October 3, 2001

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SUBJECT: PRELIMINARY ASSESSMENT OF POTENTIAL METHANE GAS MITIGATION TASKS, 2020 / 2040 AVENUE OF THE STARS PROJECT, LOS ANGELES, CALIFORNIA

References:

1. **Draft Methane Assessment Report by Camp Dresser & McKee dated September 25, 2001.**
2. **Miscellaneous building plans for Century City Theme Towers and Garage by Minoru Yamasaki and Associates, Albert C. Martin & Associates, and Skilling - Helle Christianson - Robertson, date 1969 to 1970.**

Dear Mr. Lindquist,

As requested, the purpose of this letter is to provide you with a preliminary summary of the actions or improvements that could be considered in order to further reduce risks associated with the presence of methane gas at the above referenced site. In accordance with your request, I will address potential mitigative actions for construction safety and for the subsequent occupation of the renovated structure separately.

Background: It is my understanding the proposed construction activities will include the installation of 68 reinforced concrete spread footings at the lowest parking garage level (i.e. Level F). It is anticipated the installation of each footing will involve the saw-cutting and removal of an approximately 12 foot by 12 foot section of the existing 4-inch thick concrete garage slab at each of these locations. I understand that consideration is also being given to the possible removal and replacement of a ≈120 foot wide by ≈500 foot long section of the garage slab.

The recent site investigation completed by Camp Dresser & McKee (CDM) indicates that localized areas with elevated methane concentrations are present locally beneath the floor slab of the building. Speciation of selected gas samples provides a strong indication the gas is predominately of thermogenic origin. Measurements performed in conjunction with that investigation also indicate relatively small quantities of methane are entering the building through cracks and/or seams in the floor slab. Methane concentrations measured within the garage space were above typical background

levels but well below potentially problematic concentrations.

It is my understanding from past discussions that three abandoned oil wells are located beneath the site. The available records indicate these wells were abandoned at various times between approximately 1940 and 1970. It is not currently known whether vented gas collection "hoods" were installed on these wells.

Existing Improvements: The available building plans indicate there is a sub-drain system beneath the 4-inch thick garage slab. This system is shown to consist of a 9-inch thick layer of gravel which rests directly on the soil subgrade and a series of 4-inch diameter perforated pipes installed within 12-inch deep gravel filled trenches. The trenches and associated piping are typically spaced 60 to 80 feet apart. Twelve separate (i.e. isolated) subdrain segments are shown on the building plans. These segments are shown to discharge to the following locations:

a. Seven of the sub-drain segments appear to discharge to one of four underground concrete sumps that are shown to be present beneath the garage slab. These sumps are indicated to be 5-feet in diameter and approximately 10 feet in depth with steel covers. They are fitted with float controls, pumps, and piping to discharge accumulated water.

b. One of the sub-drain segments discharges directly into a separate storm drain system that exists beneath the floor slab. This system consists of a series of 4-inch to 6-inch diameter non-perforated pipes which drain by gravity to the same four sumps described under item "a" above. It should be noted that a series of open grate type inlets are present in the floor of the garage. These inlets allow water to drain into the storm drain piping. The plans do not provide any indication that the perforated sub-drain piping is isolated from the floor drain inlets at the inter-connected segments.

c. Four of the sub-drain segments discharge into a series of large (i.e. ≈10 foot by ≈20 foot) concrete ventilation shafts that are present beneath the garage slab. These shafts are fitted with floor drains which are connected to the storm drain system discussed in item "b" above. The plans do not provide any indication that there is any isolation (e.g. a water trap) between the sub-drain piping and the ventilation shafts. The ventilation shafts at the sub-drain connection points would typically be under a positive pressure. Accordingly, if the systems are not isolated, there will be a tendency for air to be forced into these four perforated sub-drain segments. This condition could locally increase the potential for methane migration into the building.

Construction Safety: The presence of elevated concentrations of methane beneath the floor slab will require the implementation of precautionary measures during the proposed construction activities. Actions which can be taken in this regard are discussed in the following paragraphs.

Notification - All companies and contractors that are to be involved in the proposed construction activities should be informed of the presence of methane and the associated hazards. These personnel should be notified of all mitigative actions that are to be undertaken by the building owner / operator and informed of their responsibility to undertake precautionary measures for construction safety as well. Subcontractors and personnel involved in the construction activities should be provided a copy of the project health and safety plan (see below) prior to initiating work on the project.

Health and Safety Plan - A comprehensive Health and Safety plan should be prepared for the proposed construction activities by representatives of the building owner / operator, the construction management company, the general contractor, or another qualified entity. This plan should discuss potential exposure and fire / explosion risks associated with the proposed project and document the mitigative actions, monitoring, and mandatory safety requirements for the project. Contractors and other personnel involved with the project should be required to read and understand the Health and Safety manual and demonstrate a thorough working knowledge of the mitigation and safety requirements before initiating work on the project. A project Health and Safety Officer should be assigned to the project. This officer, or his designee, should have the responsibility of overseeing and enforcing the mitigation and safety requirements. One or more qualified individuals should be on site to perform continuous monitoring activities (see below) at all times when construction activities are taking place.

Monitoring - Monitoring of combustible gas levels throughout the construction area will be an important requirement of the Health and Safety plan. Monitoring of combustible gas concentrations should be performed in the breathing space, at cracks or separations in the garage slab, at floor drain inlets, in the sub-drain / storm drain sumps, in the sub-drain clean-outs, and perhaps most importantly along the exposed ground surface within any open excavations. Monitoring within excavations should take place continuously as those excavations are advanced. Gas concentrations and pressures within any fixed gas probes (see below) should also be monitored closely. The frequency of monitoring, combustible gas action levels, and the measures which are to be taken in the event action levels are exceeded, should be clearly set-forth in the project Health and Safety manual.

Weather conditions and barometric pressures should be monitored closely during construction as well. The atmospheric or barometric pressure typically falls during the day as temperatures rise. An atmospheric pressure reduction of one to two inches of water during the daytime is typical. The pressure of combustible gases that are trapped within the soil pore space beneath the building are likely to be relatively constant. Accordingly, a two inches of water reduction in the atmospheric pressure has essentially the same effect on gas migration into the building as a two inches of water increase in the pressure of the gas itself. During the passage of low pressure cells through the area, barometric pressure may fall by 10 to 15 inches of water or more. These conditions can significantly increase soil gas flux rates and the potential for associated problems. Weather conditions should be monitored closely. If potentially significant decreases in the barometric pressure are predicted, precautionary measures should be taken.

The air pressure within the construction area inside the building should also be monitored closely with respect to the atmospheric pressure outside of the building. This recommendation is discussed in greater detail in the subsequent sections.

Additional Investigation - Additional information should be collected prior to the start of construction in order to better assess potential risks and facilitate the development and implementation of appropriate mitigative measures. Additional investigative tasks which should be considered in this regard include the following:

a. Gas Probes - Multi-stage, fixed, gas probes should be installed and monitored beneath the building within the proposed construction area. At a minimum, these probes should extend to a depth of 20 to 30 feet below the garage floor to the extent feasible. Isolated gas sampling tips should be installed at 5 to 10 foot vertical intervals along the length of the probe. A schematic of a typical installation is attached for your reference. The gas concentrations and pressures at the sampling tips should be monitored to identify any zones with elevated pressures or anomalous concentrations. For at least one typical 24-hour period prior to construction, the gas sampling tip pressures, the garage interior air pressure, and the outside barometric pressure should be monitored and recorded at approximately 5 to 10 minute intervals in order to identify any short term pressure variations that

may affect gas migration into construction excavations.

b. Oil Wells - Additional information and data regarding the abandoned oil wells should be obtained. An effort should be made to locate the abandoned wells as precisely as possible and one or more multi-stage gas probes - such as those described under Item "a" above - should be installed and monitored in the vicinity of the well casings. One or more gas sampling tips should be positioned in close proximity to the well head. Monitoring of gas probe pressures and concentrations should be performed to assess the potential for leakage of combustible gas from the well casings. If combustible gas is found to be leaking, appropriate mitigative measures should be taken.

c. Subsurface Ventilation: The potential for utilizing the existing sub-drain system to reduce subsurface gas concentrations in the areas of proposed construction excavations should be evaluated. The induction of low level pressure variations - either positive or negative - within the sub-drain piping and associated gravel blanket may be effective in locally reducing subsurface gas levels. The following tasks should be included in this evaluation:

    1. An array of at least 3 or 4 fixed gas probes should be installed within a designated test area.

    2. The sub-drain system within that test area should be isolated from the storm drain system and the building ventilation system. Smoke testing of the sub-drain system should be performed to identify or confirm points of interconnection.

    3. Subsurface gas pressures and concentrations within the test area should be monitored under a variety of sub-drain air pressure conditions. These conditions should include a low level pressure reduction within the test

area (i.e. gas extraction from the sub-drain system), a low level pressure increase within the test area (i.e. air injection into the sub-drain system), and a combination of these two for adjacent sub-drain segments.

The monitoring of slab surface and breathing space gas levels within the parking garage area should also be performed during this testing. Based upon the results of this testing, the potential benefits from air injection into, and/or gas extraction from, the sub-drain system should be evaluated and recommendations for the operation of such a system during the proposed construction activities should be provided.

Ventilation: Ventilation of the interior construction area will represent the primary means of mitigating potential combustible gas hazards during construction. Potential gas flux rates from open excavations should be estimated based upon gas probe pressure data, concentration data, and soil permeability. If necessary, combustible gas flux measurements from test excavations should be performed to validate the projected values. The capacity of the existing ventilation system should be evaluated with consideration given to gas flux rates to confirm that it is sufficient. A high factor of safety should be utilized in this analysis. If necessary, restrictions should be placed on the maximum excavation area which may be open at any given time based upon the capacity of the ventilation system. Provisions should also be made for high localized ventilation rates in excavation areas. The ventilation system should be configured to operate continuously, day and night, for the duration of the construction activities when open excavations are present. Emergency power back-up should be provided for the Level F ventilation system. The ventilation system should also be evaluated to insure that other portions of the building would not be impacted by elevated methane flux rates into the Level F parking garage.

The feasibility of isolating the Level F ventilation system and/or partially containing the Level F construction area to create an over-pressure within this portion of the building should be evaluated. Partial isolation of this level and restriction of the exhaust ventilation could increase the interior air pressure by a few inches of water. Depending upon the results of the fixed gas probe monitoring results, this could have a significant beneficial effect on methane flux rates from open excavations. Given the configuration of the construction area, the creation of temporary compartments around footing excavations - using visqueen plastic taped to the floor and ceiling,

for example - and the ventilation of those compartments under elevated pressures should also be considered based upon the results of the additional testing described previously.

Ignition Sources - As an additional precaution, an effort should be made to eliminate potential ignition sources within the construction area - particularly in close proximity to open excavations. Precautions should be taken during concrete coring or cutting operations and soil excavation operations to minimize the potential for sparks. Non-explosion proof tools or equipment should not be utilized within or adjacent to open excavations unless continuous monitoring is being performed under the direction of the Site Safety Officer and the use of non-rated equipment is approved.

The existing sub-drain and storm drain sump systems (i.e. pumps and associated controls) should be evaluated to confirm they are both explosion proof and properly ventilated. Modifications to these systems should be made, if necessary, to insure these conditions are met.

Post-Construction Improvements: Information obtained from the additional construction investigation activities described in the previous section will provide insight into the need for supplemental post-construction mitigation as well as assist in the identification of the most effective means of configuring any improvements which are warranted. Potential mitigative actions which could be taken to provide a higher level of safety following the proposed construction activities are described in the following paragraphs. These comments should be considered preliminary pending the completion of the additional investigation activities described previously.

Slab Sealing - Locally elevated concentrations of methane were found to be present at cracks and/or separations in the garage floor slab during the recent CDM investigation. Cracks or separations in the floor slab should be sealed using either a structural grade epoxy (where required for structural considerations) or a high quality elastomeric sealant. Smoke testing of the sub-drain system should be performed to assist in the identification of slab discontinuities or penetrations. Smoke testing should also be utilized to confirm the sub-drain clean-out caps are gas tight and to identify sub-drain cross connections with the storm drain and ventilation systems.

Sub-Drain Cross Connections: As discussed previously, all cross connections between the Level F sub-drain piping and other systems (i.e. the storm drain and ventilation systems) should be identified and eliminated. Water traps or mechanical restrictors can be utilized to isolate the sub-drain piping at the storm drain and ventilation tunnel connection points while still allowing that system to drain water from beneath the floor slab as intended in the original design.

Well Investigation: As discussed previously, the abandoned oil wells that are located beneath the site should be investigated to confirm their locations and determine if they represent a source of combustible gas. If the casings are found to be leaking, appropriate mitigative measures should be taken.

Sub-Slab Ventilation: It appears that with relatively minor modifications, the existing sub-drain system could be utilized as either an active or passive gas collection system. Given the elevated methane concentrations that exist beneath the floor slab, modification of the sub-drain system to function as a sub-slab ventilation system will likely be warranted. The type of system best suited for this project (i.e. active or passive) should be determined after the additional testing is completed.

Gas Detection: Given the elevated methane levels beneath the garage floor slab, the installation of a methane monitoring system on Level F will likely be warranted. This system would likely consist of a series of interconnected detectors mounted on the ceiling of the garage and in enclosed spaces - such as the fan rooms or sump areas. As with the existing carbon monoxide detectors, the combustible gas detectors would activate the ventilation system, as well as a notification light on the master control panel, in the event methane was detected above the pre-established action level.

Again, I should emphasize that my evaluation of the site conditions and the existing building improvements is ongoing. Accordingly, the observations and recommendations presented herein should be considered preliminary. I hope this information is helpful to you.

Sincerely,
GEOKINETICS, INC.

Glenn D. Tofani, GE/RCE/REA
Principal Engineer

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