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CH2MHILL

TECHNICAL MEMORANDUM

IRWP Seasonal Storage Project Pump Stations Evaluation

PREPARED FOR: City of Santa Rosa

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Background and Purpose

Approximately 500 million gallons (MG) of additional seasonal storage is needed in the Santa Rosa Subregional Water Reuse System (Subregional System) to facilitate carrying out the Incremental Recycle Water Program (IRWP) Master Plan objectives. Subsequent to reviewing the Evaluation of Storage Sites, the Santa Rosa Board of Public Utilities authorized conceptual design development of storage facilities located at the six recommended sites listed in Table 1. At all storage sites, depending on site elevation, a pump station will be required either to fill the storage pond or to pump from the pond back into the Subregional System.

TABLE 1
Storage Sites and Ponds
IRWP Seasonal Storage Project - Pump Stations Evaluation

Site	Storage Pond(s)	ID	Normal Fill Rate[a] (mgd)	Max Fill Rate[b] (mgd)	Normal Drain Rate[a] (mgd)	Max Drain Rate[b] (mgd)	Total Pump Station hp
Kelly Farm	Pond No. 1	KF1	5	8	2	7	80
Kelly Farm	Pond No. 2	KF2	5	8	2	7	80
Brown Farm	Pond No. 1	BF1	7	10	2	5	60
Brown Farm	Pond No. 2	BF2	7	10	2	5	60
Alpha Farm	Pond No. 1	AF1	3	4	1	5	60
Petaluma Hill Road	Pond No. 1	PHR1	7	12	3	3	400
Petaluma Hill Road	Pond No. 2	PHR2	7	12	3	3	400

[a]Normal fill and drain rates at which the pond must fill or drain to facilitate irrigation demands.

[b]Maximum fill and drain rates are the maximum rates used in the Storage Planning Model (used to offset high volumes in Meadow Lane Pond complex or Delta Pond).

Conclusions and Recommendations

The configuration of the pump station would depend on whether it would be used to pump out of a storage pond or to boost the recycled water pipeline pressure to fill a pond. Vertical turbine pumps enclosed in masonry buildings are recommended for either configuration. An inboard configuration is recommended for the Alpha, Brown, and Kelly storage pond sites, and an outboard configuration is recommended for the Petaluma Hill Road (PHR) site.

The West College and Alexander Valley Road Sites are not considered further because of findings from the geotechnical investigations indicating uncertainty related to potential impacts from liquefaction, fault zones, and/or landslides and the appropriate measures to mitigate for these potential hazards. Based on the geotechnical findings at these sites, both are considered infeasible as defined by CEQA Guidelines, as described in the TM *Geotechnical Evaluation, November 2007*.

Pump Station Configurations

The existing recycled water pipelines have sufficient pressure to fill the proposed ponds at all of the sites. However, pumps would be required to move the recycled water out of the ponds and back into the recycled water pipelines. Table 1 provides the normal and maximum fill and drain rates for each of the proposed ponds as provided in the TM, *Water Reuse System Storage Model, November 2007*.

Two types of pump stations are described below: an inboard pump station, and an outboard pump station. For either type of pump station, vertical turbine-type pumps are shown. Generally, they are less affected by pressure variations than horizontal pumps, and they provide a more consistent output over a wider pressure range. In addition, they require less floor space than horizontal pumps.

Constant-speed pumps would be used for draining the ponds against a constant pressure in the recycled water pipelines. Consequently, the flow out of the pump station would only be adjusted in increments equal to the output of each pump. If smaller flow increments are required, adjustable-speed drives can be used to vary and control the pump output.

The pump stations in either configuration would be sized to provide the maximum drain rate shown in Table 1, with one additional pump to provide redundancy. It is assumed that all pumps would have a capacity between 2 and 3 million gallons per day (mgd). The physical size of the pumps and discharge piping would be the same throughout this capacity range, so only one size pump is shown. Figures 3 and 4 show an outboard pump station with three pumps. This would be appropriate for Alpha Farm or Brown Farm, where two duty pumps would deliver 5 mgd. The size of the pump station structure at Kelly Farm can be approximated by adding one pump to the arrangement shown on the figures. At Kelly Farm, the pump station would be approximately 6 feet longer than shown.

Inboard Pump Station

For draining a storage pond, the pump station would be constructed on the inboard side of the pond as shown on Figures 1 and 2. Vertical line-shaft pumps would be suspended on a concrete slab above a pump well constructed in the side of the embankment. A slanted trash

rack would keep larger debris from entering the pumps. The pumps would be enclosed in a masonry building to minimize exterior noise and to protect the equipment from vandalism. Skylights would be provided above the pumps for pump removal and replacement.

The discharge piping would not penetrate the storage pond embankment, but would cross over it in a concrete encasement. In the immediate vicinity of the pump station, the embankment would be raised and widened slightly to cover the piping. Because the piping would not be in the embankment, regulatory requirements would be less stringent.

Outboard Pump Station

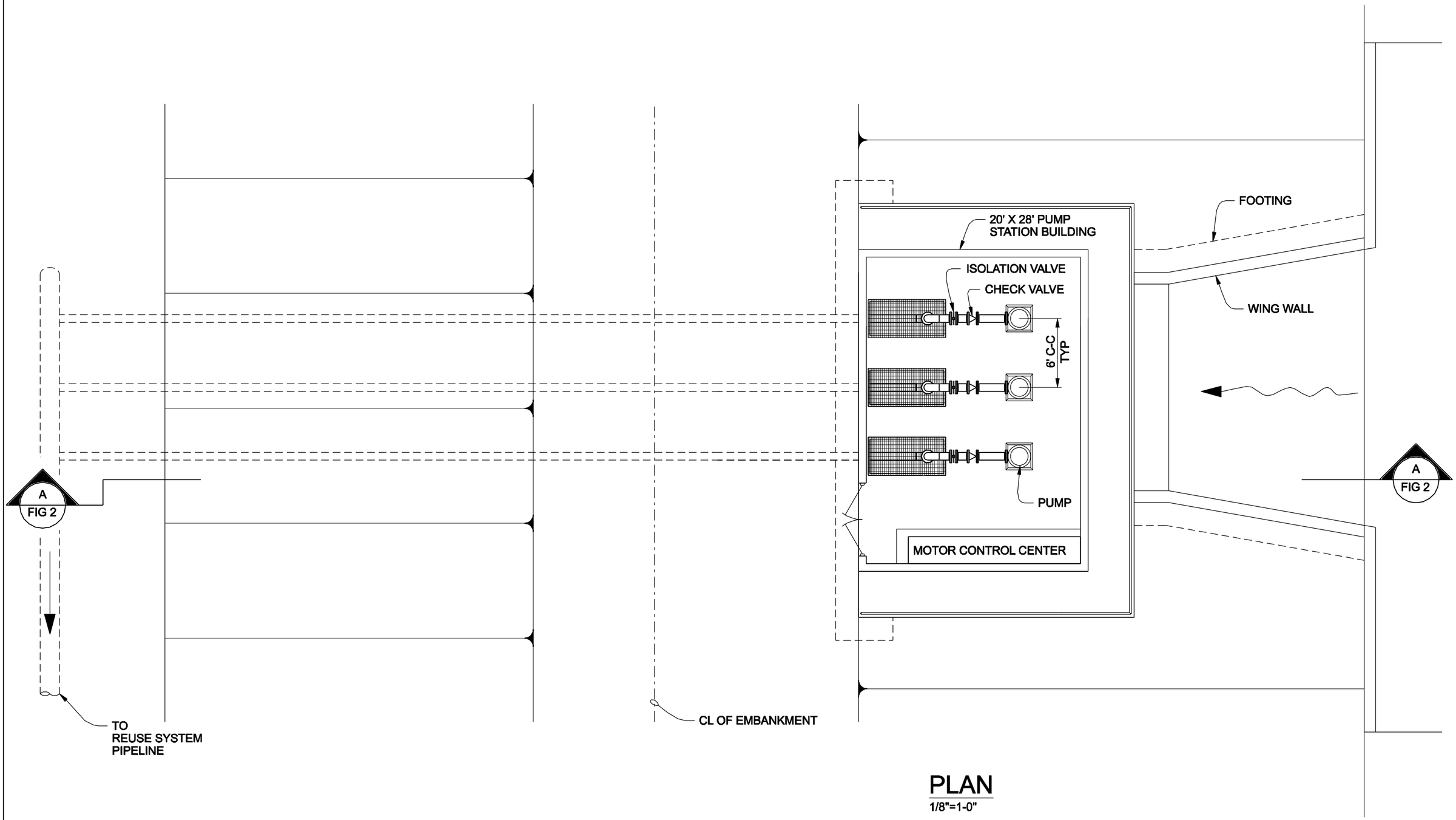
At the PHR site, an outboard pump station is considered to be preferable because it could be integrated with the treatment facilities (required for returning the stored water into the Rohnert Park Urban Reuse System) and reduce the number of structures on the site.

The proposed pump station would be located on the outboard side of the pond embankment. The pump station would have slab-on-grade construction with vertical pumps installed in suction cans. This arrangement is shown on Figures 3 and 4.

As with the inboard pump station configuration, it is assumed that an outboard pump station would also have a masonry building for noise reduction and protection of the equipment. Skylights would be provided above the pumps for pump removal and replacement.

Adjustable frequency drives are shown, but would only be necessary to allow the pumps to operate over the wide range of flows.

Figures



PLAN
1/8"=1-0"

IRWP MASTER PLAN
Seasonal Storage

FIGURE 1
TYPICAL INBOARD
PUMP STATION PLAN

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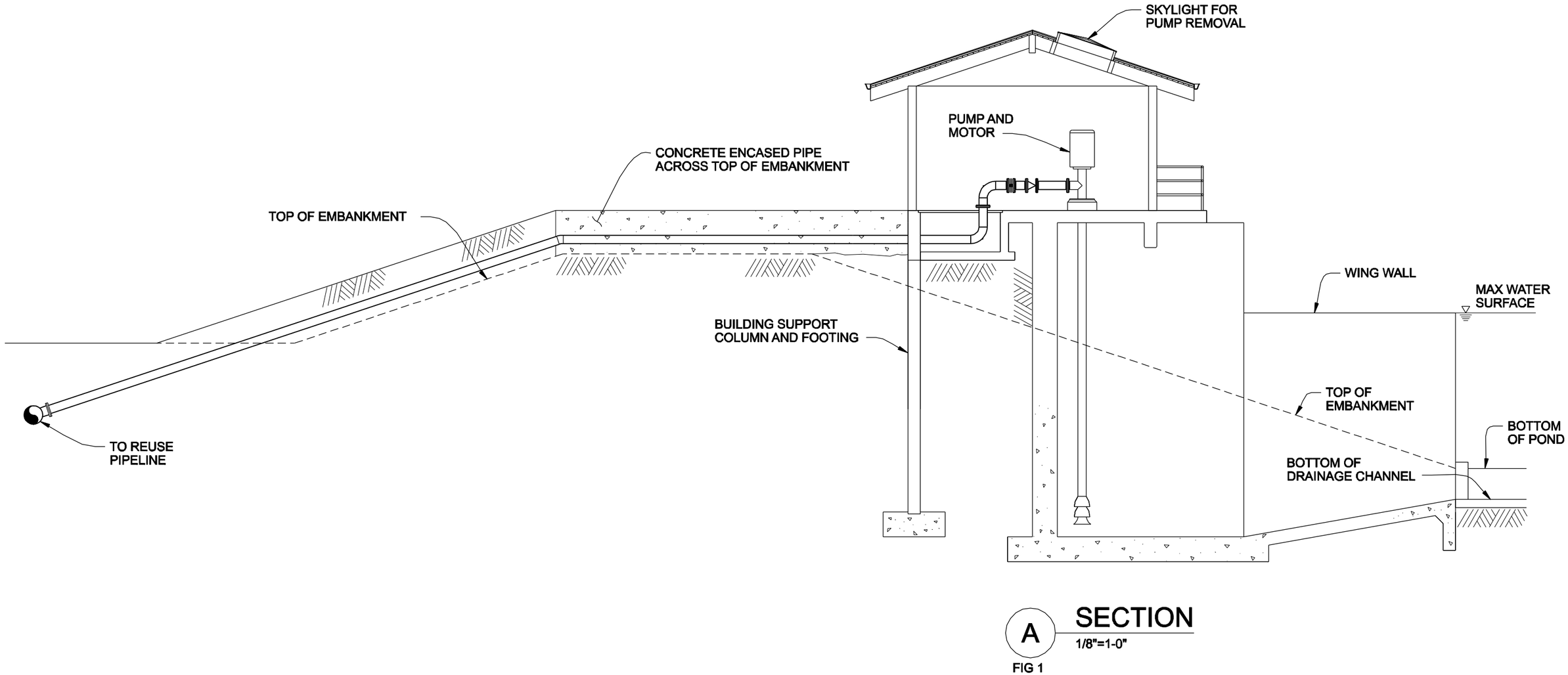

A SECTION
1/8"=1-0"

FIG 1

IRWP MASTER PLAN
Seasonal Storage

FIGURE 2
TYPICAL INBOARD
PUMP STATION SECTION

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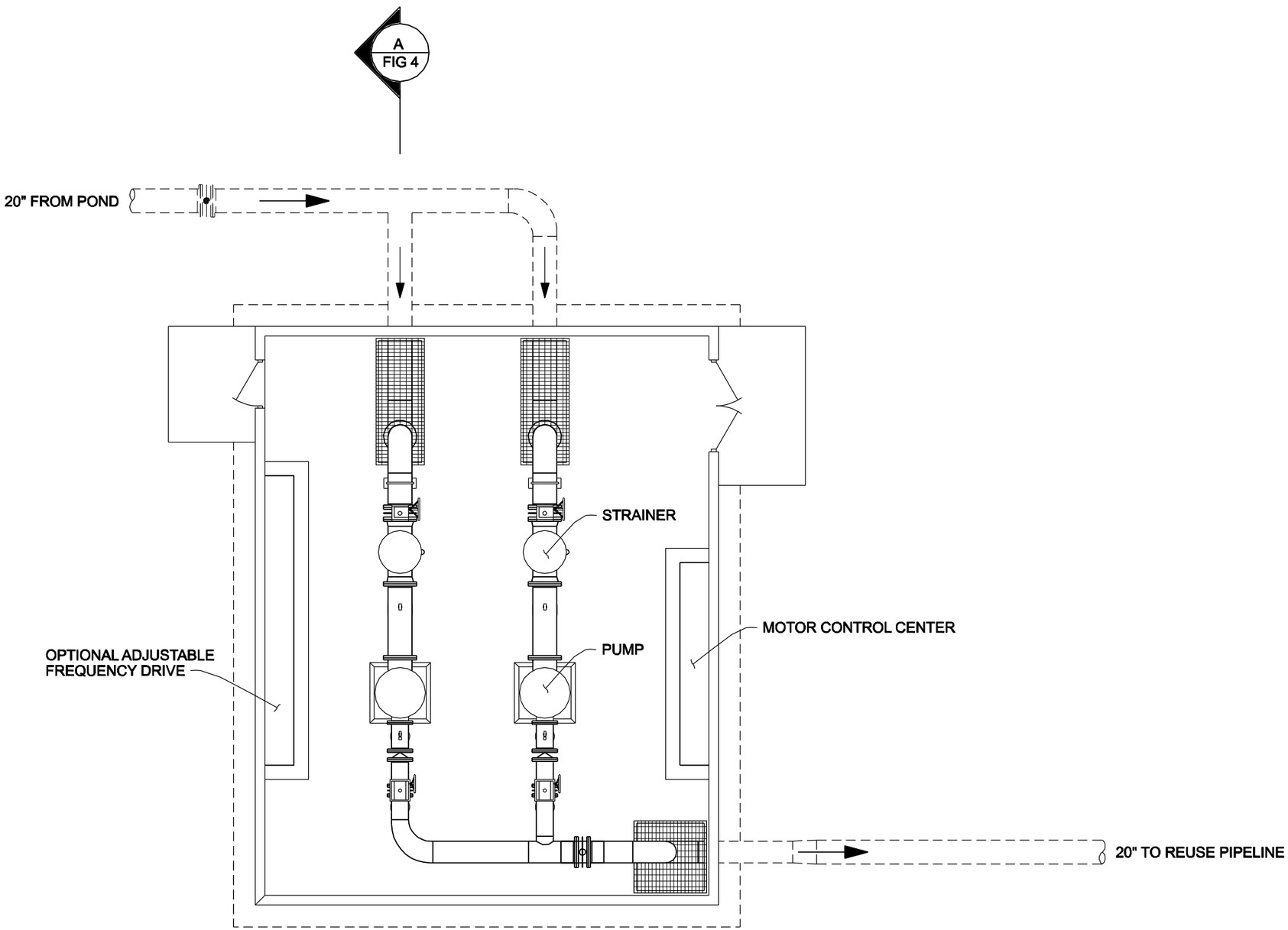

A
FIG 4

40'x32' PUMP STATION

PLAN

1/8"=1'-0"

IRWP MASTER PLAN

Seasonal Storage

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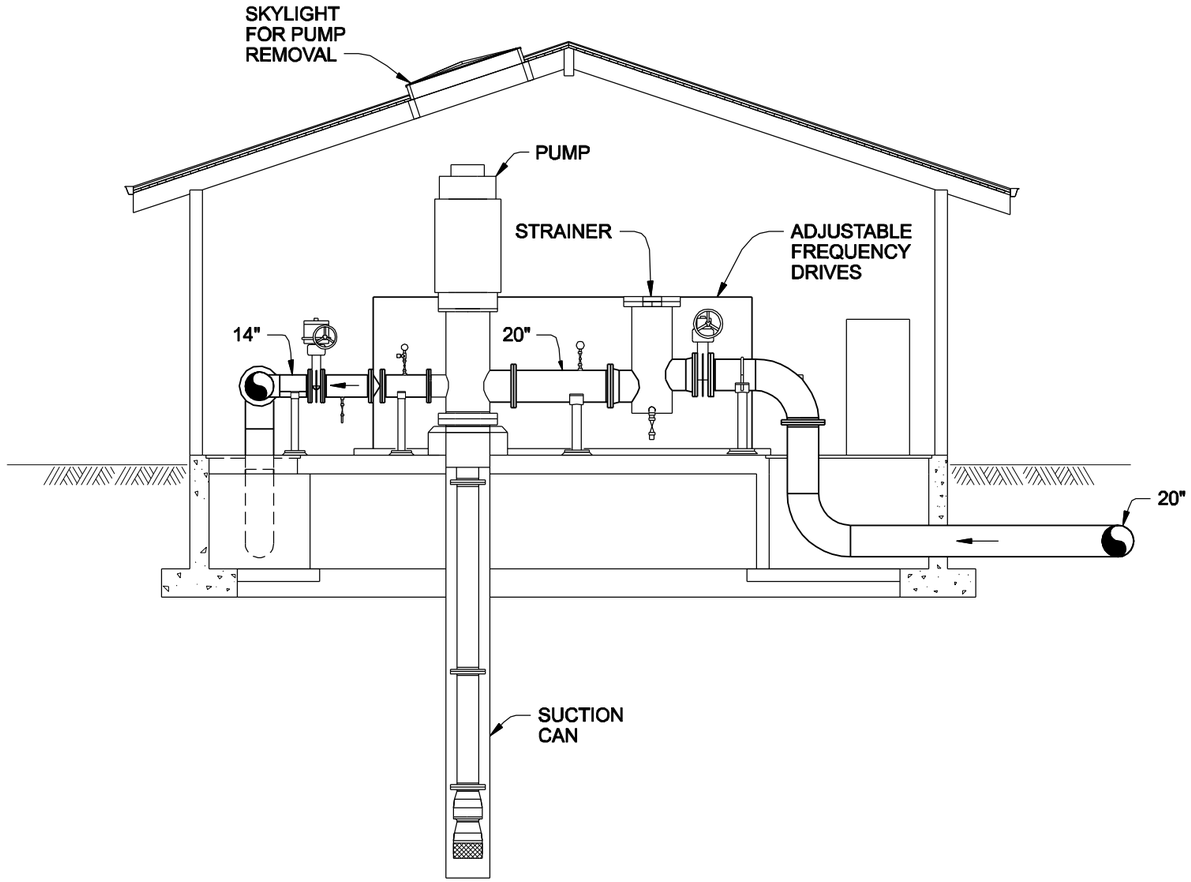
FIGURE 3
TYPICAL OUTBOARD
PUMP STATION PLAN



A SECTION
1/8"=1'-0"

FIG 3

IRWP MASTER PLAN
Seasonal Storage

FIGURE 4
TYPICAL OUTBOARD
PUMP STATION SECTION

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