250 Third Avenue North, Ste 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088
www.LHBcorp.com

MEMORANDUM

DATE: February 12, 2008

TO: Council Member Scott Benson, Chair, Council Committee on Health, Energy & Environment, City of Minneapolis

FROM: Rick Carter, AIA, LHB, Inc.

RE: Target Green Roof Analysis

The following is an independent review memo of the cost-benefit analysis of a variety of roofing options for the Target Center.

1. **THE TEAM**

Leo A Daly (LAD) has assembled an exceptional team. Peter MacDonagh is very knowledgeable about green roofs and Jim Roed is the person who knows the most about the structure of the Target Center. These members complement the LAD structural engineering group and Gary Patrick of Inspec, an expert in conventional roof design. Tom Reller from AEG and Phil Handy, independent consultant to the City, have significant understanding from the owner and operator perspective. In our opinion, the best possible team has been assembled by LAD for this process.

2. **THE OPTIONS**

The team has assessed options that range from a conventional white roof (with no additional weight) to a 39 psf (6 inches growing medium) green roof. They have narrowed down their recommendations to a range that includes a white roof in combination with a perimeter green roof of 22 psf. This analysis has included both economic and environmental criteria. It has also included several combinations or "hybrid" solutions. In our opinion, the correct options have been reviewed during this analysis

3. **RIGGING CAPACITY**

The ability to support roof structure suspended equipment with rigging is clearly important to the functionality of this facility. The operator and team have taken the position that the new roof project should not decrease the capacity of the original design. This puts the rigging capacity at a level that is comparable to the average of new facilities coming on line today. We consider this to be a very reasonable position.

4. ACOUSTICAL IMPROVEMENTS

Since the internal acoustical controls being pursued by the operators have an impact of only one psf on the overall structural capacity, we feel that this is not a critical issue. We are not aware of any scenario in which the project could benefit from a deeper green roof in return for the addition one psf. In addition, we feel that anything that gives the facility a chance of an extended life, allows for the cost effectiveness of the green roof selection.

5. THE RECOMMENDATION

The options that appear to have some economic and environmental merit include the white roof, the 13.4 psf and 17.4 psf green roof and the two combination options. The 22 psf option which requires $500,000 of structural modification seems like a questionable investment. The 39 psf green roof, requiring substantial structural modifications and possible facility down time does not appear to be reasonable. We ultimately concur with the recommendation by the team's report to do the combination 17.4 psf/22 psf roof solution. This is based on the original timeframe for consideration of twenty years.

6. COST BENEFIT

The team analyzed the options based on a twenty year timeframe. The white roof is expected to last between 15 and 25 years and a green roof between 40 and 50 years. The white roof is approximately one half on the cost of the green roof options. Once you get to the point of having to replace the white roof for the first time, the green roof options become cost effective. The real question in this case is how long we expect this building to last. All of the major financial considerations, i.e. the bonds and the primary lease, expire in 2025, sixteen years from the expected construction date of 2009.

7. DECISION

The Council really needs to come to some agreement on what they expect the useful life of the facility to be from this point on. If that life is more than 25 years, the green roof decision has good economic support. If it is less than twenty five years, it does not. This does not mean that a green roof should not be the final solution. In addition to the economic considerations, there are environmental, social, public relations and other reasons that have not been quantified. Possibly more important is the fact the green roof could give momentum to other improvements which would actually extend the useful life.

8. NEXT STEPS

In our opinion, the design team should be asked to modify their fee and schedule in order to have the construction documents for the original white roof include alternates for the 17.4 and 22 psf green roofs in combination with the white roof and each other. This would provide for actual hard bids on all four scenarios that make sense for consideration: an all white roof, a white roof with a 22 psf green roof perimeter, an all 17.4 psf green roof and a 17.4 psf green roof with a deeper 22 psf green roof perimeter.

9. **OUR PROCESS**

Our (LHB) process included attending two meetings at LAD, on January 15, 2008 and January 29, 2008. In addition to these two meetings we thoroughly reviewed all of the team's correspondence that we were copied on, including the reports prepared for the February 21st Council committee meeting. Please contact me with any questions at 612.385.5182.

This constitutes my understanding of items discussed and decisions reached. If there are any omissions or discrepancies, please notify the author in writing.

c: LHB File No.: 070769.10-F202

M:\07Proj\070769\ADMN\F200 Design\F203 Meeting Minutes\070769MM020808 Meeting Minutes.doc