FEHR & PEERS
TRANSPORTATION CONSULTANTS

TECHNICAL MEMORANDUM

Date:	July 20, 2005
To:	Eric Dehaan, P.E. - Park City Municipal Corp.
From:	Timothy J. Taylor, P.E., PTOE - Fehr & Peers Diego Carroll, P.E. – Fehr & Peers
Subject:	**Treasure Hill Traffic Review**

UT05-616

I. INTRODUCTION

This memorandum reports the results of a review of the assumptions and conclusions of traffic work previously performed for the proposed Treasure Hill project located south of the switchback intersection of Lowell Avenue and Empire Avenue.

Fehr & Peers reviewed documents related to the Treasure Hill project along with the transportation policies of Park City and a performed a technical review of the traffic analysis performed by Project Engineering Consultants, Inc. (PEC, Inc.).

In general, Fehr & Peers found that the Traffic Impact Analysis (TIA) performed by PEC, Inc. provides an adequate assessment of the traffic characteristics and potential impacts related to the proposed Treasure Hill project. Fehr & Peers also found that the proposed Treasure Hill project is consistent with general guidelines provided in the Transportation Element of the General Plan and Land Management Code.

Additional recommendations related to key transportation issues, including: public safety, roadway and intersection capacity, and pedestrian facilities, are summarized below.

II. DOCUMENTATION REVIEW

Fehr & Peers reviewed the Master Planned Development (MPD) plans for Treasure Hill to become familiar with the proposed development. Fehr & Peers reviewed policy and development documents provided by Park City staff, development information posted on the Treasure Hill web site (www.treasurehillpc.com), and additional traffic information obtained from PEC, Inc. Items reviewed include the following:

1. Policy Documents
   a. Park City General Plan – adopted 03/20/97
   b. Park City Municipal Code Section 15-1-10 – Conditional Use Review Process

2. Development Information Documents
   a. Development Program and Plans – 04/14/04
   b. Treasure Hill Project Design Booklet – 01/23/04 – (Treasure Hill web site)

3. Traffic Study Documents
   a. Three Intersections Study (City Transportation Analysis) – dated 04/15/96
   b. Treasure Hill Traffic Opinion Summary – 12/18/03 (PEC, Inc.)
   c. Treasure Hill Traffic Impact Analysis Report – 07/04 (PEC, Inc.)
   d. Treasure Hill Traffic Impact Analysis Report – Addendum #1 – (PEC, Inc.)
   e. Treasure Hill Traffic Impact Analysis Report – Addendum #2 – (PEC, Inc.)
   f. Winter season peak hour count details – Obtained from PEC, Inc.

4. Public Meetings and Comments
   a. Winter photos (copies) of Lowell Ave (7) and Empire (1) – winter/05
   b. Planning Commission Staff Report – 03/09/05
   c. Planning Commission Staff Report – 07/14/05 – (Treasure Hill web site)
   d. Planning Commission Meeting Minutes for the following dates:
      - 04/28/04 – (Treasure Hill web site)
      - 05/26/04 – (Treasure Hill web site)
      - 07/14/04 – (Treasure Hill web site)
      - 08/11/04 – (Treasure Hill web site)
   e. Planning Commission Meeting Presentations for the following dates:
      - 04/28/04 – (Treasure Hill web site)
      - 05/26/04 – (Treasure Hill web site)
      - 07/14/04 – (Treasure Hill web site)
   f. Eight (8) Park City Planning Staff email responses to public comments – (project web)

Consistency Assessment

Fehr & Peers found that the proposed Treasure Hill project is consistent with general guidelines provided in the Transportation Element of the General Plan based on a review of the above listed documents. These documents appear to address all the Conditional Use review items related to transportation as outlined in section 15-1-10 of the Park City Land Management Code.

III. TECHNICAL ASSESSMENT

Fehr & Peers performed a technical review of the traffic work previously performed for the *Treasure Hill Traffic Impact Analysis Report* prepared by PEC, Inc. and dated July 2004 (Treasure Hill TIA). Fehr & Peers also performed an assessment of key issues identified as part of the technical review.

Assessment of TIA Assumptions

Traffic Volumes

Fehr & Peers found the background and forecast traffic volumes used in the Treasure Hill TIA analysis to be adequate.

Notes:

- Winter season (ski-day) traffic conditions were estimated by adjusting the summer values and seasonal occupancy rates obtained from the Park City Chamber of Commerce. The winter conditions traffic forecasts provided a conservative estimate based on limited information available in the summer season.

- PEC, Inc. performed additional data collection during Presidents Day weekend (February, 2005) in an effort to substantiate their original winter conditions traffic forecasts. Based on the traffic counts, the overall winter conditions intersection volume forecasts were found to be conservative. Our review of the winter turning movement counts did show that there are some substantial differences in the individual turning movement counts as compared to the forecasts. However, the differences do not appear to substantially alter recommendations.

Trip Generation

Fehr & Peers agrees with the trip generation assumptions and calculations reported in the Treasure Hill TIA.

Notes:

- The Treasure Hill TIA reduced gross ITE trip generation rates by 30% to account for internalization of trips and the use alternative modes of transportation, such as the ski lift and cabriolet. Based on internal capture rates reported for comparable sites in the Park City area, this reduction is conservative.

- The Treasure Hill TIA compared existing traffic conditions to existing "plus project" conditions as an approach to assessing impacts of the proposed Treasure Hill project. The "plus project" condition was intended to represent a 2012 design year; however, it appears that the forecasts did not account for background growth unrelated to the proposed project. Increasing volumes to account for background growth would likely have the greatest impact at the intersections of Deer Valley Drive / Park Avenue and Empire Avenue / Silver King Drive, with minor impacts to Lowell Avenue and Empire Avenue south of Manor Way.

- The Treasure Hill TIA assumes that none of the project generated trips will use Crescent Tram. This trip assignment assumption is adequate because the pedestrian connection from the project to Main Street will discourage residents and guests of the project to use Crescent Tram to reach the Old Town. As a worst case scenario, assigning 10% of project traffic to Crescent Tram would increase traffic on this road from 90 to 106 vehicles during the PM peak hour. The capacity of Crescent Tram would not be degraded by such an increase. However, because of the undesirable design features of Crescent Tram, motorists should be discouraged from using it. Treasure Hill should discourage the use of this road by providing guests with route maps that emphasize Lowell Avenue and Empire Avenue. The use of Crescent Tram could be further discouraged by prohibiting right turns from Empire Avenue to Crescent Tram and left turns from Crescent Tram to Empire Avenue.

Traffic Operations Analysis

Fehr & Peers evaluated the Treasure Hill TIA traffic operations analysis and, with the exception of the Deer Valley Drive / Park Avenue Intersection, found it to be adequate.

Notes:

- For the intersection of Deer Valley Drive / Park Avenue, the Treasure Hill TIA geometry and signal phasing assumptions were incorrect. Fehr & Peers preformed a reevaluation of PM peak hour traffic operations using the corrected geometry and signal phasing. Results are presented in Table 1. The results indicate that the Treasure Hill TIA provided an adequate measure of the relative impact generated by the proposed project, but underestimated the total delay for the intersection.

TABLE 1
PM Peak Hour Level of Service Re-Evaluation Summary

Analysis Scenario	Delay (sec/veh) / LOS	
	Re-evaluation	Treasure Hill TIA [1]
Existing Winter Conditions	**71.0 / LOS E**	**48.0 / LOS D**
Winter Plus Project Conditions	**74.2 / LOS E**	**52.9 / LOS D**

1. Treasure Hill TIA Table Four.

Source: Fehr & Peers, July 2005.

- Treasure Hill TIA assumptions related to the analysis of other intersections were found to provide an adequate estimate of delays. The intersection analyses did not, however, address potential capacity limitations resulting from snow storage and on-street parking conditions typical during the winter season. Fehr & Peers performed a supplemental assessment of the operation of Empire Avenue and Lowell Avenue (south of Manor Way) that accounted for the potential impacts of the snow storage and on-street parking. The results of this assessment are reported in the *Intersection Capacity and Queue* section notes.

Mitigation Measures

Fehr & Peers reviewed the recommendations identified in the Treasure Hill TIA and is in agreement as to their ability to mitigate traffic impacts of the proposed Treasure Hill project.

Notes:

- Based on the additional intersection assessment performed by Fehr & Peers, mitigation is necessary at the Deer Valley Drive / Park Avenue and Empire Avenue / Silver King Drive intersections (see *Intersection Capacity and Queue* notes). It is important to note that the intersection of Deer Valley Drive / Park Avenue is under the jurisdiction of the Utah Department of Transportation (UDOT) and any modifications/improvements will require UDOT approval.

Assessment of Key Issues

In addition to assessing the assumptions and results reported in the Treasure Hill TIA, Fehr & Peers performed an independent assessment of the following key issues: 1) public safety (emergency access), 2) roadway capacity of Lowell Avenue and Empire Avenue, 3) intersection capacity and queuing, and 4) pedestrian connectivity.

Public Safety

Fehr & Peers assessed the emergency vehicle access and circulation for Lowell Avenue and Empire Avenue for winter season conditions and found it to be adequate.

Notes:

- Lowell Avenue and Empire Avenue, as well as intersections with Manor Way, were found to adequately accommodate the turning path requirements of emergency vehicles, delivery and service trucks, and buses (represented by AASHTO SU Truck, WB-50 Truck, and BUS-40 vehicle classifications).
    - The available street width during winter conditions is occasionally limited by on-street parking and snow removal / storage. These roadway limitations should be managed through on-street parking restrictions and prioritized snow removal. Parking should also be prohibited in the vicinity of the Lowell Avenue and Empire Avenue switchback.
    - The proposed Treasure Hill project is not expected to add on-street parking or directly impact the need for snow removal / storage on Lowell Avenue and Empire Avenue. The occasional winter season roadway width restrictions are an existing condition and are not expected to be impacted by the proposed Treasure Hill project.

- The winter season traffic conditions for Lowell Avenue and Empire Avenue are not expected to block emergency access from Manor Way to the Lowell Avenue and Empire Avenue switchback.
    - The proposed Treasure Hill project will increase the traffic on Lowell Avenue and Empire Avenue, but is not expected to significantly degrade traffic conditions (see next section for details).
    - To ensure smooth circulation of traffic on Lowell Avenue and Empire Avenue, these roadways should be managed through on-street parking restrictions (see next section for details) and prioritized snow removal.

Roadway Capacity

Fehr & Peers performed a supplemental assessment of the roadway capacity of Empire Avenue and Lowell Avenue (south of Manor Way) to account for the potential impacts of the snow storage and on-street parking. The capacity assessment was based on winter season PM peak hour traffic volumes and new traffic volumes forecasted for the proposed Treasure Hill project. The capacity of Lowell Avenue and Empire Avenue was determined to adequately accommodate new trips generated by the Treasure Hill project.

Notes:

- Fehr & Peers determined that Lowell Avenue and Empire Avenue will accommodate the existing winter season local traffic and the additional Treasure Hill traffic forecasted for these roads. This conclusion accounts for blocking of Lowell Avenue and Empire Avenue caused by snow storage and on-street parking, but assumes that intermittent segments of both roadways are wide enough to accommodate two-way travel. If winter season on-street parking is allowed on Lowell Avenue and Empire Avenue, the following rules of thumb may be applied to manage on-street parking:

- Limit on-street parking to one side of the street only.
- Do not allow on-street parking on more than half of the roadway length of Lowell Avenue and Empire Avenue from Manor Way to the switchback. At least half of these segments should be clear of snow and parked vehicles and allow two-directional travel.
- Limit segment lengths of on-street parking to no more than six continuous parking spaces (150 feet) and separate each segment of on-street parking by a minimum of 150 feet.
- Prohibit on-street parking in the vicinity of the Lowell Avenue and Empire Avenue switchback.
- Provide strict enforcement of parking restrictions during the winter season.

- The conclusions of this study assume that Lowell Avenue and Empire Avenue will be reconstructed at the same width as currently exists from Manor Way to the Lowell Avenue and Empire Avenue switchback.

Intersection Capacity and Queuing

Fehr & Peers performed an assessment of study intersection delays and queuing near the Park City Mountain Resort (PCMR) base area during peak winter (ski) season conditions and identified mitigations to reduce delay and queues.

Notes:

- The PM peak period was analyzed because it captures the resort departure and captures the critical (worst case) traffic conditions. The intersection capacity and queue assessment was based on traffic volumes collected in February 2005.

- During the peak resort departure period, the intersections of Deer Valley Drive / Park Avenue and Empire Avenue / Silver King Drive create bottlenecks that induce queues and occasionally short periods of gridlock on Lowell Avenue and Empire Avenue. The operational assessment results of winter traffic conditions for these intersections are reported in Table 2.

- Traffic conditions at the Deer Valley Drive / Park Avenue signalized intersection could be improved during the PM peak hour by providing the following mitigation:
  - Modify the eastbound approach to provide separate dual left turn lanes and a shared thru-right turn lane,
  - Provide southbound dual left turn lanes, and
  - Replace the east/west split signal phasing with protected only left turns.

  The results of implementing these mitigation measures are also reported in Table 2. It is important to note that the intersection of Deer Valley Drive / Park Avenue is under the jurisdiction of the Utah Department of Transportation (UDOT) and any modifications/improvements will require UDOT approval.

- The failing traffic conditions of the Empire Avenue / Silver King Drive intersection may be mitigated by signalizing the intersection or providing human traffic control during peak periods. Table 2 shows results of signalizing this intersection. The peak hour signal warrants are met for the traffic volumes collected in February 2005 (President's Day weekend), but they are not met for the volumes collected in June 2004. Further data collection and analysis would be required to determine the feasibility of signalization at this intersection.

TABLE 2
PM Peak Hour Level of Service Summary

Intersection	Without Mitigation		With Mitigation[2]	
	LOS	Avg. Delay (Sec/Veh)[1]	LOS	Avg. Delay (Sec/Veh)[1]
Existing Winter Conditions				
Deer Valley Drive / Park Avenue	E	71.0	D	42.6
Empire Avenue / Silver King Drive	F	>50.0[3]	B	11.8
Winter Plus Project Conditions				
Deer Valley Drive / Park Avenue	E	74.2	D	45.1
Empire Avenue / Silver King Drive	F	>50.0[3]	B	12.9

1. This represents the overall intersection LOS and delay (seconds/vehicle) for signalized intersections and the worst approach delay for unsignalized two-way stop controlled intersections
2. Mitigations for Deer Valley Drive include separate eastbound and southbound dual left turn lanes and modifications to the signal phasing. Mitigations for the Empire Avenue / Silver King Drive intersection include signalization and lane modifications to accommodate the signal.
3. The results reported for this table are based on traffic volumes measured in February 2005 instead of the forecasted winter conditions traffic volumes used in the Treasure Hill TIA. As such, the results for the Empire Avenue / Silver King Drive intersection do not match those reported in the Treasure Hill TIA.

Source: Fehr & Peers, July 2005.

- Fehr & Peers performed an operational analysis of the Lowell Avenue / Manor Way and Lowell Avenue / Manor Way intersections based on the traffic volumes collected in February 2005. The analysis tools used to evaluate these intersections result in low levels of delay and queuing. However, in reality these intersections experience extensive delays and queues as a result of friction created by pedestrians, pick-up/drop-off traffic, and transit traffic. The one-way designation of Lowell Avenue enhances the circulation of traffic through the PCMR base area. Traffic conditions in this area could be further improved by consolidating and channeling pedestrian crossings and improving the circulation of pick-up/drop-off traffic.

Pedestrian Connectivity

Fehr & Peers assessed the pedestrian facilities and lift/run connections proposed to connect Treasure Hill, its surrounding neighborhoods, Park City Mountain Resort, and Old Town (Main Street). The proposed pedestrian facilities were determined to provide convenient connections that will facilitate significant reductions in the amount of vehicular traffic generated by the Treasure Hill project.

Notes:

- Ski trail connections are provided between the Treasure Hill project and the PCMR base, but no exclusive pedestrian connections are identified between these two points. Consideration should be given to provide non-ski pedestrian connections to

the PCMR base, especially for the peak noon and evening periods when non-ski pedestrians are likely to shop and/or eat at the PCMR base. Treasure Hill guests who end their ski day at the PCMR base would also use these facilities. Non-ski pedestrian connections could include sidewalk/path facilities and/or an on-call shuttle or transit service.

IV. SUMMARY OF FINDINGS AND RECOMMENDATIONS

Fehr & Peers reviewed documents related to the Treasure Hill project along with the transportation policies of Park City and a performed a technical review of the traffic analysis performed by PEC, Inc.

In general, Fehr & Peers found that the Treasure Hill TIA provides an adequate assessment of the traffic characteristics and potential impacts related to the proposed Treasure Hill project. Fehr & Peers also found that the proposed Treasure Hill project is consistent with general guidelines provided in the Transportation Element of the General Plan and Land Management Code.

Fehr & Peers identified the following findings and recommendations related to key transportation issues:

- Lowell Avenue and Empire Avenue were determined to provide adequate emergency vehicle access and traffic capacity from Manor Way to the switchback. To ensure smooth circulation of traffic on Lowell Avenue and Empire Avenue, these roadways should receive prioritized snow removal treatment and if on-street parking is allowed during the winter season, it may be managed through the following rules of thumb:
    - Limit on-street parking to one side of the street only.
    - Do not allow on-street parking on more than half of the roadway length of Lowell Avenue and Empire Avenue from Manor Way to the switchback. At least half of these segments should be clear of snow and parked vehicles and allow two-directional travel.
    - Limit segment lengths of on-street parking to no more than six continuous parking spaces (150 feet) and separate each segment of on-street parking by a minimum of 150 feet.
    - Prohibit on-street parking in the vicinity of the Lowell Avenue and Empire Avenue switchback.
    - Provide strict enforcement of parking restrictions during the winter season.

- The Deer Valley Drive / Park Avenue intersection currently operates at LOS E and may be improved to operate at LOS D through the following measures:
    - Modify the eastbound approach to provide separate dual left turn lanes and a shared thru-right turn lane.
    - Provide and additional southbound left turn lane.
    - Modify the intersection signal phasing.

  It is important to note that the intersection of Deer Valley Drive / Park Avenue is under the jurisdiction of the Utah Department of Transportation (UDOT) and any modifications/improvements will require UDOT approval.

- The Empire Avenue / Silver King Drive intersection currently fails and may be improved by signalizing the intersection or providing human traffic control during peak periods. Further data collection and analysis would be required to determine the feasibility of signalization at this intersection.

- The delays and queues currently observed during peak resort departure periods were not captured by the analysis tools used to evaluate the Lowell Avenue / Manor Way and Lowell Avenue / Manor Way intersections. Delays and queues at these intersections are a result of friction created by pedestrians, pick-up/drop-off traffic, and transit traffic. The one-way designation of Lowell Avenue enhances the circulation of traffic through the PCMR base area. Traffic conditions in this area could be further improved by consolidating and channeling pedestrian crossings and improving the circulation of pick-up/drop-off traffic.

- The pedestrian facilities proposed for the Treasure Hill project were determined to provide convenient connections that will facilitate significant reductions in the amount of vehicular traffic generated by site. However, no exclusive pedestrian connections were identified between the project and PCMR base. Consideration should be given to provide non-ski pedestrian connections to the PCMR base. These connections could include sidewalk/path facilities and/or an on-call shuttle or transit service.

- The conclusions of this study assume that Lowell Avenue and Empire Avenue will be reconstructed at the same width as currently exists from Manor Way to the Lowell Avenue and Empire Avenue switchback.