MEMORANDUM

To:	**Vinh Huynh, Senior Engineer, SDG&E**	**Date:**	February 9, 2016
From:	**Jack Abcarius, Associate, NV5**	**Project:**	SX to PQ
CC:	**Dan Klausenstock, P.E., Engineering Manager, NV5**		
Subject:	**Carmel Mountain Road Bridge Cells**		

NV5's review of the Carmel Mountain Road Bridge Phase 1 as-builts found that all four bridge cells are already occupied as follows (listed from north to south):

- Cell #1 has 2 – 4-inch diameter and 4 – 5-inch diameter SDG&E distribution line conduits, plus an 8-inch diameter drain pipe;
- Cell #2 has a 4 ½-inch diameter SDG&E gas line;
- Cell #3 has 4 – 4-inch diameter AT&T conduits; and
- Cell #4 has a 30-inch diameter water main.

It is not feasible to have a 230kV line share any of the cells above as that would require an additional 40-inch diameter minimum opening (note the bridge cells have a maximum usable diameter of 30 inches) in the Abutment diaphragm and End diaphragm which would jeopardize the structural integrity of the superstructure. Specifically, the Carmel Mountain Road Bridge is constrained from the addition of the 230 kV duct package for the following reasons:

1. There are no vacant cells (all cells are already occupied).
2. The 230kV cannot be co-located with the gas line (Cell #2) due to lack of compatibility (electric and gas utilities lines cannot share a common bridge cell).
3. The 230kV cannot be co-located with the AT&T lines (Cell #3) due to lack of compatibility and space. Separate casings are required by each utility therefore this cell would require a casing in addition to the existing opening used by AT&T. The minimum diameter casing required for the 230kV duct bank is typically 30-inch diameter, which would not fit with the existing AT&T line.
4. The 230kV cannot be co-located with the 30-inch water lines (Cell #4) because of lack of space since a single 30-inch diameter pipe is the largest diameter allowable through the bridge.
5. The 230kV cannot be co-located with the 12kV SDG&E duct bank (Cell #1) due to lack of space since because when using the maximum casing dimeter of 30 inches, the total ducts required inside the casing would be adding 6 – 8-inch ducts and 4 – 2-inch ducts (230kV line) to the existing 4 – 5-inch and 2 – 4-inch distribution line ducts which does not fit (refer to Figure 1[1]).

The Carmel Mountain Road Bridge will accommodate the addition of the double circuit 69kV duct package as follows:

[1] Figure 1 shows the maximum casing size of 30 inches and that the required ducts for a 230kV system will not fit inside with the existing distribution line ducts.

- The 69kV can likely be co-located with the 12kV SDG&E duct bank as there is space within the 30-inch casing limit. Using the maximum casing dimeter of 30 inches, the total ducts required inside the casing would be adding 6 – 6-inch and 1 – 4-inch duct (for the two 69kV lines) to the existing 4 – 5-inch and 2 – 4-inch distribution line ducts which does fit in the 30-inch casing (refer to Figure 2[2]).

Finally, attaching the 230kV line to the outside of the bridge (i.e. under the overhang) may be feasible from a structural standpoint, but is not feasible from an alignment standpoint as the line would have to be bent around the bridge wingwall and transverse shear key before reaching the overhang. Coring through the transverse shear key of this bridge would not be acceptable, as it would nullify the structural intent of the shear key during a seismic event.

[2] Figure 2 shows the 30-inch casing will just barely accommodate the two 69 kV circuits in addition to the existing distribution line ducts.

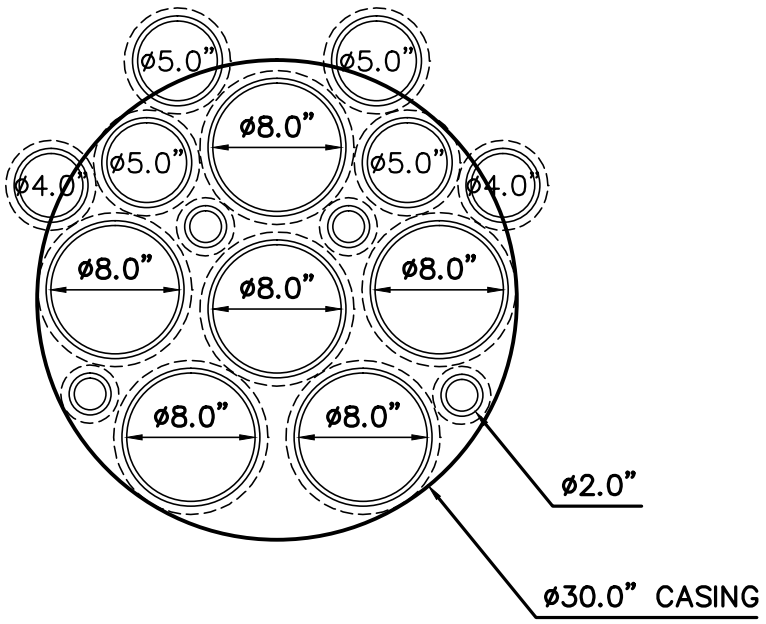

FIGURE 1

GRAPHIC SCALE

0' .5' 1' 1.5' 2' 3' 4'

SCALE 1"= 1'

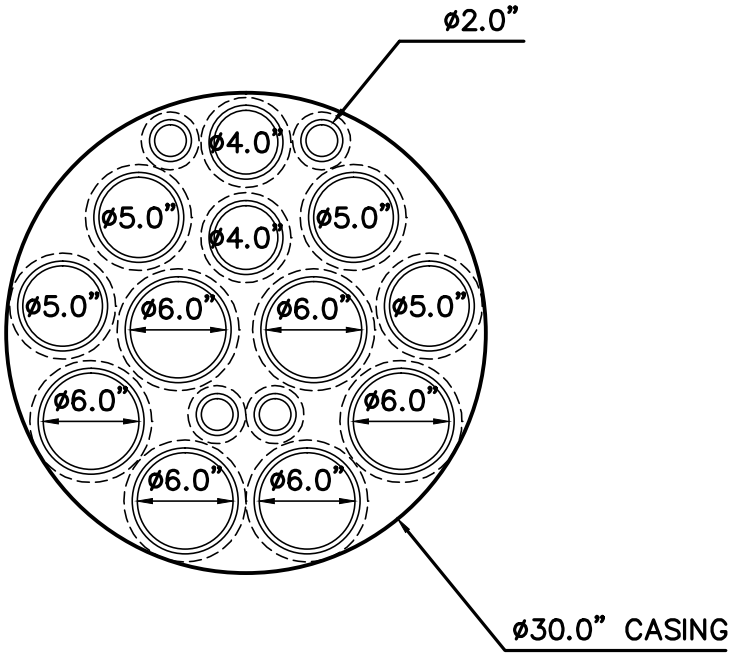

FIGURE 2

GRAPHIC SCALE

0' .5' 1' 1.5' 2' 3' 4'

SCALE 1"= 1'