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Project No. 11844.G
March 31, 2008

Mr. Sherman Lewis
Hayward Area Planning Association
2787 Hillcrest Avenue,
Hayward, CA 94542

Subject: **Preliminary Geologic Hazards Evaluation**
Proposed Residential Construction
Quarry Village
Carlos Bee Boulevard
Hayward, California

Dear Mr. Lewis:

As requested, we have prepared this preliminary geologic hazards evaluation to assess the feasibility of proposed residential development at the Quarry Village project in Hayward, California. The purpose of our preliminary study was to identify and address the potential geologic hazards that may impact the proposed development. Our evaluation was based on observations from a brief geologic reconnaissance to the site, a review of published geologic maps and aerial photographs of the site area, and opinions and judgments developed from our analysis of such information.

SITE DESCRIPTION

The project is located at an abandoned rock quarry site on the northeast side of Carlos Bee Boulevard. We accessed the site from Overlook Avenue that is connected to Carlos Bee Boulevard. The site is generally surrounded by residential developments. A deeply incised, west-draining creek channel is located along the north side of the property. An overhead power line easement exists along the southeast side of the property.

Quarry operations began at the site in the mid-1950s and continued into the early 1970s, based on our review of aerial photographs. The resulting landscape currently consists of a sizeable, nearly level bedrock cut pad surrounded by artificial fill berms and steep bedrock cut slopes. The largest of the bedrock cut slopes is up to 150 feet in height, located along the southeast portion of the project site. This cut slope is approximately 1.2:1 (Horizontal to Vertical). The slope gradient throughout the property varies considerably from near vertical cut slopes to gentle dipping topography.

GEOLOGIC DATA AND AERIAL PHOTOGRAPHIC REVIEW, AND GEOLOGIC MAPPING

We have reviewed published geologic maps of the site area to determine the bedrock type and geologic structure underlying the site. We have reviewed selected vertical stereo pairs of historic aerial photographs of the site vicinity to supplement our research and to observe the site prior to past quarry operations. We have also briefly visited the site to generally map the exposed geology. The results of our research and site observations are plotted on the Preliminary Geologic Map of Figure 2.

Aerial Photographic Analysis

We have reviewed aerial photographs for the years 1947, 1953, 1957, 1963, 1973, 1983, 1997, and 2002. The 1947 and 1953 aerial photographs show the site prior to the existing quarry operations. The pre-quarry site consisted of a prominent northwest-striking ridge that sloped down to the creek at the north end of the site and sloped down to Carlo Bee Boulevard at the southwest end. At the extreme northwest portion of the site and near the base of the natural slope, near vertical excavations had been made into the hillside, presumably from older quarry operations that pre-date the quarry operations at the site (this area is now developed by homes at the end of Tamalpais Place). We observed these older quarry excavations during our site reconnaissance.

Quarry operations began in the mid-1950s and continued into the early 1970s, based on our review of aerial photographs. Several fill berms were constructed along the edges of the quarry site as seen on the aerial photographs. The largest of these fill berms was along the west portion of the site where the fill materials seem to have migrated over the slopes, especially over the older quarry excavations at the extreme northwest portion of the site. Another large fill berm was constructed along the top of the large cut slope in the southeast portion of the site. The 1983 and later aerial photographs reviewed showed no signs of active quarry operations. Several small landsides were observed in the 1973 and later aerial photographs along the fringes of the property, related mostly to the fills and steep-sided creek banks.

Artificial Fill

There are scattered pockets and berms of artificial fill throughout the site. Fill berms appears to have been created around the west side of the quarry operation. Some of the fill seems to have spilled over the side slopes and accumulated along the lower slopes adjacent to the residential developments at the end of Overlook Avenue and at the end of Tamalpais Place, based on our review of aerial photographs. A significant fill berm has been placed along the upper portion of the large cut slope at the southeast portion of the site. Another significant fill area exists along the downslope side of the old quarry access road in the south portion of the site (see Figure 2).

We have not investigated the actual areal limits or depths of the various fills throughout the site. Our observations of the surface exposures of the fill materials indicates that these materials generally consists of soil and rock debris generated from quarry operations, and asphalt and concrete demolition debris after the quarry operations ceased. We also observe scattered piles of household garbage and metal debris from more recent sources.

Landslides

Nilsen (1975) of the U.S. Geological Survey does not map any landslides within our adjacent to the property. Similarly, Majmundar (1996) of the California Geological Survey does not map any landslides within or adjacent to the property.

However, we have mapped several small landslides along the north and west fringes of the property from our geologic reconnaissance and from our review of aerial photographs (see Figure 2). These relatively small failures are within the fill areas along the west side of the property and along the steep-sided creek bank along the north side of the property.

The California Geologic Survey has recently issued several 7.5-minute quadrangle maps of the San Francisco Bay area under the Seismic Hazards Mapping Act of 1990. These maps identify potential liquefaction and earthquake-induced landslide hazard areas. The Seismic Hazards map for the site identifies the entire cut slope along the southeast side of the property as being prone to earthquake-induced landsliding. Also, the descending slopes along the west and northwest portions of the site are generally identified as being susceptible to earthquake-induced landsliding (State Geologist, 2003). The site and adjacent areas have not been identified as potentially liquefiable areas (State Geologist, 2003)

Bedrock

Based on our review of published geologic maps, the site is generally underlain by two bedrock formations separated by a major fault. In the north half of the site, gabbro of late Jurassic age has been mapped (Dibblee, 1980 and 2005; Ellen and Wentworth, 1995; Graymer and others; Robinson, 1956). This rock type was being quarried as part of the previous activities at the site. As observed in cut slope exposure at the site, the gabbro is fractured throughout with fracture spacing generally ranging from 0.5 to 2.0 feet.

In the south half of the site, sedimentary rocks of the Knoxville Formation of late Jurassic to early Cretaceous age have been mapped. These rocks generally consist of clay shale, greywacke, sandstone, and dolomite (Dibblee, 1980 and 2005; Ellen and Wentworth, 1995; Graymer and others; Robinson, 1956). These rocks appeared considerably more fractured and deformed than the gabbro as observed during our reconnaissance.

Faults

The site is not located within an Earthquake Fault Zone for seismically active faults as defined by the State of California (Hart and Bryant, 1997). However, the active Hayward fault has been mapped approximately 1,000 feet to the southwest of the west portion of the site (State Geologist, 1982). There are other faults mapped near the property that have not been designated as active by the State Geologist. The largest of these other faults include the northwest-striking West and East Chabot faults, mapped approximately 700 and 2,300 feet to the northeast, respectively (Dibblee, 1980 and 2005).

An unnamed northwest striking fault has been mapped as passing through the site (Dibblee, 1980 and 2005; and Graymer and others, 1996). This fault generally separates sedimentary rocks on the south from igneous rocks on the north as discussed in the Bedrock Section of this report. From our analysis of pre-development aerial photographs we have identified a linear geomorphic break in the natural slope cutting across the central portion of the site in approximately the same general location as the previously mapped fault. This linear feature coincides with the mapped trace of the unnamed fault. Our brief geologic reconnaissance at the site suggests that the fault consists of a relatively wide zone of deformation that is steeply inclined or vertical. Further geologic mapping and subsurface exploration is needed to determine the actual location and activity of the fault.

DISCUSSIONS AND CONCLUSIONS

Based on the information collected and reviewed for this geologic research, we have assessed the geologic hazards that might impact the proposed development, which include surface ground rupture from faulting, ground shaking from earthquakes, and slope stability. Our conclusions and opinions regarding potential geologic hazards at the project site are summarized below.

- An unnamed fault has been mapped as passing through the site as shown on Figure 2 (Dibblee, 1980 and 2005; and Graymer and others, 1996). This fault has not been designed by the State Geologist as being seismically active (Hart and Bryant, 1997). However, secondary movement could occur along the fault during an earthquake on a nearby fault. A detailed fault evaluation study should be performed to investigate this fault.

- The approximately 150-foot high, northwest-facing bedrock cut slope along the southeast portion of the site is the result of past quarry operations. This cut slope does not comply with currently acceptable graded slope standards, such as maximum slope angle and drainage benches. This slope is likely prone to generate rock falls and the slope may be susceptible to landsliding during a seismic event (State Geologist, 2003). Global and surficial stability analyses of the slope should be performed.

- There are other oversteepened slopes that surround the site that also do not comply with currently acceptable graded slope standards. Some of these slopes already exhibit small landslides. The majority of the slopes in the west and northwest portion of the site may be susceptible to landsliding during a seismic event (State Geologist, 2003). Stability analyses of these slopes should be performed.

- The potential for strong ground shaking during an earthquake from the nearby Hayward or other active faults is judged to be violent.

PRELIMINARY RECOMMENDATIONS

Without the benefit of performing any subsurface exploration or laboratory tested of soil and rock materials at the site, we have developed some building envelope recommendations that should be considered preliminary at this time. We recommend that any proposed construction at the site be set back from ascending and descending slopes resulting in accordance with Uniform Building Code Section 1344, and set back from the mapped trace of a major fault. These preliminary recommendations are generally stated below graphically shown on Figure 2.

- Construction set back of a minimum of 20 horizontal feet from the top of descending slopes with maximum steepness of 2:1 (Horizontal to vertical).

- Construction set back of 50 horizontal feet along both sides of the approximate location of the major fault that has been mapped as passing through the southwest portion of the site.

LIMITATIONS AND CLOSURE

Our findings and recommendations stated in this preliminary geologic hazards evaluation are not intended for actual construction or proposed construction design, they are intended to aid in determining the feasibility of development at the site and should be considered as preliminary only. A complete geologic and geotechnical investigation should be performed at the site to confirm and delineate potential geologic and geotechnical hazards that might impact any proposed development at the site. Such a complete investigation should include, but not be limited to, detailed geologic mapping, subsurface drilling, shallow test pits, and fault trenching.

Should you have any questions relating to the contents of this report or should you require additional information, please do not hesitate to contact our office at your convenience.

Sincerely,
TERRASEARCH, inc.,

CERTIFIED ENGINEERING GEOLOGIST
PATRICK L. DRUMM
CEG NO. 1916
11-30-09
STATE OF CALIFORNIA

Patrick L. Drumm, PG, CEG, CHG
Consulting Geologist

Kamran Ghiassi, Ph. D., G.E.
Senior Engineer

Enclosures: Figure 1 – Site Location Map
Figure 2 – Preliminary Geologic Map

REFERENCES

Dibblee, T.W., Jr., 1980, Preliminary Geologic Map of the Hayward Quadrangle, Alameda and Contra Costa Counties, California: U.S. Geological Survey Open-File Report 80-540, map scale 1:24,000.

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Ellen, S.D., and Wentworth, C.M., 1995, Hillside Materials and Slopes of the San Francisco Bay Region, California: U.S. Geological Survey Professional Paper 1357, 215 p., 7 pls.

Graymer, R.W., Jones, D.L., and Brabb, E.E., 1996, Preliminary Geologic Map Emphasizing Bedrock Formations in Alameda County, California: A Digital Database: U.S. Geological Survey Open-File Report 96-252.

Hart, E.W., and Bryant, W.A., 1997 (revised), Fault-Rupture Hazard Zones in California: California Geological Survey Special Publication 42, 38 p.

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Nilsen, T.H, 1975, Preliminary Photointerpretation Map of Landslide and Other Surficial Deposits of the Hayward 7 ½' Quadrangle, Alameda County, California: U.S. Geological Survey Open-File Map 75-277-19, map scale 1:24,000.

Robinson, G.D., 1956, Geology of the Hayward Quadrangle, California: U.S. Geological Survey Map GQ 88, map scale 1:24,000.

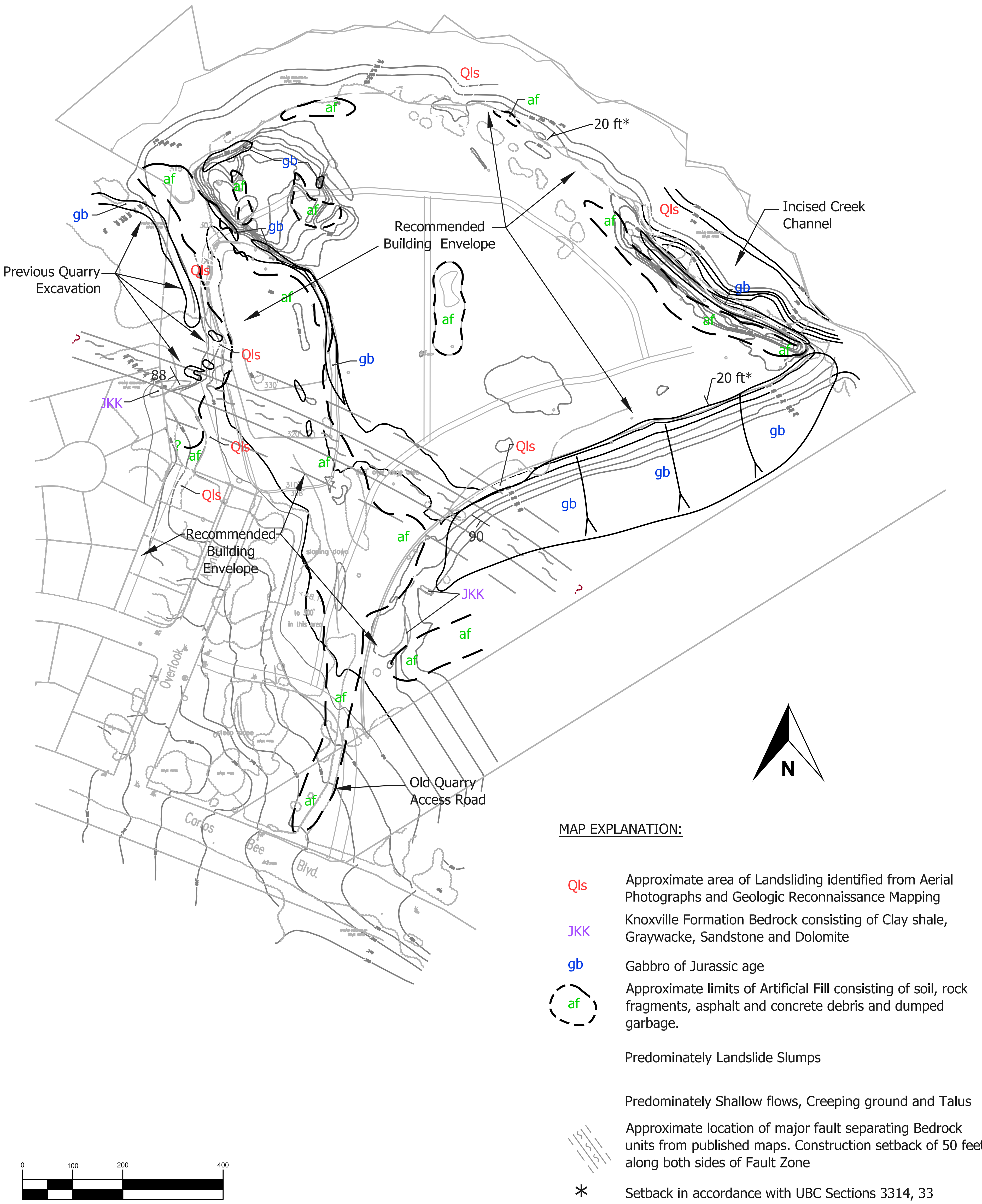
State Geologist, 1982, Revised Official Map of the Alquist-Priolo Earthquake Fault Zones, Hayward Quadrangle: California Geological Survey Official Map, Released January 1, 1982, map scale 1:24,000.

State Geologist, 2003, Official Map of the Seismic Hazard Zones, Hayward Quadrangle: California Geological Survey Official Map, Released June 20, 2003, map scale 1:24,000.

AERIAL PHOTOGRAPHS REVIEWED

Date	Flight Line	Frames	Scale	Type
03-24-47	AV-11	04-26 & 27	1:20,000	B & W Stereo
08-17-53	AV-119	21-25 & 26	1:10,000	B & W Stereo
05-03-57	AV-253	17-46 & 47	1:12,000	B & W Stereo
07-26-63	AV-550	11-26 & 27	1:36,000	B & W Stereo
04-18-73	AV-1100	08-42 & 43	1:12,000	B & W Stereo
06-21-83	AV-2300	08-43 & 44	1:12,000	B & W Stereo
06-07-97	AV-5433	3-4 & 5	1:7,200	B & W Stereo
06-27-02	AV-8202	18-40 & 41	1:12,000	B & W Stereo

All photographs available at Pacific Aerial Surveys, Oakland, CA



Reference: Emailed Base map received 3/2008

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PRELIMINARY GEOLOGIC MAP

QUARRY VILLAGE
HAYWARD, CALIFORNIA

Project No.	Drawn by:	Figure No.
11844.G	GC	2
Scale:	Date:	
≈ 1" = 200'	03/2008	