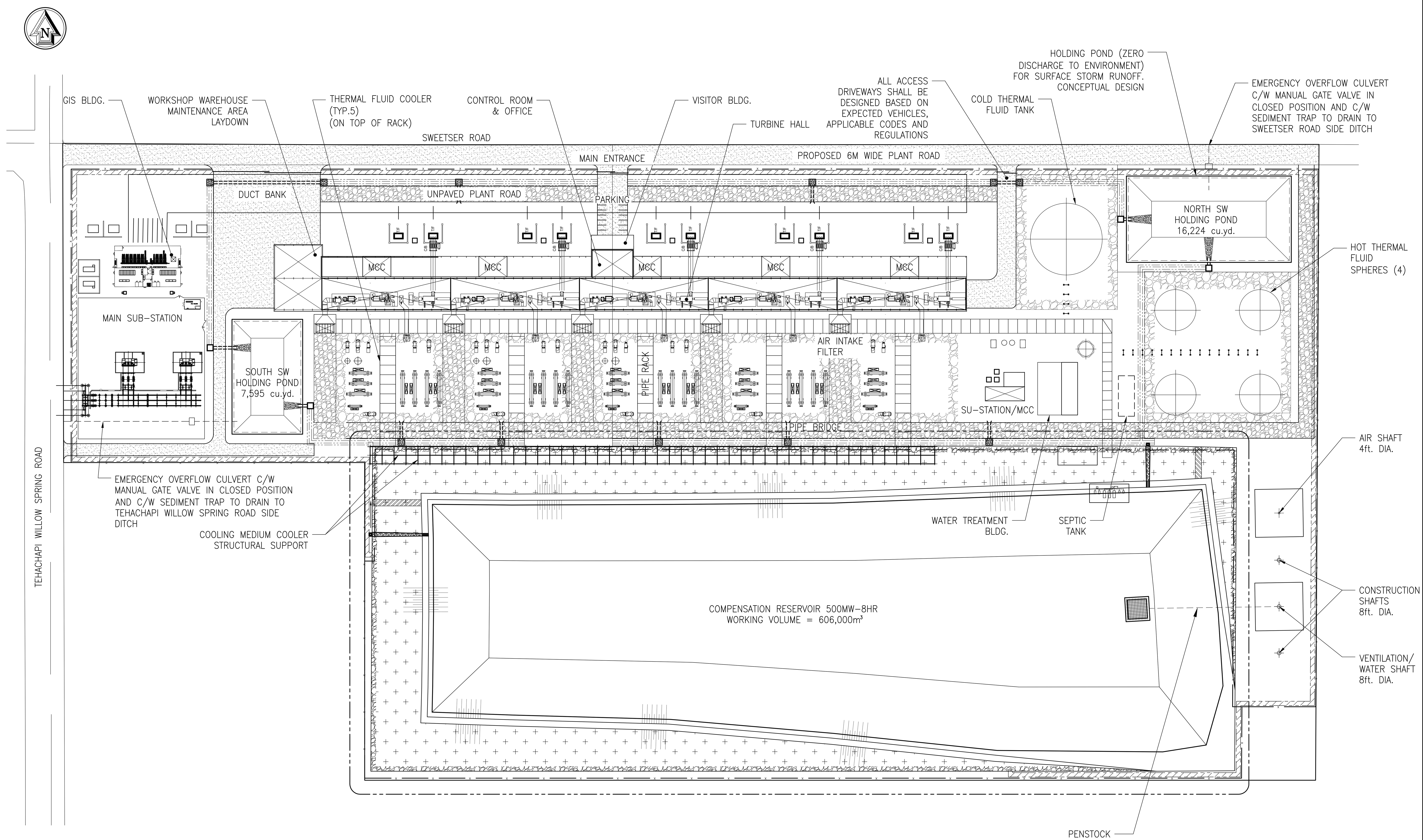
DOCKETED	
Docket Number:	21-AFC-02
Project Title:	Gem Energy Storage Center
TN #:	240768-14
Document Title:	Appendix 5_15A
Description:	N/A
Filer:	Kari Miller
Organization:	Golder Associates USA Inc.
Submitter Role:	Applicant Representative
Submission Date:	12/1/2021 5:37:30 PM
Docketed Date:	12/1/2021

APPENDIX 5.15A

Grading and Drainage Plan, Stormwater Basin Design Drawings and Supporting Calculations Forms



CIVIL LAYOUT PLAN

NOTES:

1. RESERVOIR SIZE, SHAPE AND POSITION MAY CHANGE
2. RESERVOIR IS NOT SIZED TO RECEIVE ENTIRE SITE STORM RUNOFF
3. ASSUMPTIONS
   NO STRUCTURAL OR STABILITY STUDY DONE.
   FREE BOARD & STORM WITHIN THE RESERVOIR = 4 ft.
4. FOR EQUIPMENT LAYOUT DRAWING, REFER TO 21-5291-00-3149-002
5. FOR GRADE ELEVATIONS, REFER TO DWG 21-5291-00-3341-004

LEGEND:

- SOIL BERM
- FENCE
- RIP RAP
- GRASSED (HYDROSEED)
- CUT/FILL SLOPE
- PAVED SURFACE (ASPHALT)
- GRAVEL SURFACE
- GRAVEL PAVED

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION

REV.	MM/DD/YY DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
C	07/29/21	ISSUED FOR PERMIT	GKW	KVS	NSM	
B	07/22/21	ISSUED FOR REVIEW	GKW	KVS	NSM	
A	07/21/21	ISSUED FOR SQUAD CHECK	GKW	KVS	NSM	

CLIENT

HYDROSTOR

TITLE GEM ENERGY STORAGE CENTER 500MW-8HR CIVIL LAYOUT PLAN

SCALE: NTS
DRAWN BY GKW
CHECKED BY KVS
APPROVED NSM

EMPOWERING EPCM
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PROJECT NO. 21-5291
DRAWING NO. 21-5291-00-3341-001
SHT. 1 / 1
REV. C

PRELIMINARY NOT FOR CONSTRUCTION

CONCEPTUAL

FileName: J:\21-5291 HYDROSTOR ROSAMOND PROJECT\30 ENG\33 CIVIL\41 SITE PREP\21-5291-00-3341-001.DWG
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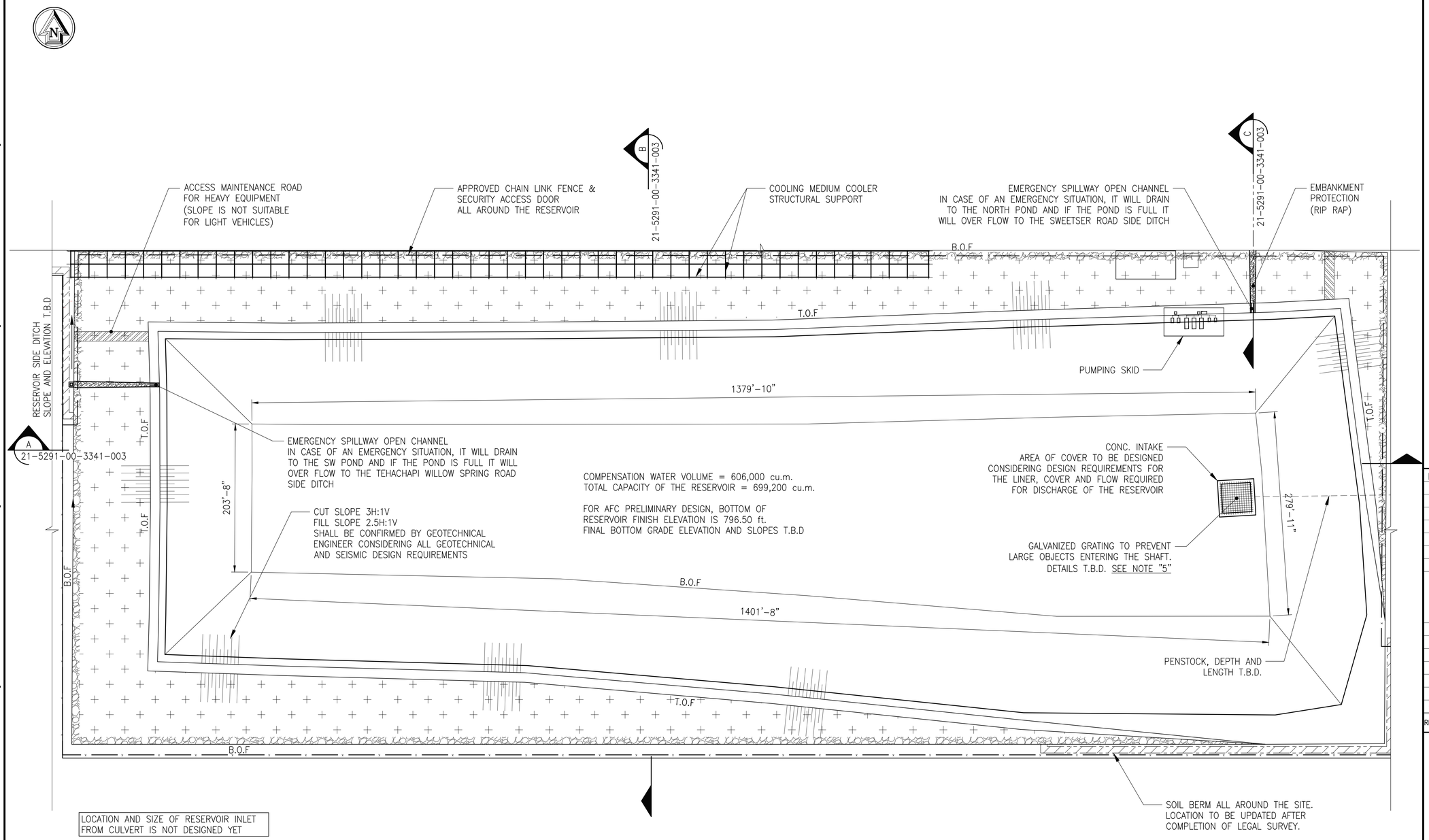

RESERVOIR PARTIAL PLAN

FOR LAYOUT, REFER TO DWG 21-5291-00-3341-001

NOTES:

1. RESERVOIR SIZE, SHAPE AND POSITION ARE PRELIMINARY AND DESIGN IS AN INITIAL ESTIMATION.
2. RESERVOIR IS NOT SIZED FOR SITE STORM RETENTION/DETENTION
3. ASSUMPTIONS
   NO STRUCTURAL OR STABILITY STUDY DONE.
   FREE BOARD & STORM WITHIN THE RESERVOIR = 4 ft.
   PROPOSED RESERVOIR SIZE MAY CHANGE
4. FOR FINISH ELEVATION SEE SECTIONS
5. A SEDIMENT CONTROL AND BLOCKING PREVENTION SYSTEM WILL BE DESIGNED FOR RESERVOIR DRAINAGE OUTLET CONSIDERING EXISTENCE OF WATER TIGHT COVER OVER THE ENTIRE RESERVOIR.

LEGEND:

SOIL BERM

FENCE

RIP RAP

GRASSED (HYDROSEED)

CUT/FILL SLOPE

PAVED SURFACE (ASPHALT)

GRAVEL SURFACE

GRAVEL PAVED

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION

REV.	DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
C	07/29/21	ISSUED FOR PERMIT	GKW	KVS	NSM	
B	07/22/21	ISSUED FOR REVIEW	GKW	KVS	NSM	
A	07/21/21	ISSUED FOR SQUAD CHECK	GKW	KVS	NSM	

CLIENT

HYDROSTOR

TITLE

GEM ENERGY STORAGE CENTER
500MW-8HR
RESERVOIR CONCEPTUAL DESIGN
PARTIAL PLAN

SCALE:	NTS
DRAWN BY	GKW
CHECKED BY	KVS
APPROVED	NSM

EMPOWERING EPCM
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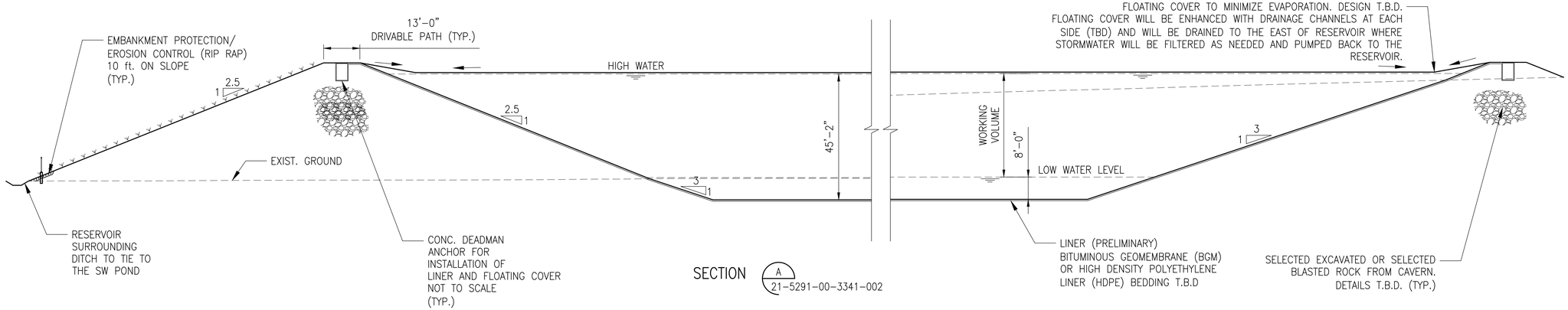
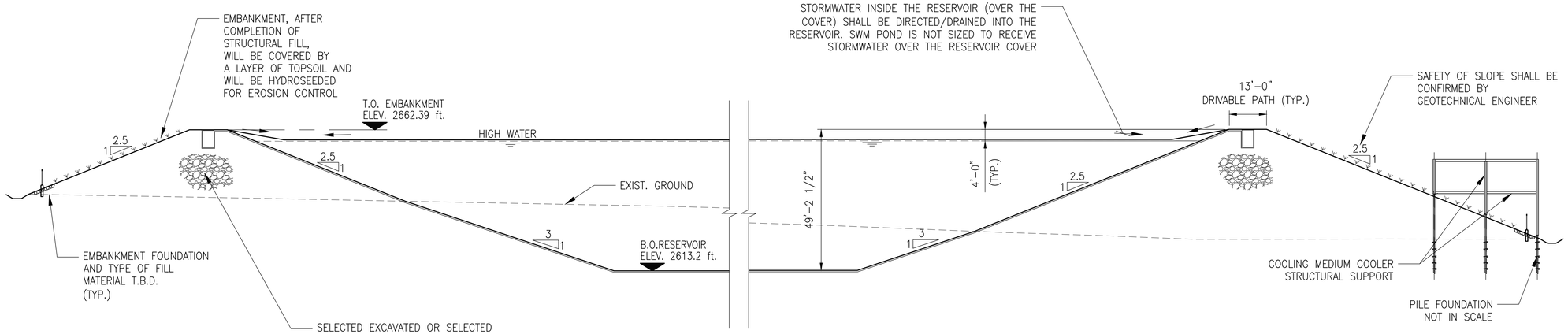
PROJECT NO.	DRAWING NO.	SHT.	REV.
21-5291	21-5291-00-3341-002	1/1	C

PRELIMINARY
NOT FOR
CONSTRUCTION

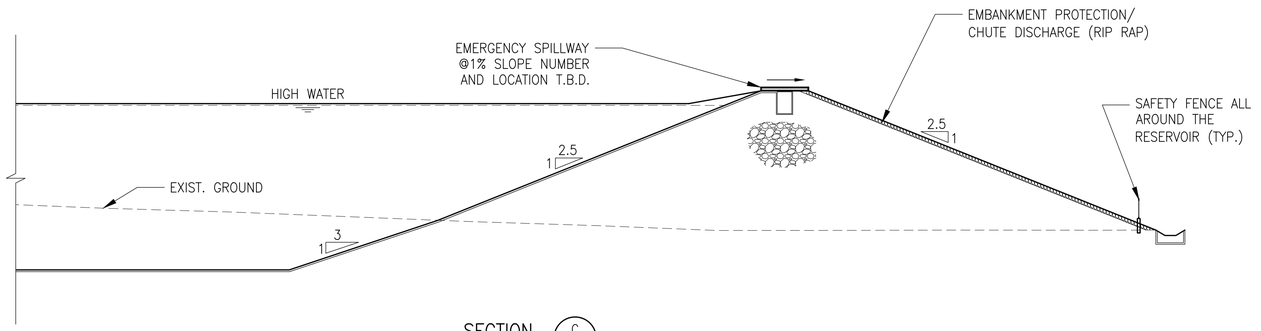
CONCEPTUAL



SECTION A
21-5291-00-3341-002



SECTION B
21-5291-00-3341-002



SECTION C
21-5291-00-3341-002

PRELIMINARY
NOT FOR
CONSTRUCTION

CONCEPTUAL

NOTES:

1. RESERVOIR SIZE, SHAPE AND POSITION ARE PRELIMINARY AND DESIGN IS AN INITIAL ESTIMATION.
2. RESERVOIR IS NOT SIZED FOR SITE STORM RETENTION/DETENTION
3. ASSUMPTIONS
   NO STRUCTURAL OR STABILITY STUDY DONE.
   FREE BOARD & STORM WITHIN THE RESERVOIR = 4 ft.
   PROPOSED RESERVOIR SIZE MAY CHANGE
4. NO TOPOGRAPHICAL SURVEY AND NO BOUNDARY SURVEY AVAILABLE. EXIST. GROUND ELEVATIONS ARE EXTRACTED FROM AUTODESK INFRAWORKS 360
5. COMPREHENSIVE GEOTECHNICAL INVESTIGATION REPORT FOR EXIST. GROUND AND PROPOSED DESIGN SHALL BE PROVIDED PRIOR DETAIL ENGINEERING PHASE.
6. FOR APPLICABLE CODES AND STANDARDS, REFER TO PROJECT'S DESIGN BASIS.

ABBREVIATION:

T.B.D. TO BE DETERMINED

LEGEND:

RIP RAP
SLOPE DIRECTION
GRAVEL
GRASSED (HYDROSEED)

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION

REV.	DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
C	07/29/21	ISSUED FOR PERMIT	GKW	KVS	NSM	
B	07/22/21	ISSUED FOR REVIEW	GKW	KVS	NSM	
A	07/21/21	ISSUED FOR SQUAD CHECK	GKW	KVS	NSM	

CLIENT

HYDROSTOR

TITLE GEM ENERGY STORAGE CENTER
500MW-8HR
RESERVOIR CONCEPTUAL DESIGN
SECTIONS

SCALE: NTS
DRAWN BY GKW
CHECKED BY KVS
APPROVED NSM

TWD
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PROJECT NO. 21-5291
DRAWING NO. 21-5291-00-3341-003
SHT. 1/1
REV. C

FileName: z:\21-5291 HYDROSTOR ROSAMOND PROJECT\30 ENG\33 CIVIL\41 SITE PREP\21-5291-00-3341-003.DWG
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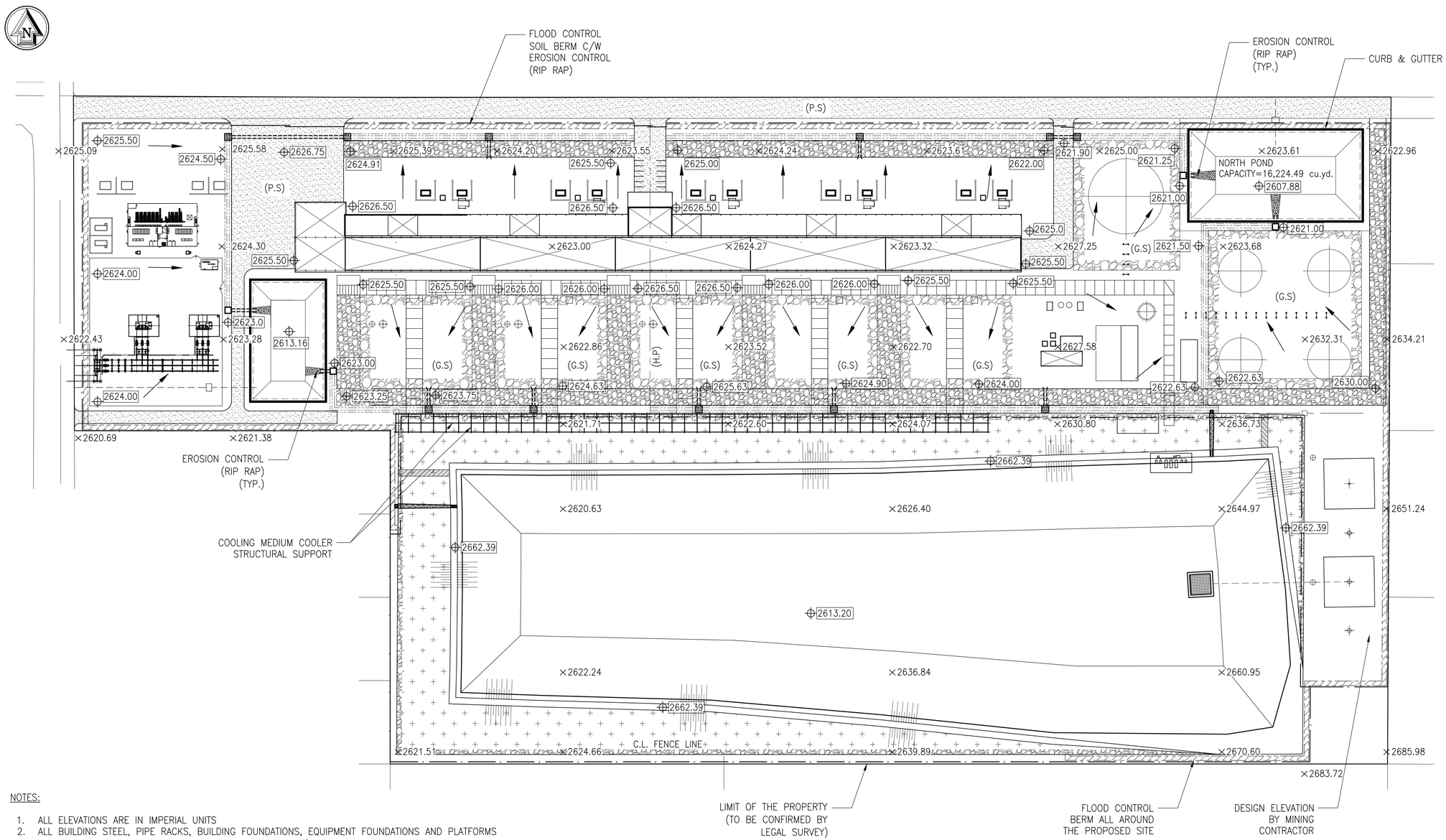


GRADING PLAN

NOTES:

1. ALL ELEVATIONS ARE IN IMPERIAL UNITS
2. ALL BUILDING STEEL, PIPE RACKS, BUILDING FOUNDATIONS, EQUIPMENT FOUNDATIONS AND PLATFORMS ARE CONCEPTUAL AT THIS STAGE. NO STRUCTURAL DESIGN/CALCULATIONS ARE PERFORMED
3. NO TOPOGRAPHICAL/LEGAL SURVEY AVAILABLE AT THIS TIME
4. RESERVOIR SIZE, SHAPE AND POSITION ARE PRELIMINARY BASED ON VOLUME SPECIFIED BY HYDROSTOR. CURRENT DESIGN INCLUDES 4ft. FREEBOARD AND 15% EXTRA TO WORKING VOLUME
5. NO STRUCTURAL OR STABILITY STUDY DONE
6. NO EVAPORATION CONSIDERED
7. NO ICE OR FREEZING CONDITION CONSIDERED
8. CUT SLOPE FOR 3H:1V
9. FILL SLOPE FOR 2.5H:1V
10. LINER WILL BE BITUMINOUS GEOMEMBRANE OR HIGH DENSITY POLYETHYLENE
11. ASSUMED LINER WILL BE FINAL SURFACE OF THE RESERVOIR
12. FLOATING COVER WILL BE INSTALLED TO MINIMIZE EVAPORATION. CONCRETE DEADMAN ANCHOR WILL BE INSTALLED TO STABILIZE THE LINER AND FLOATING COVER
13. TOP WIDTH OF RESERVOIR EMBANKMENT IS 13ft. FOR HEAVY EQUIPMENT ACCESS
14. NO LIGHT VEHICLE ACCESS WILL BE REQUIRED TO TOP OF THE RESERVOIR EMBANKMENT
15. ONLY 2 EMERGENCY SPILLWAY CONSIDERED AT THIS STAGE OF DESIGN FOR EACH RESERVOIR
16. RESERVOIR OUTER EMBANKMENTS SLOPE WILL BE COVERED BY RIP RAP (BOTTOM 10ft.) AND THE REST WILL BE COVERED BY TOPSOIL AND HYDRO SEEDED
17. ASSUMED RESERVOIR IS CONSIDERED A DAM ACCORDING TO DSOD REQUIREMENTS
18. STORMWATER INSIDE THE RESERVOIR (TOP OF THE FLOATING COVER) WILL BE TREATED (IF REQUIRED) AND PUMPED BACK TO THE RESERVOIR
19. A COMPREHENSIVE GEOTECHNICAL INVESTIGATION SHALL BE COMPLETED PRIOR TO ENGINEERING DESIGN PHASE
20. EXIST. ELEVATIONS ARE EXTRACTED FROM AUTODESK INFRAWORKS 360 CONTOUR LINES. FURTHER TOPOGRAPHICAL SURVEY SHALL BE PROVIDED PRIOR TO ENGINEERING DESIGN PHASE

EXIST. GRADE ELEVATIONS ARE EXTRACTED FROM AUTODESK INFRAWORKS 360.

PRELIMINARY NOT FOR CONSTRUCTION

CONCEPTUAL

ABBREVIATION:

P.S	PAVED SURFACE
G.S	GRAVEL SURFACE
H.P	HIGH POINT
C.L	CENTER LINE

LEGEND:

DITCH/SWALE	
FENCE	x
RIP RAP	
SLOPE DIRECTION	
EXISTING GRADE ELEV.	× 801.68
DESIGN GRADE ELEV.	⊕ 800.50
PAVED SURFACE (ASPHALT)	
GRAVEL SURFACE	
GRAVEL PAVED	

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION

REV.	MM/DD/YY DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
C	07/29/21	ISSUED FOR PERMIT	GKW	KVS	NSM	
B	07/22/21	ISSUED FOR REVIEW	GKW	KVS	NSM	
A	07/21/21	ISSUED FOR SQUAD CHECK	GKW	KVS	NSM	

CLIENT

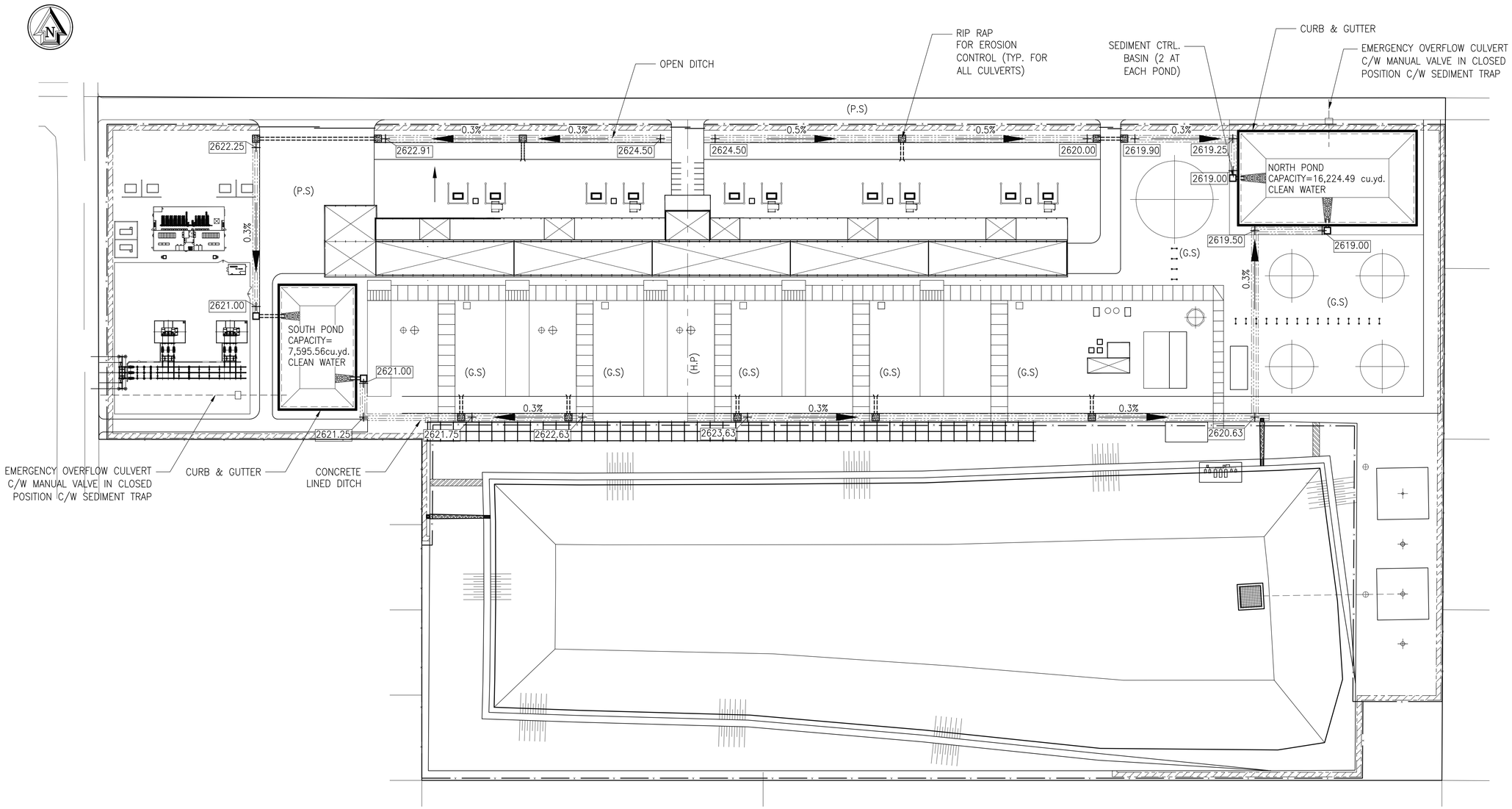
HYDROSTOR

TITLE GEM ENERGY STORAGE CENTER 500MW–8HR GRADING PLAN

SCALE: NTS	
DRAWN BY	GKW
CHECKED BY	KVS
APPROVED	NSM

EMPOWERING EPCM
www.twdepcm.com

PROJECT NO.	DRAWING NO.	SHT.	REV.
21–5291	21-5291-00-3341-004	1/1	C



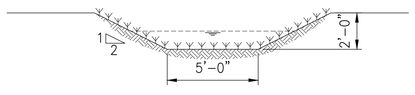
STORMWATER DRAINAGE PLAN

NOTES:

1. ALL ELEVATIONS ARE IN IMPERIAL UNITS
2. ALL BUILDING STEEL, PIPE RACKS, BUILDING FOUNDATIONS, EQUIPMENT FOUNDATIONS AND PLATFORMS ARE CONCEPTUAL AT THIS STAGE. NO STRUCTURAL DESIGN/CALCULATIONS ARE PERFORMED
3. NO TOPOGRAPHICAL/LEGAL SURVEY AVAILABLE AT THIS TIME
4. RESERVOIR SIZE, SHAPE AND POSITION ARE PRELIMINARY BASED ON VOLUME SPECIFIED BY HYDROSTOR. CURRENT DESIGN INCLUDES 4ft. FREEBOARD AND 15% EXTRA TO WORKING VOLUME
5. NO STRUCTURAL OR STABILITY STUDY DONE
6. NO EVAPORATION CONSIDERED
7. NO ICE OR FREEZING CONDITION CONSIDERED
8. CUT SLOPE FOR 3H:1V
9. FILL SLOPE FOR 2.5H:1V
10. LINER WILL BE BITUMINOUS GEOMEMBRANE OR HIGH DENSITY POLYETHYLENE
11. ASSUMED LINER WILL BE FINAL SURFACE OF THE RESERVOIR
12. FLOATING COVER WILL BE INSTALLED TO MINIMIZE EVAPORATION. CONCRETE DEADMAN ANCHOR WILL BE INSTALLED TO STABILIZE THE LINER AND FLOATING COVER
13. TOP WIDTH OF RESERVOIR EMBANKMENT IS 13ft. FOR HEAVY EQUIPMENT ACCESS
14. NO LIGHT VEHICLE ACCESS WILL BE REQUIRED TO TOP OF THE RESERVOIR EMBANKMENT
15. ONLY 2 EMERGENCY SPILLWAY CONSIDERED AT THIS STAGE OF DESIGN FOR EACH RESERVOIR
16. RESERVOIR OUTER EMBANKMENTS SLOPE WILL BE COVERED BY RIP RAP (BOTTOM 10ft.) AND THE REST WILL BE COVERED BY TOPSOIL AND HYDRO SEEDED
17. ASSUMED RESERVOIR IS CONSIDERED A DAM ACCORDING TO DSOD REQUIREMENTS
18. STORMWATER INSIDE THE RESERVOIR (TOP OF THE FLOATING COVER) WILL BE TREATED (IF REQUIRED) AND PUMPED BACK TO THE RESERVOIR
19. A COMPREHENSIVE GEOTECHNICAL INVESTIGATION SHALL BE COMPLETED PRIOR TO ENGINEERING DESIGN PHASE
20. EXIST. ELEVATIONS ARE EXTRACTED FROM AUTODESK INFRAWORKS 360 CONTOUR LINES. FURTHER TOPOGRAPHICAL SURVEY SHALL BE PROVIDED PRIOR TO ENGINEERING DESIGN PHASE

DITCH NOTES:

1. DITCH ADJACENT TO THE RESERVOIR SHALL BE LINED WITH CONCRETE
2. ALL OTHER DITCHES ARE TO BE COVERED WITH GRASS (NOT LARGER THAN 10 INCHES)
3. MIN. DITCH VELOCITY SHALL BE 2fps., MAX. DITCH VELOCITY SHALL BE 4fps.
4. FREE BOARD SHALL BE 1ft.
5. DITCH SIDE SLOPE SHALL BE 2H:1V



TYPICAL DITCH DETAIL

PRELIMINARY NOT FOR CONSTRUCTION

CONCEPTUAL

ABBREVIATION:

P.S	PAVED SURFACE
G.S	GRAVEL SURFACE
H.P	HIGH POINT
C.L	CENTER LINE

LEGEND:

CULVERT
DITCH/SWALE
FENCE
RIP RAP
SLOPE DIRECTION
DESIGN ELEVATION AT CENTRE OF DITCH/SWALE — 2600.00
PAVED SURFACE (ASPHALT)
GRAVEL SURFACE
GRAVEL PAVED

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION

REV.	DATE (MM/DD/YY)	DESCRIPTION	BY	CHK.	ENG.	APP.
C	07/29/21	ISSUED FOR PERMIT	GKW	KVS	NSM	
B	07/22/21	ISSUED FOR REVIEW	GKW	KVS	NSM	
A	07/21/21	ISSUED FOR SQUAD CHECK	GKW	KVS	NSM	

CLIENT

HYDROSTOR

TITLE GEM ENERGY STORAGE CENTER
500MW–8HR
STORMWATER DRAINAGE PLAN

SCALE:	NTS
DRAWN BY	GKW
CHECKED BY	KVS
APPROVED	NSM

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PROJECT NO.	DRAWING NO.	SHT.	REV.
21–5291	21-5291-00-3341-005	1/1	C

FileName: J:\21-5291 HYDROSTOR ROSAMOND PROJECT\30 ENG\33 CIVIL\41 SITE PREP\21-5291-00-3341-005.DWG
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Calculation Cover Page

Calculation Title:	Project	Calculation No:	
eser oir olume Calculation rs	Gem nerg Storage Center		
	Client		
	drostor	**Rev.**	C
	Project No.	**Date**	
		ul ,	

Assumptions:

eser oir is uilt in a lat errain
Groundwater elow ottom o t e reser oir
Bottom o eser oir is sloped towards t e tras rac
ree Board t ormal ree oard or etc mile and wind speed o miles per our Bureau o eclamation, Design Standard o , C apter , a le B
Soil Sta ilit was not re iewed
is is an initial estimation, no detail design, no structural or sta ilit stud
o ce olume considered
o aporation considered
ining will e DP or Similar
Berm ill slope and e ca ation slope
lt oug t e eser oir as e tra capacit t an t e wor ing olume and also accommodated wit t ree oard, owe er it is not designed or entire site stormwater management e storm o er t e reser oir co er, a ter screening and treatment i re uired will e disc arged in to t e reser oir
n case o an accidental o er low, t e o er low water, will drain to t e nearest S pond, and i t e pond does not a e capacit , it will o er low into t e ad acent ditc es

Data Input (from Hydrostor)	Unit	500MW / 8hr
Compensation water olume acti e reser oir olume	m^3	,
Cold t ermal luid olume	m^3	ot aila le
ot t ermal luid olume	m^3	ot aila le

Compensation water volume including 15% Additional Volume	**696,900.00**	**cu.m**	**911,510.79**	**Cu.yd**

eser oir Bottom widt	rregular S ape	See s etc			
eser oir Bottom engt	rregular S ape	See s etc			
rea o Bottom	,	s t	,	s m	
otal eig t o reser oir			t		
eser oir eig t e cluding t o ree oard			t		m
rea at ree Board t					
elow top o erm	,	s t	,	s m	

Calculations:

	,	s t	,	s m
	,	s t	,	s m
			,	
		t		m
olume o reser oir	,	Cu d	,	cu m

Total Volume of Reservoir	**914,524.43**	**Cu.yd**	**699,204.09**	**cu.m**

en t e eser oir is illed up to t e ottom o ree oard, t ere will e appro imatel t u er a ter wor ing olume is completel disc arged

EMPOWERING EPCM

Stormwater Pond Calculations

Calculation Title:	Project	Calculation No:	
Gem Storm uno Calculations	Gem nerg Storage Center		
	Client		
	drostor	**Rev.**	C
	Project No.	**Date**	
		ul ,	

Note: *Proposed site will not produce any discharge to the environment. (Zero Discharge)*

Storm Management:

pstream lands Site will e separated rom ot er lands a proposed soil erm surrounding entire site pstream storm runo will e directed to t e current disc arge point pre construction t roug new ditc es along t e soil erm

Storm wit in t e site e cept t e eser oir e proposed grading will create slope towards stormwater ponds retention pond wit no disc arge s stem e ponds will not a e disc arge to t e en ironment part o regular li e c cle e cept or an emergenc situation w ic ma es une pected o er low Ponds will e e uipped wit o er low disc arge cul ert wit a manual gate al e alwa s in closed position and wit a sediment control s stem er low cul erts will disc arge t e clean o er low to t e e isting road side ditc es i e Sweetser road at nort and e ac pi illo Spring road at east e o er low disc arge point will a e erosion control design ip ap or similar

e stormwater inside t e pond will e e aporated or pumped to t e reser oir it is assumed t at t e water inside t e pond is clean water since t ere is no source o contamination wit in t e site

eser oir e reser oir will e co ered e co er will drain to a ilter pump ouse or cleaning ter t e storm water is iltered, it will e pumped ac into t e reser oir e stormwater wit in t e reser oir will not disc arge to t e ponds

e reser oir wor ing olume is , cu m e current capacit o t e reser oir is a out , cu m e cluding t o ree oard e olume wit in t e ree oard is more t an , cu m ere ore t e reser oir as capacit o olding muc more t an t e re uired wor ing olume n case o an un oreseen emergenc situation, t ere will e emergenc o er low disc arge w ic will drain to t e ponds and i t e ponds are ull, t e o er low will e disc arged to t e C orro Cree

Reference Standard

ern Count De elopment Speci ication, Di ision our, Standards or Drainage

ern Count drolog anual

Data	e erence data
ain all ntensit	tlas olume ersion Point Precipitation re uenc stimates ocation o a a, Cali ornia

Ser ice	uno Coe icient	emar s
ard Ser ices		Buildings and Structures
oose Gra el Crus ed Stone		ll reas ot er t an, ard sur ace, Pond, and access oads
Gra el Pa ed		ll Pa ed Compacted Gra el
Ponds and eser oir		

Calculation Method:

ational et od

e runo olume or ntermediate Storm Design Disc arge SDD i e da storm rs rs ern Count De elopment Spec rea easurements

otal and	,	m	,	d	ppro imate rea, o Sur e in o aila le
ootprint o eser oir	,	m	,	d	outer perimeter
nside o t e eser oir	,	m	,	d	Drain to t e eser oir
eser oir utside	,	m	,	d	Drain to t e ponds
otal ard Sur ace	,	m	,	d	Drain to t e ponds
Compacted Gra el	,	m	,	d	Drain to t e ponds
oose Gra el Crus ed Stone	,	m	,	d	Drain to t e ponds

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Stormwater Pond Calculations

Calculation Title:	Project	Calculation No:
Gem Storm uno Calculations	Gem nerg Storage Center	
	Client	
	drostor	**Rev.** C
	Project No.	**Date**
		ul ,

Ponds ootprint	,	m	,	d	Drain to t e ponds

otal rea e cluding t e eser oir inside , , , , ,

olume calculation

rea	m	uno Coe icient C	rs rs Dept mm	rs rs Dept mm	ain uno olume rs rs rs rs C m
ard Sur ace	,				, ,
Compacted Gra el	,				
oose Gra el Crus ed Stone	,				, ,
Pond	,				
otal	,				**6,913.00 | 11,559.00**

otal rain runo olume or da storm rs rs , , m , d
da mass ratio C drolog anual, a le B
rs rs , m , d da storm rs rs

EMPOWERING EPCM

Stormwater Pond Calculations

Calculation Title:	Project	Calculation No:	
Gem Storm uno Calculations	Gem nerg Storage Center		
	Client		
	drostor	**Rev.**	C
	Project No.	**Date**	
		ul ,	

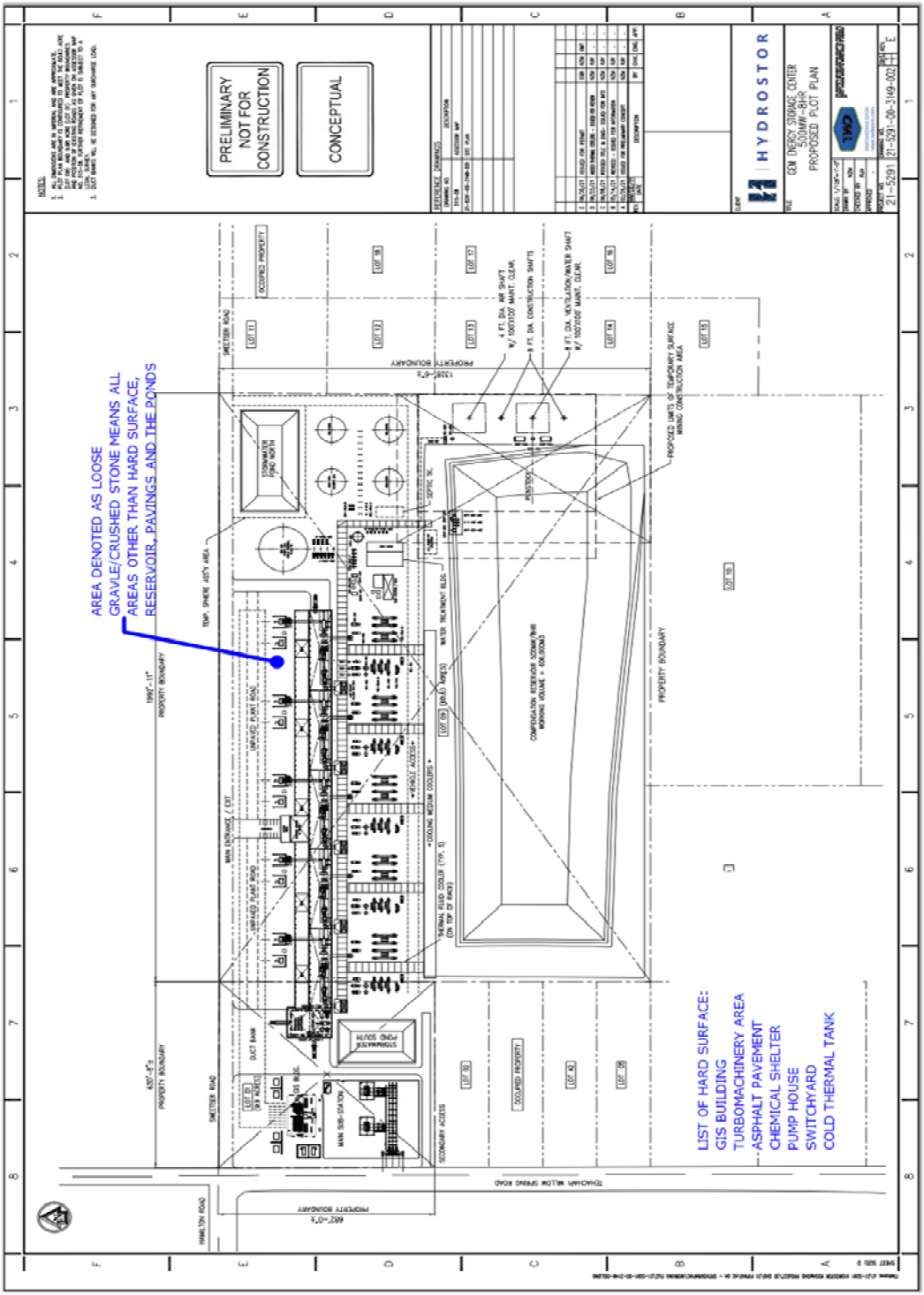

Fig 1 - Plot Plan

EMPOWERING EPCM

Stormwater Pond Calculations

Calculation Title:	Project	Calculation No:	
Gem Storm uno Calculations	Gem nerg Storage Center		
	Client		
	drostor	**Rev.**	C
	Project No.	**Date**	
		ul ,	

n order to a oid er long run open ditc es, t e S odling pond is di ided into two smaller ponds at eit er sides o t e ur omac iner Building

ort Pond

Assumptions:

Slope	to	
eig t	m	t
ree oard	m	t

Calculations: Based on a conceptual plot plan

Bottom	,	s m	,	s t
op	,	s m	,	s t
	, ,			
	,			
	,			
		m	m m m	
	,	Cu m	,	cu d

Sout Pond

Assumptions:

Slope	to	
eig t	m	t
ree oard	t	t

Calculations: Based on a conceptual plot plan

Bottom	,	s m	,	s t
op	,	s m	,	s t
	, ,			
	,			
	,			
			m m m	
	,	Cu m	,	cu d

Sum o ort Pond and Sout Pond	,	Cu m	,	cu d
olume o a ear rs da storm			,	cu d
olume o a ear rs			,	cu d

otal Ponds Capacit is greater t an da storm rs rs rs

EMPOWERING EPCM

Stormwater Pond Calculations

Calculation Title:	Project	Calculation No:	
Gem Storm uno Calculations	Gem nerg Storage Center		
	Client		
	drostor	**Rev.**	C
	Project No.	**Date**	
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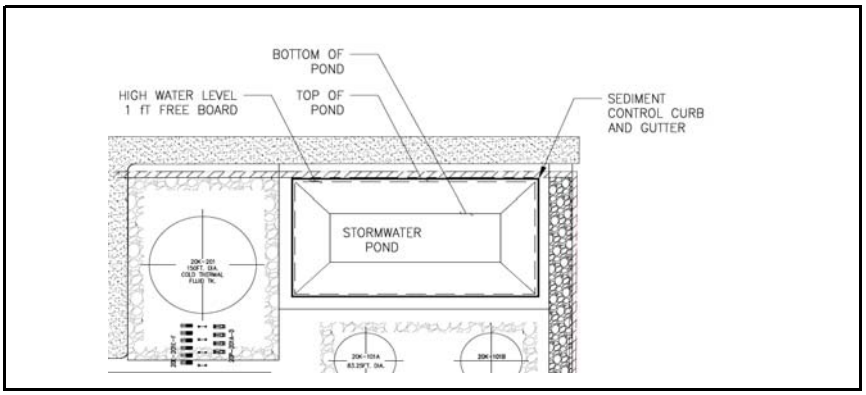
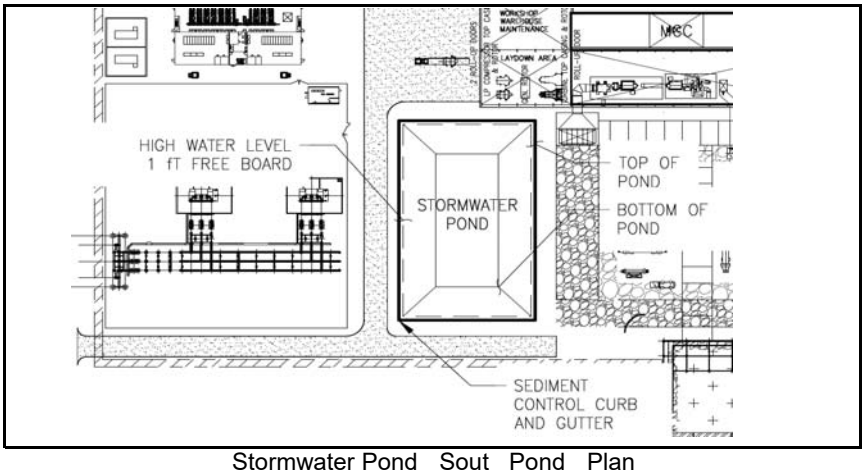
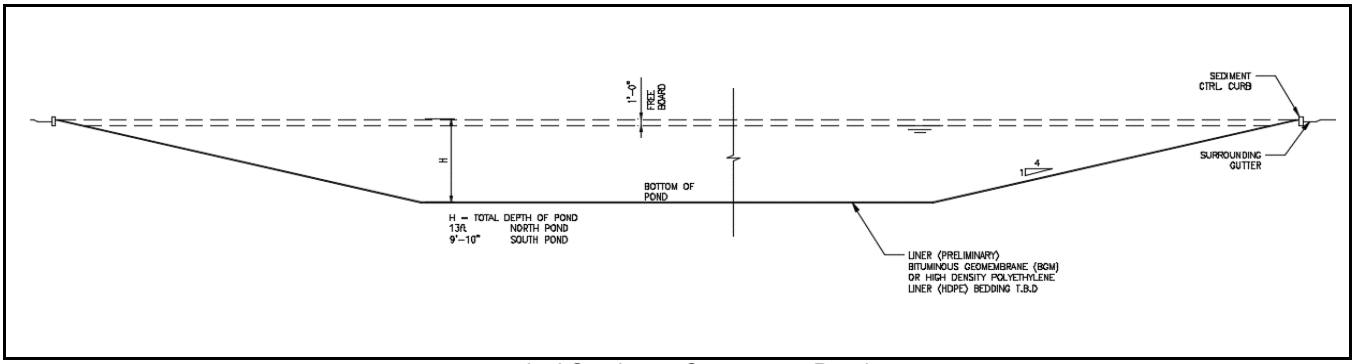


Stormwater Pond ort Pond Plan



Stormwater Pond Sout Pond Plan



pical Section o Stormwater Pond