in demand for radiotherapy (growth at 4-5% per year)

Further Issues

- Failure to maintain the appropriate number and type of linacs will impact on the Centre's ability to recruit, train and retain staff
- To deliver improvements in clinical practice and cancer care
- To avoid potential waiting list issues
- To improve the quality of services to patients
- To deliver improvements in clinical practice and cancer care

Objectives

- To improve the quality of services to patients
- To avoid potential waiting list issues
- To deliver improvements in clinical practice and cancer care

Existing equipment workload at MVCCT

<table>
<thead>
<tr>
<th>Name</th>
<th>Make</th>
<th>Model</th>
<th>Multi-Leaf collimator</th>
<th>Portal image</th>
<th>V &amp; R</th>
<th>Electrons</th>
<th>Commissisioned</th>
<th>Planned decommissioning date</th>
<th>Age by 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA1</td>
<td>Elekta</td>
<td>SL75</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>1995</td>
<td>2005</td>
<td>7</td>
</tr>
<tr>
<td>LA2</td>
<td>Elekta</td>
<td>SL75-5</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>1996</td>
<td>2004</td>
<td>8</td>
</tr>
<tr>
<td>LA3</td>
<td>Elekta</td>
<td>SL20</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>1988</td>
<td>2001</td>
<td>14</td>
</tr>
<tr>
<td>LA4</td>
<td>Elekta</td>
<td>SL75</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>1991</td>
<td>2003</td>
<td>11</td>
</tr>
<tr>
<td>LA5</td>
<td>Elekta</td>
<td>SL75-5</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>1991</td>
<td>2003</td>
<td>11</td>
</tr>
<tr>
<td>LA6</td>
<td>Elekta</td>
<td>SL75</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>2002</td>
<td>2011</td>
<td>0</td>
</tr>
<tr>
<td>LA7</td>
<td>SL150</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2002a</td>
<td>2011</td>
<td>0</td>
</tr>
</tbody>
</table>


The Solution

- Temporary Moveable ("Re-Locatable") structure of 5-Rad-Pro Bunkers
- This design also offered a faster solution than conventional, as well as not leaving a "Concrete Legacy"

Details

- A complete bunker consists of two layers of five modules, each 2.4m wide, 2.4 m tall, and 12.2m long. The central 3 modules (pods) of the first layer form the inside of the linac room (with dimensions of 7.3 m by 6.7 m); the outer modules and the upper layer form the bulk of the shielding. This shielding is a combination of steel and a proprietary granular fill.

Radiation Protection

All barriers designed for 18MV and doses for mixture of conventional and IMRT at rate of 4 patients/hour and dose rates of 600MU/min

Primary Barriers (except for roof) must reduce dose rate to less than 7.5µSv/h

Secondary Barriers (Public Area) to less than 0.3µSv/year

Secondary barriers (Staff Area) to less than 1µSv/year

Direct Access Door must reduce dose rates to similar levels

- Neutron absorption in door is a greater problem than in wall, because a) not "concrete" b) not as thick!!
- The Door consists of combined set of material that gives about 10¹⁻ attenuation for X-rays and 10¹⁻ attenuation for neutrons (and weighs about 8 tonnes)

The Rad-Pro Solution at Mayo Clinic (Phoenix Ar)

- see also Gary Ezzell:“Shielding evaluation and acceptance of a prefabricated, modular, temporary radiation therapy treatment facility”, Journal of Applied Clinical Medical Physics, September 2004

Modular Build erected as freestanding building in 24 hours (see Below)

<table>
<thead>
<tr>
<th>Morning</th>
<th>Late Afternoon</th>
<th>Evening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutrons</td>
<td>door: X-rays 0.5 µSv/h</td>
<td>Neutrons 0.2 µSv/h</td>
</tr>
<tr>
<td>Barriers</td>
<td>All within specified values</td>
<td></td>
</tr>
</tbody>
</table>

The Mount Vernon Plan (Project Director Kyle McClelland; Project Management Carrie and Brown Group)

The Timetable

1. FBC signed January 2005
2. Contracts signed February 2005
3. Site at Mount Vernon Prepared
5. 47 Load-Loaders ……M25 (!!!) …to Mount Vernon
6. Bunkers arrive September 2005 (at which time Linear Accelerators-Varian-are installed in central modules)
7. Bunkers erected on site by end-October

Conclusion

5-Bunker Installation (incl. Linacs): Start-Finish < 1 year