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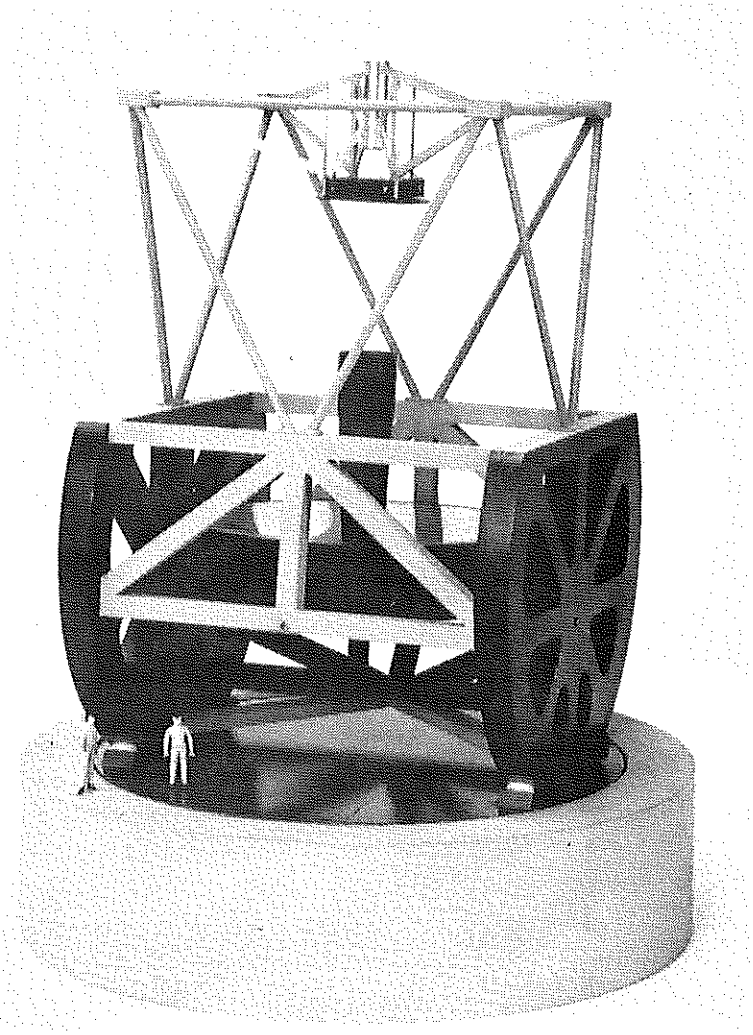

Support Building(s) for the 8-Meter Telescope

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INTRODUCTION

This report will concern itself principally with the support buildings and their siting in relationship to the telescope instrument enclosure and the topographical and wind influences of the site. Two concepts have been developed for the ridge which runs from the Swope telescope building to the du Pont telescope building. The site, identified as site 2, is approximately 140 meters southeast of the du Pont 100-inch telescope building. Both concepts will be described in words, shown graphically and their merits discussed.

TOPOGRAPHY

The ridge runs in an almost northwest-southeast direction. The length of the ridge from the Swope to the du Pont building is approximately 600 meters. The elevation at the Swope is $\approx$ 2295 meters, dropping to $\approx$ 2273 meters at mid-point along the ridge and rising back to $\approx$ 2284 meters at the du Pont. When viewed in profile, the effect is a long gentle saddle. The Observatory service road runs parallel to the ridge on the southwesterly side. Readings taken over an extended period indicate that the prevailing wind direction occurs at ninety degrees to the spine of the ridge, primarily out of the northeast and secondarily from the southwest. See Magellan Report No. 14 for an extended discussion of Las Campanas site information.

SITING

In both concepts presented in this report, the support buildings and the telescope enclosure have been disposed in a manner to minimize the amount of excavation and grading required to properly site the structures. The one-story building concept requires more earthwork than the two-story building concept. Dramatic changes in contour have been avoided in both. The position of the buildings and their relationship to the Observatory service road are arranged to provide reasonably easy access. Level terrain is provided adjacent to the structures for erection purposes and for future maintenance operations. It is propitious that the wind direction is appropriate to both concepts.

THE TELESCOPE ENCLOSURE

Only a brief discussion of the telescope enclosure will be given here. Further details can be found in Magellan Reports 4 and 11. The rotatable part of the enclosure of choice is an octagonal structure and the stationary part is a hexadecagon. The skin of the building would be a commercially available insulated panel. The octagonal building is

approximately 27 meters across. The height of the altitude axis is approximately 10 meters above grade, with the springline of the rotatable octagon at the same level. The "observing floor level" is 5 meters above grade. This configuration permits full aperture observing to 17.5 degrees altitude, decreasing to half aperture at the horizon. Both the stationary and the rotatable parts of the building have large flat areas which accommodate large doors for nighttime ventilation. We have identified the Wilson bifold doors for this application. In actual operation, the temperature of the interior of the enclosure will be artificially controlled during the day to approximate that anticipated at night. The telescope and octagonal enclosure are not co-rotating.

THE SUPPORT BUILDING

Serious study began on the integration of the telescope into its enclosure and support building after the decision was made that the alt-az disk was the mounting of choice. The support building must provide ample space for the operation and maintenance of the telescope and its instrumentation. In addition, the building must also provide a safe and convenient method for recoating the large primary mirror. Space is needed for the building mechanicals for the operation of the entire facility. At the same time the structure should not jeopardize the seeing in the telescope enclosure.

Two concepts or plans have been developed for what is identified as site 2 (see Magellan Report No. 14). The two plans differ principally in the way the primary mirror is serviced. In one concept, the mirror and cell, after removal from the telescope, are moved out of the telescope enclosure, and then, with the aid of a hoist, lowered to the coating facility level. The mirror and cell are then moved horizontally into the coating facility. In the other concept, the coating facility is at the observing floor level so that the mirror and cell move only horizontally, directly into the coating facility.

The prevailing wind directions played the major role in developing the two plans. Figure 1, a wind rose, shows the average wind direction and a building that represents the second of the two concepts. These limited wind directions, northeast or southwest, permit one to place the support building(s) so that air does not flow from the support building(s) toward the telescope enclosure. The site topography is favorably disposed to this arrangement.

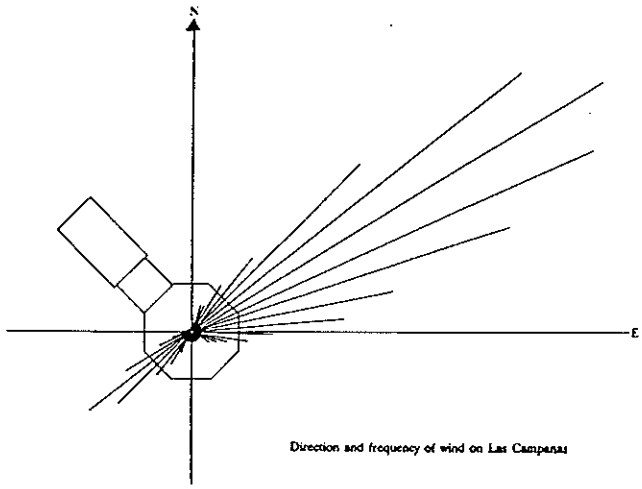

Figure 1 - Wind Rose

One-Story Building Concept

The first concept of the support building was developed in an attempt to reduce the wind profile to a minimum. The design resulted in two buildings, each one story. The coating facility, the mechanicals for all the buildings, and the telescope maintenance would be concentrated in one building and the operation and instrument maintenance in the other. The telescope enclosure remains as a semi-detached building that has no human activity. Figure 2 shows a schematic site utilization plan. The operational building is toward the northwest from the telescope enclosure and the coating and maintenance building toward the south-southeast. The floor area for operations is approximately 3600 square feet and that for mechanicals, maintenance and coating an additional 6000 square feet. In Figure 3 we show a section through the telescope enclosure and coating facility. The large vertical hoist for lowering the mirror and cell to the coating facility level is clearly shown. Figures 4 and 5 show two elevations where both buildings, in addition to the telescope enclosure, can be easily seen. Note that the coating and mechanical building is partially underground.

Two-Story Building Concept

The second concept was also driven by an attempt to reduce the building profile in the proximity of the telescope enclosure, but, in addition, convenient mirror maintenance, mirror safety and cost were taken into consideration. This plan has only one building other than the telescope enclosure, where the operations and all maintenance, including mirror coating and building mechanicals, are in a two level building. As before, the telescope enclosure has no human activity. This building is also semi-detached from the telescope enclosure at approximately the same level and manner as the operational building in the concept just described. This support building provides for operation and all instrument and some telescope maintenance on the first level and coating and the remaining telescope maintenance on the second level. Mechanicals for the two buildings are on the first level away from operations. This support building is also located strategically with regard to the prevailing wind directions (see Figure 1).

Figure 6 shows a schematic site utilization plan for the single support building. In order to avoid any possible seeing interference in the telescope enclosure, the building is placed toward the northwest, a direction from which the wind essentially never blows. The coating area on the second story has 4600 square feet, the same as in plan 1. The first floor has 3600 square feet for operations, the same as in the one-story building concept, and 2000 square feet for mechanicals and maintenance. Figure 7 shows a section through the telescope enclosure and the support building. For recoating, the mirror and cell are rolled from the observing floor, after removal from the telescope, directly into the washing room and then, after cleaning, into the coating room. Figure 8 is an elevation from the northeast. Note that for the first 10 meters, the building is at the same height as the

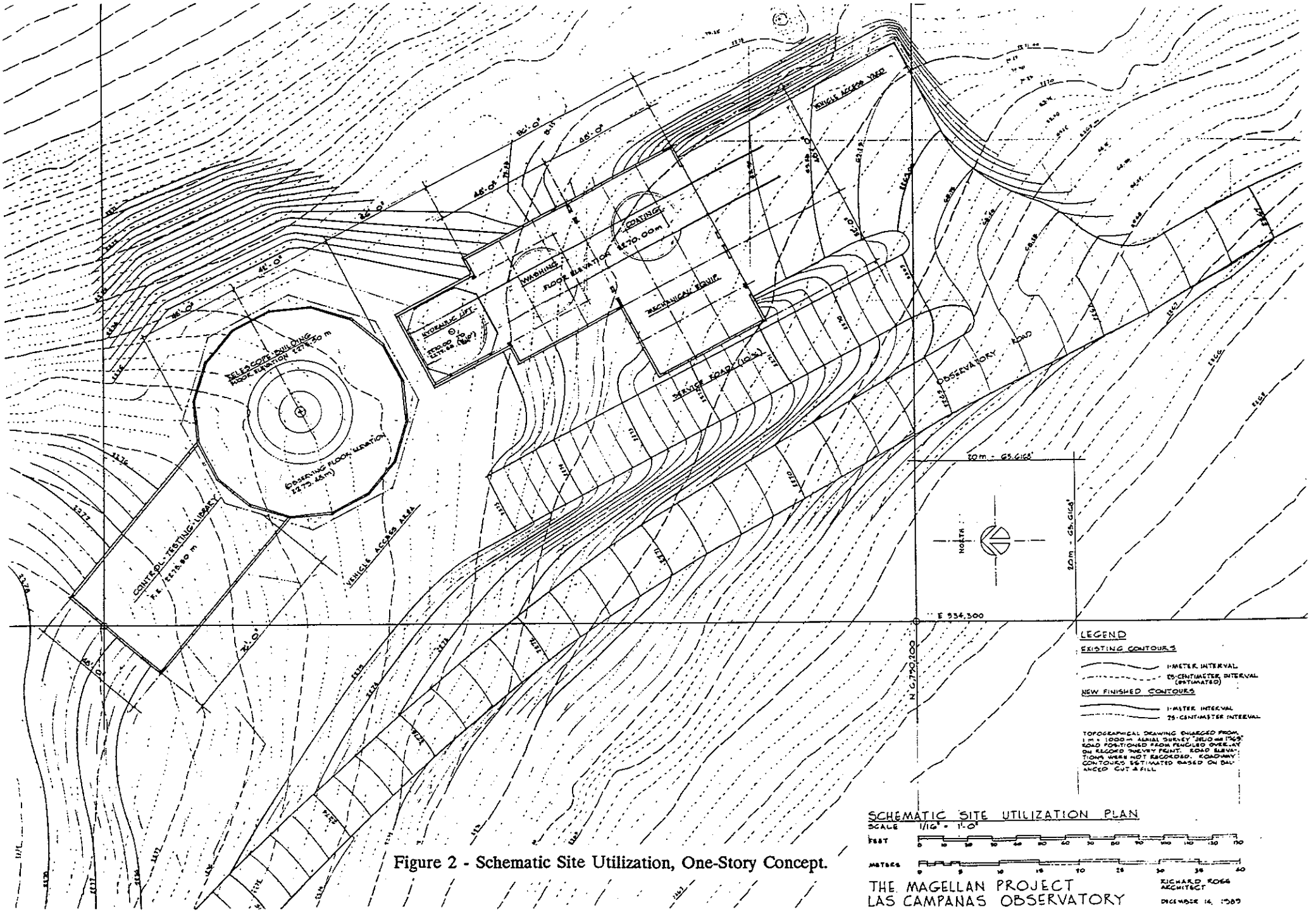

Figure 2 - Schematic Site Utilization, One-Story Concept.

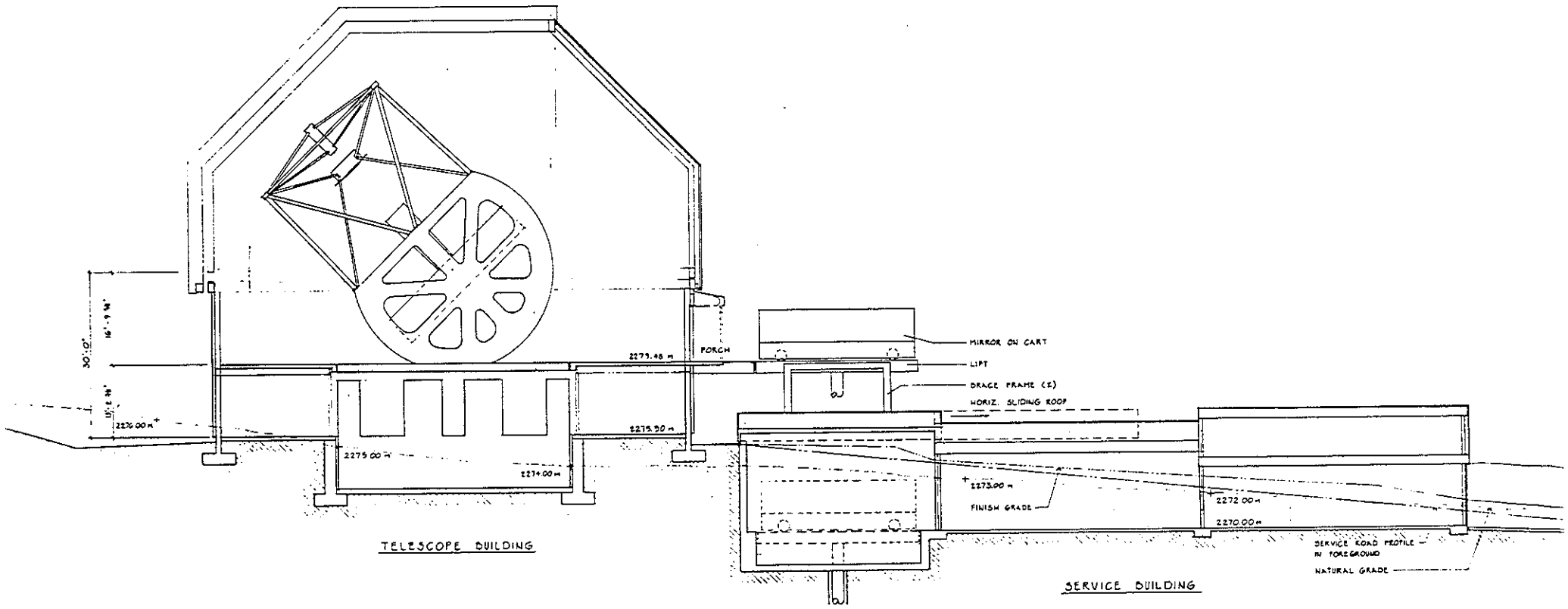

Figure 3 - Section Looking Northeast, One-Story Concept.

SCALE IN FEET 0 5 10 15 20 25 30

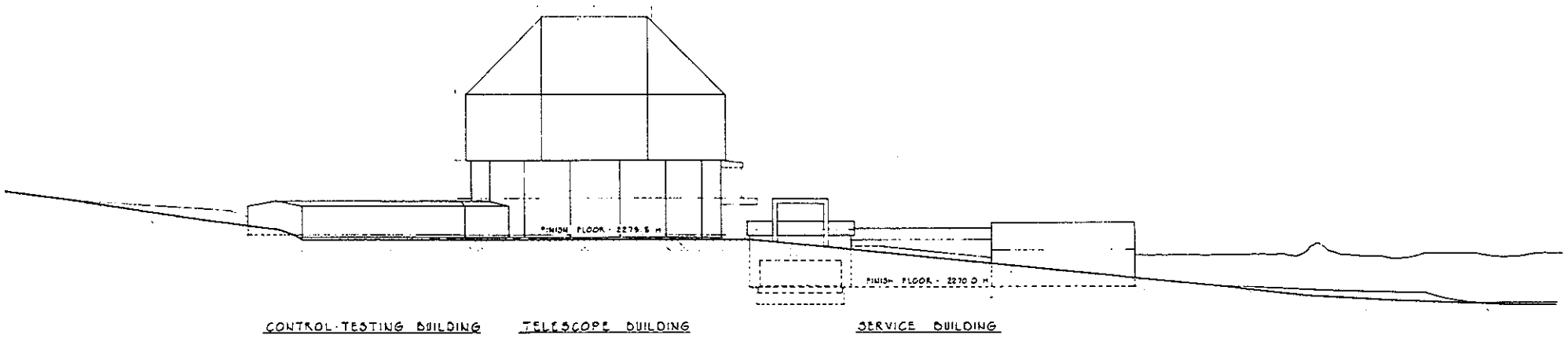

Figure 4 - Southwest Elevation, One-Story Concept.

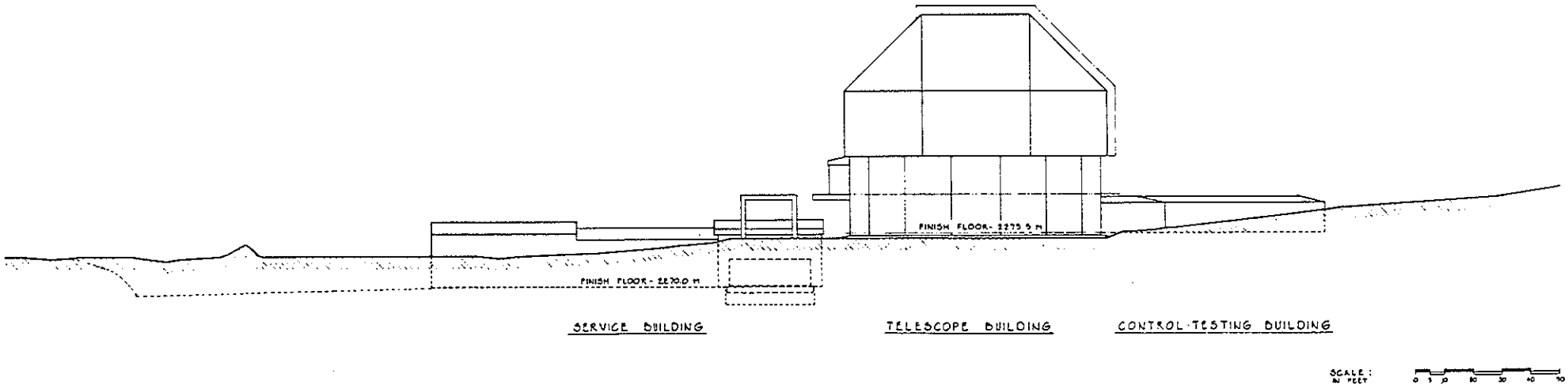

Figure 5 - Northeast Elevation, One-Story Concept.

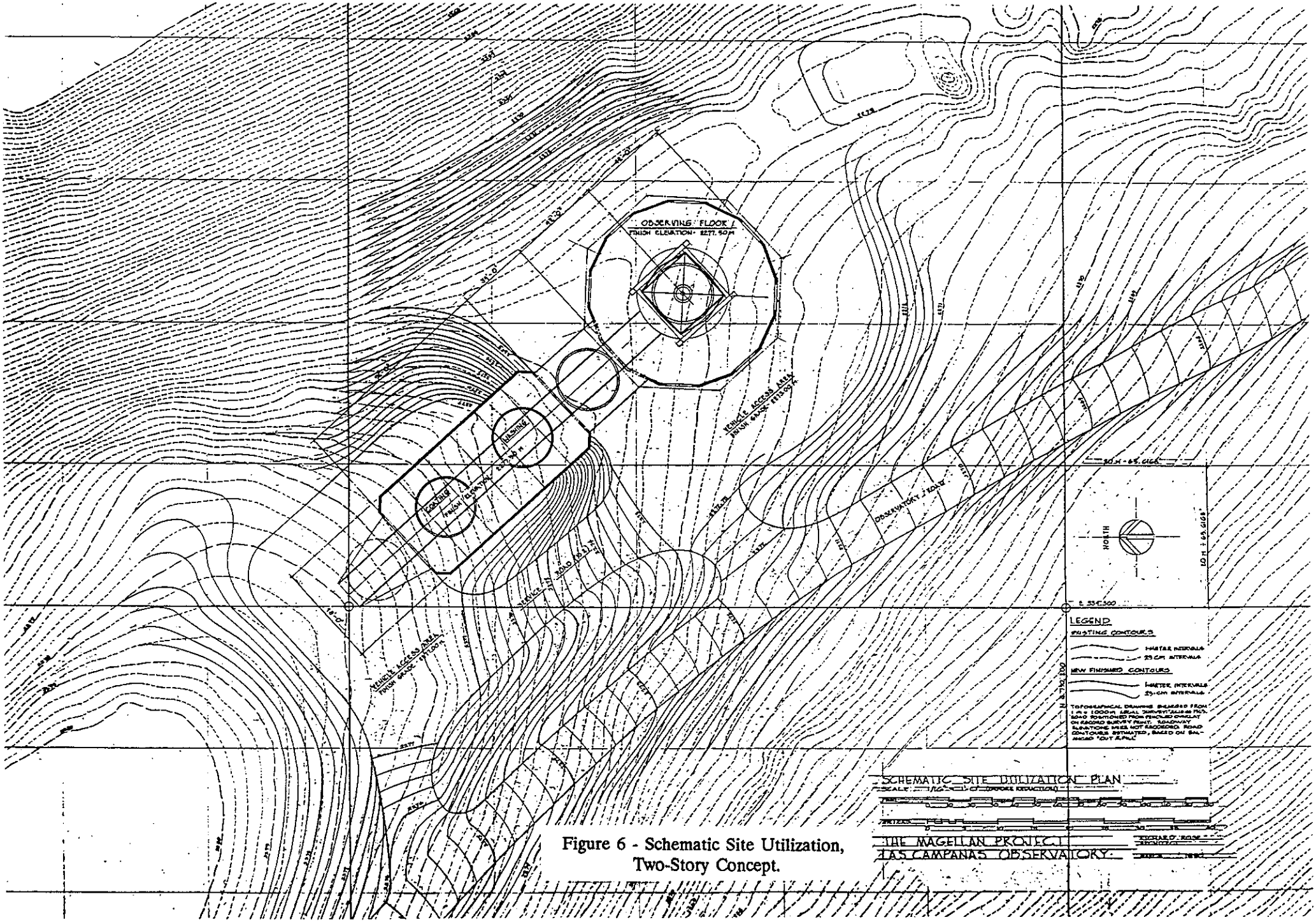

Figure 6 - Schematic Site Utilization, Two-Story Concept.

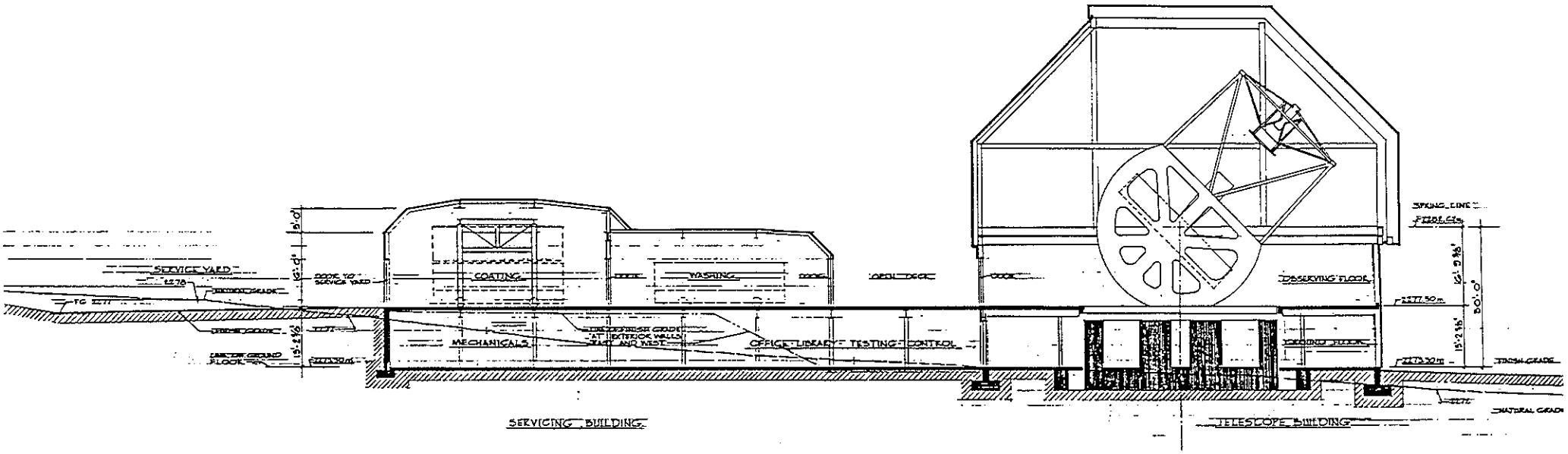

Figure 7 - Section Looking Northeast, Two-Story Concept.

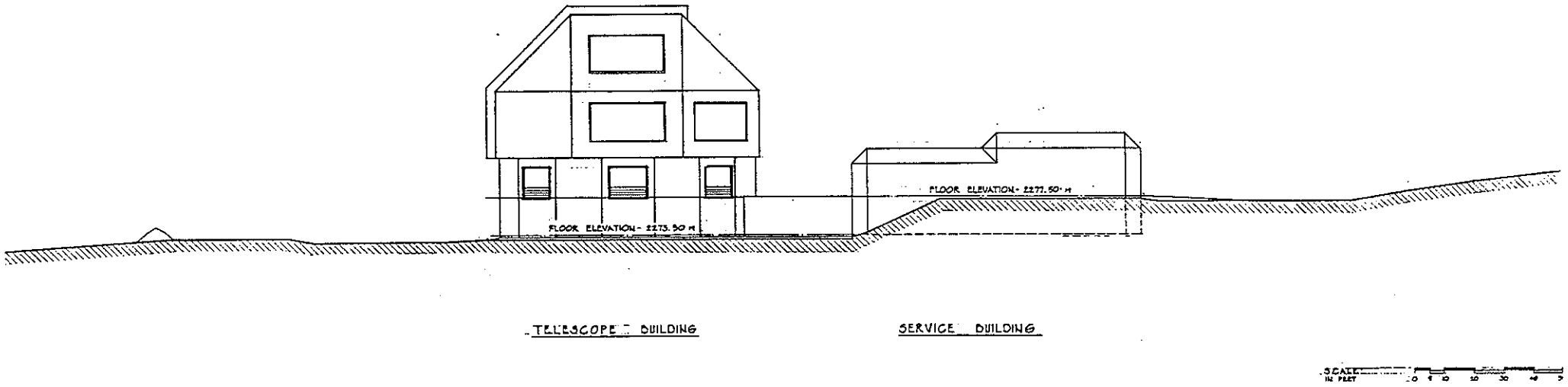

Figure 8 - Northeast Elevation, Two-Story Concept.

operational building in the first concept described above. The height is then increased in two steps to accommodate mirror washing and coating.

ADVANTAGES AND DISADVANTAGES

Either concept has its advantages and disadvantages. Some of those that come to our immediate attention are as follows (where each commonly has the same advantage or disadvantage it is not listed):

ONE-STORY BUILDING CONCEPT

Advantages

1. Lower wind profile.
2. Separation of telescope maintenance.
3. Easier large vehicle access to mechanical level of the support structure.

Disadvantages

1. Greater risk to mirror during servicing.
2. Higher cost of construction; hydraulic lift, more building and earthwork.
3. Additional design services for hydraulic lift and more building.
4. Less convenient washing and coating procedure.
5. Higher maintenance costs. Hydraulic lift maintenance, power consumption.
6. Inconvenient hike from lower support building level to telescope operations.

TWO-STORY BUILDING CONCEPT

Advantages

1. Less risk to mirror; horizontal movement only.
2. Lower design and construction cost.
3. Smaller building and site "footprint."
4. More convenient washing and coating.
5. Convenient storage for optical secondary when not in use.
6. Availability of a direct, level access from the support building service entrance to the telescope enclosure observing floor when necessary. (Initial telescope and mirror installation, for instance.)

Disadvantages

1. Higher profile of support building in relationship to finish grade and observing floor level.

It is apparent that the choice between the two concepts rests with the weight one assigns to costs, mirror safety, convenience, and a judgement call regarding the influence that the higher profile building will have, if any, on the seeing toward the northwest when this building's higher profile is some 10 meters from the telescope enclosure and in the typical crosswind. In order to further reduce any residual effect the boundary layer may have on the seeing in the enclosure, the suggestion has been made that the grade floor level, which normally would be used only for storage, be open. The wind would then move relatively unimpeded under the observing floor. This suggestion applies to either concept. The only obvious concern is the warming of the floor during the day and the loss of dead storage space.