



Climate Smart Water Resource Management on Farm Level: Case Study in Brandenburg, Germany

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Ronjon Heim

EduClimate, RONWATER

Renewable Organic Nexus

for Water treatment, Adaptation, Transformation, Engagement and Resilience

Edufarm Climate Smart Farming Project



Living and Recreation



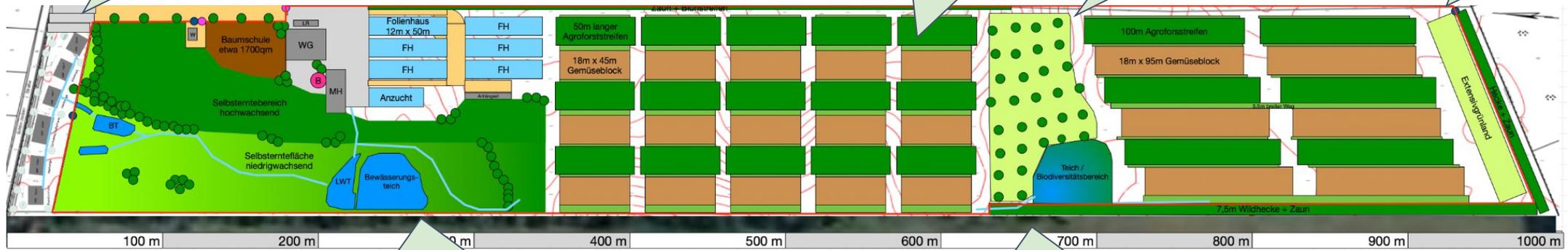
Vegetable



Foodforest



Agroforestry



Water

Biodiversity

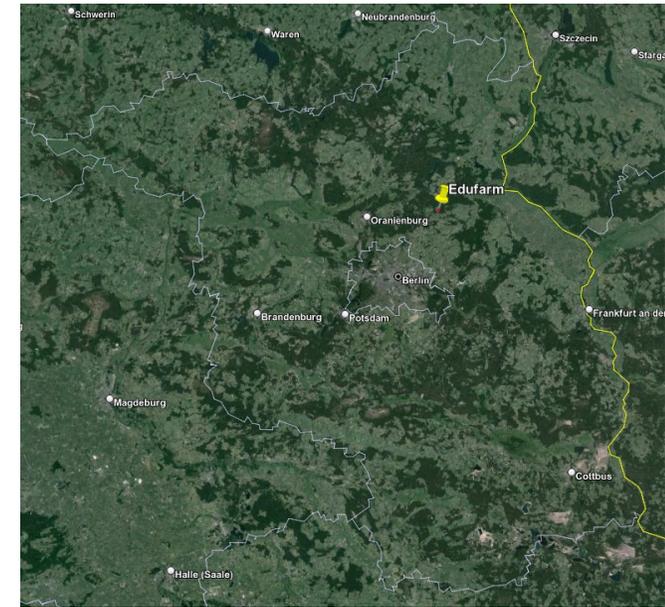




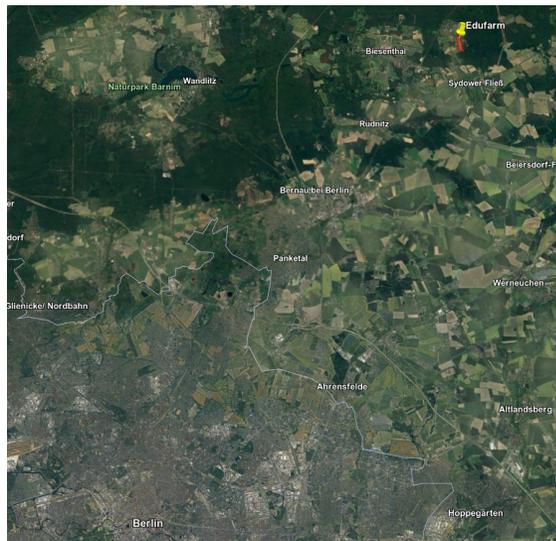
Edufarm location in Europe



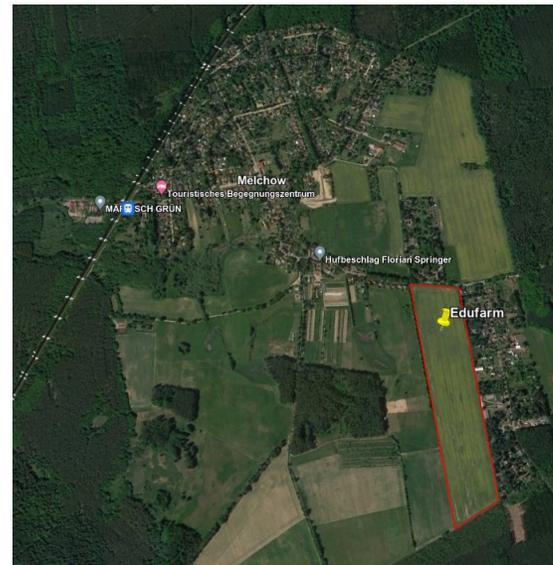
Edufarm location in Germany



2-04 Edufarm location in Brandenburg



Edufarm location near Berlin (Barnim)



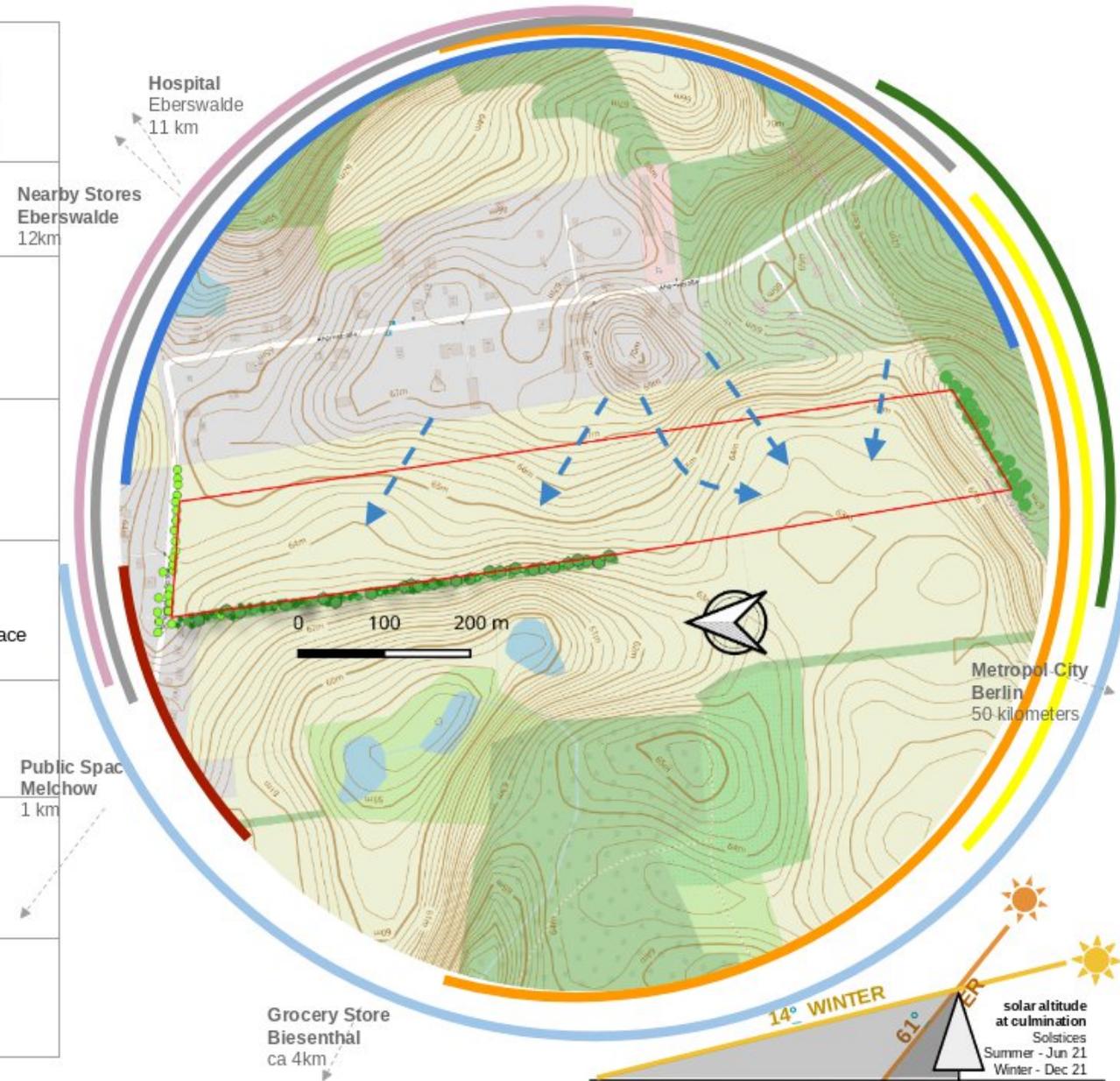
Edufarm location in Melchow

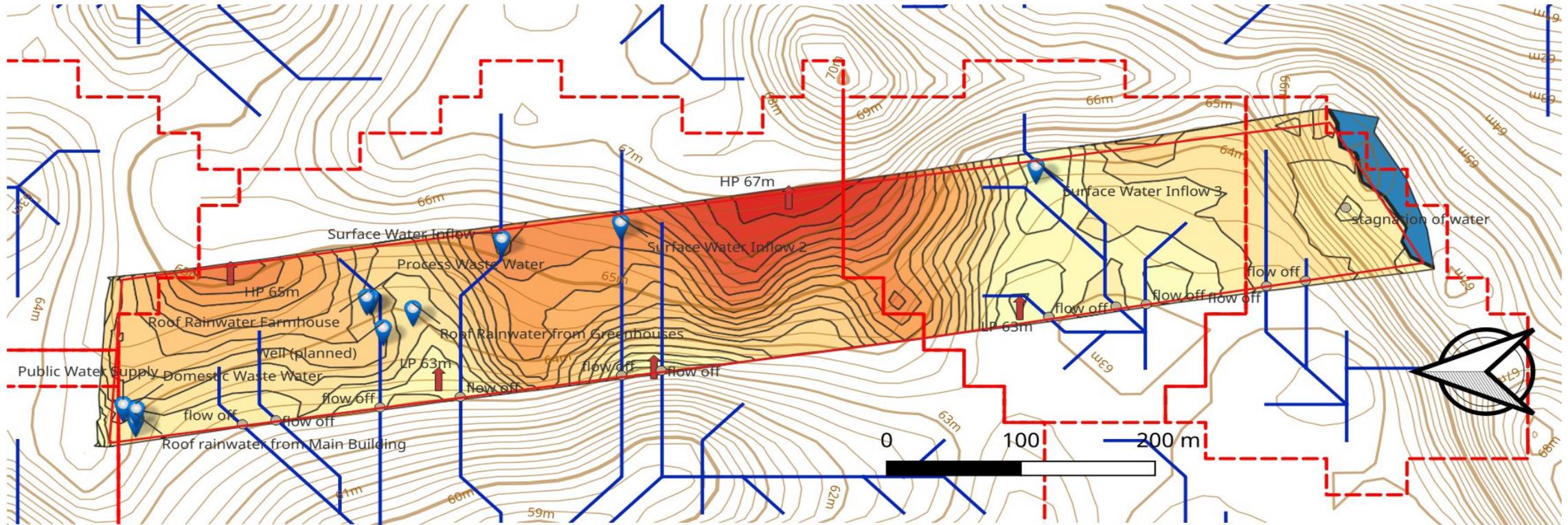


Edufarm direct neighbourhood

Sector Analysis

WATER FLOW	<ul style="list-style-type: none"> + strong rain events generate surface runoff flowing downhill from the adjoining agricultural strip and continuing to the beyond the plot to some ditches where temporary ponds accumulate. USE and store water on site with keyline, catchment channels and tanks/ponds
FIRE	<ul style="list-style-type: none"> + Potential of house fires from neighbors (low risk) DEFLECT by increasing moisture retention and have vegetation gaps
SUMMER SUN	<ul style="list-style-type: none"> + Strong light, medium angle, very long days + Solstice 16h 53m (4:40 sunrise, 21:34 sunset) + Solar noon angle 14° DEFLECT from house USE in garden and solar panels
WINTER SUN	<ul style="list-style-type: none"> + Strong light, low angle, very short days + Solstice 7h 36m (9:15 sunrise, 16:52 sunset) + Solar noon angle 61° AMPLIFY + USE winter sun in garden, passive solar heating, and solar panels
POLLUTION	<ul style="list-style-type: none"> + Rye fields on the eastern side spray pesticides every summer + Road with minimal traffic DEFLECT airborne pesticides from property with a hedge and street preventing surface runoff from entering
WILDLIFE	<ul style="list-style-type: none"> + Various species of birds throughout the year from various habitats + rabbits, mice, fox, dears, wild boars from nearby forest AMPLIFY wildlife habitat DEFLECT garden damage
VISITORS/VIEW	<ul style="list-style-type: none"> + Neighbors pass by on car, bicycle, and foot + Desire for both privacy from road and open areas to greet neighbors AMPLIFY some street views into garden DEFLECT some street views into private areas and windows
PREVAILING WIND	<ul style="list-style-type: none"> + mostly westerly winds + partial protection by hedge DEFLECT from sensitive plants with hedges and agroforestry





Site Water Flow Paths computed

Edufarm
 Schönholzerstr. 24,
 16230 Melchow
 52°46'13.7"N 13°42'48.4"E
 12.5 ha
 ~135mx930m
 63-68masl
 28.06.2025
 Ronjon

Legend

- Plot Boundary
- PC Watermanagement
- L4_water_problems
- ↑ L4_high_low
- 📍 L4_water_sources
- Water
- channels_unfilled
- Micro Drainage Basins

Elevation

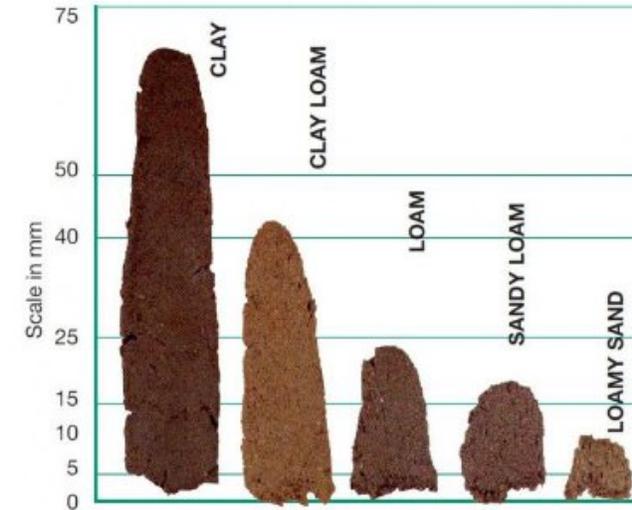
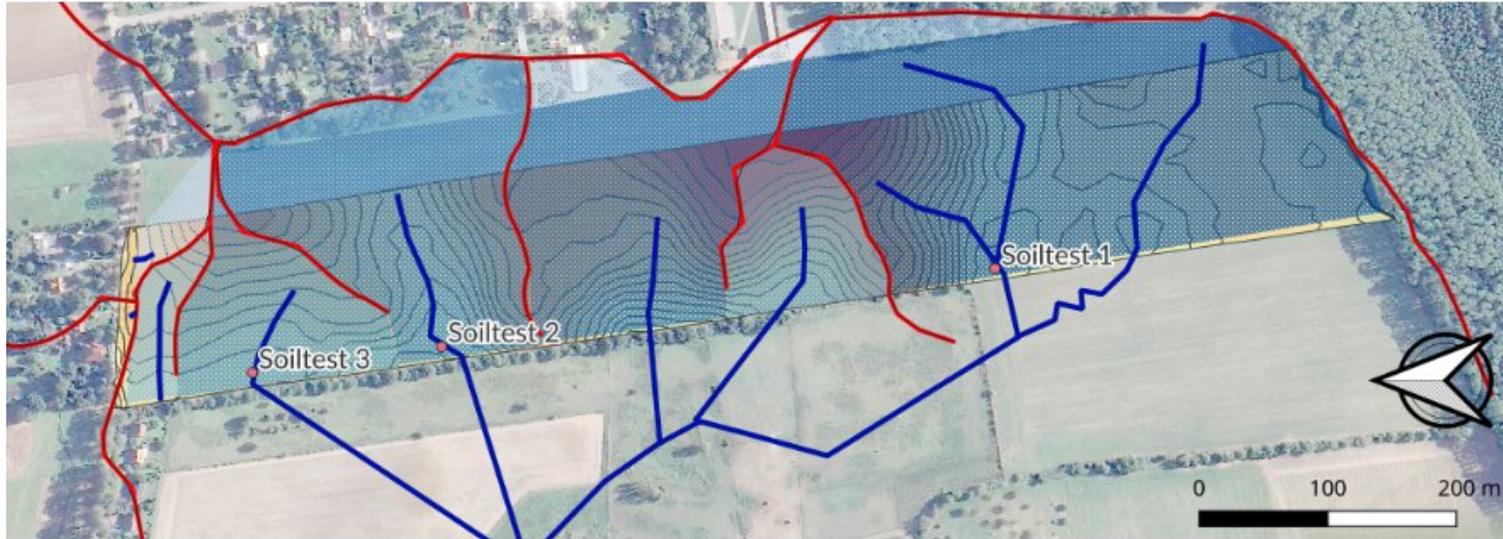
— Contour Lines 0.25m

Elevation Survey Lines

- < 60.00
- 60.00
- 60.25
- 60.50
- 60.75
- 61.00

 61.25	 63.75	 66.00
 61.50	 64.00	 66.25
 61.75	 64.25	 66.50
 62.00	 64.50	 66.75
 62.25	 64.75	 67.00
 62.50	 65.00	 67.25
 62.75	 65.25	 67.50
 63.00	 65.50	 67.75
 63.25	 65.75	
 63.50		

Soiltest



Soil Test 1
Loamy Sand

Soil Test 2
Sandy Loam

Soil Test 3
Rather loamy Sand



Soil ribbon length up to 10mm



Soil ribbon length up to 20mm



Soil ribbon length up to 15mm

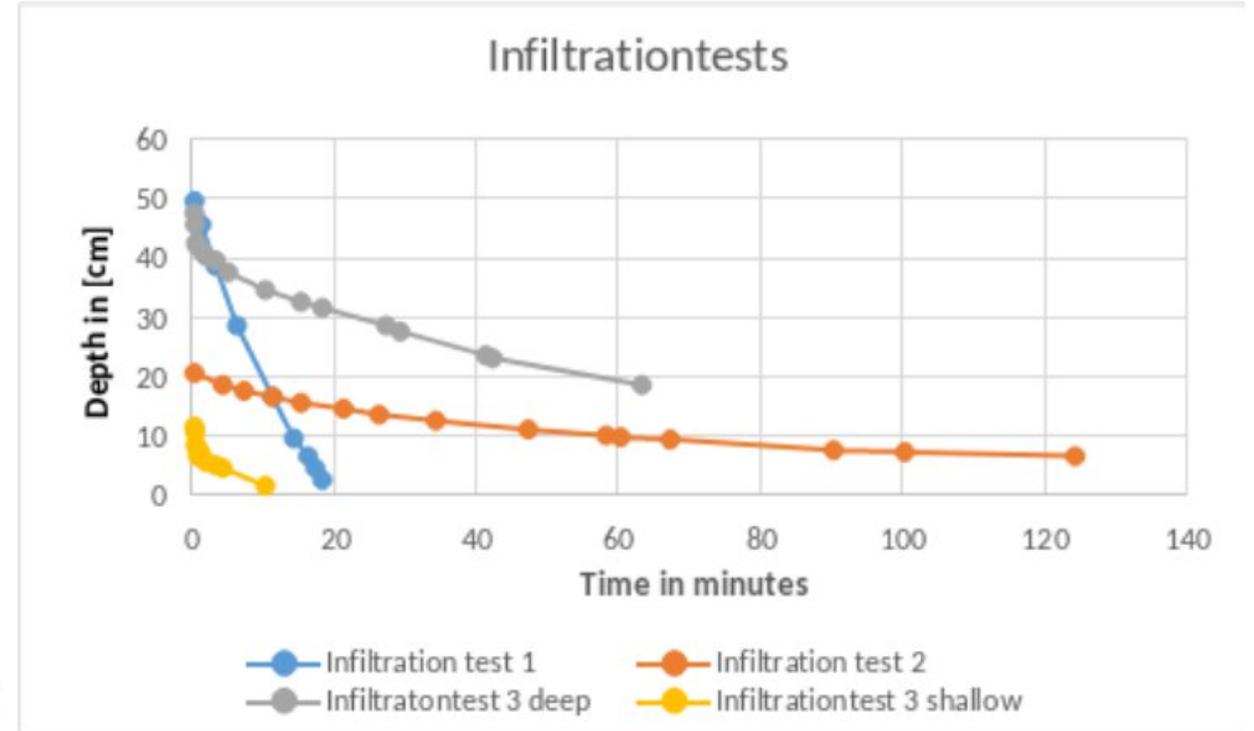
Infiltration Tests



Infiltrationtest 1 -
In 18min the water sank 47cm $K_f = 4,4 \text{ E-04}$



Infiltrationtest 2
In more than 120 min the water only sank
round 11cm $K_f = 1,8 \text{ E-05}$



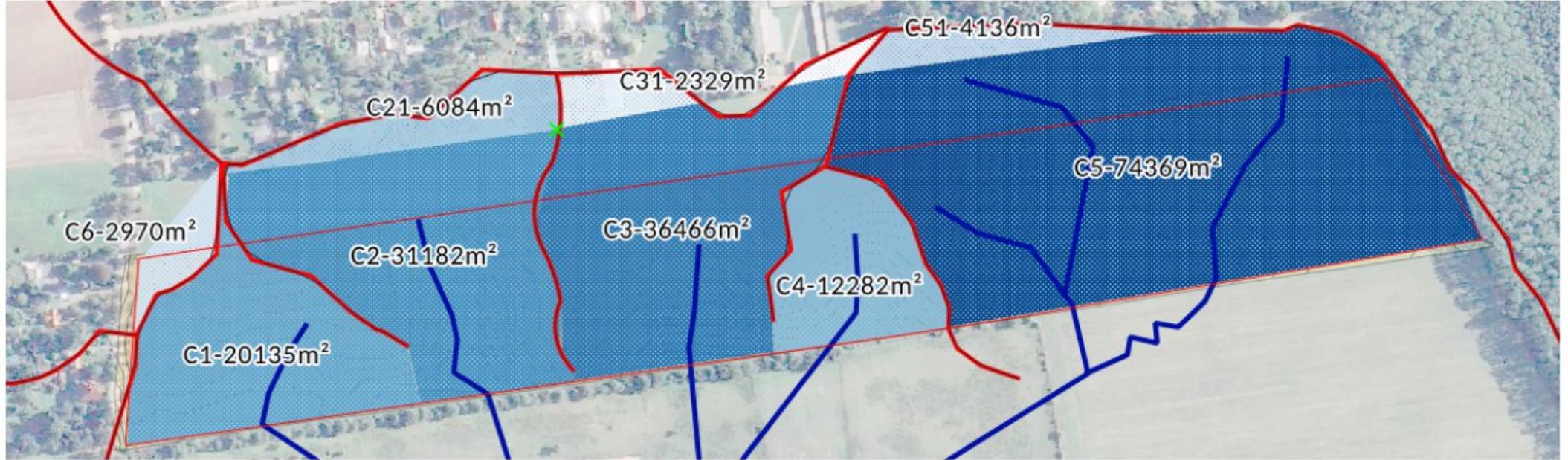
Infiltrationtest
3 shallow
In than 10
min the water
sank round
12cm $K_f =$
1,6 E-04



Infiltrationtest 3 deep
In 63 min the water sank
round 29cm $K_f = 17,7 \text{ E-05}$



Potential Catchment Runoff



Sub watershed	Land use	Size (hec)	Size (sq m)	Avg. Annual Precip (mm)	Annual Rainfall Volume (L)	Annual Rainfall Volume (ML)	Runoff Coef	Annual Runoff Volume (L)	Annual Runoff Volume (ML)
C1	cultivated land	2.01	20,135	520	10,472,214	10.47	0.08	837,777	0.84
C2	cultivated land	3.12	31,182	520	16,217,758	16.22	0.08	1,297,421	1.30
C21	residential 1/2a	3.65	36,466	520	18,965,967	18.97	0.16	3,034,555	3.03
C3	cultivated land	1.23	12,282	520	6,387,868	6.39	0.08	511,029	0.51
C31	residential 1/2a	0.23	2,329	520	1,211,313	1.21	0.16	193,810	0.19
C32	residential 1/2a	0.10	1,025	520	533,103	0.53	0.16	85,296	0.09
C4	cultivated land	1.23	12,282	520	6,387,868	6.39	0.08	511,029	0.51
C5	cultivated land	7.44	74,369	520	38,679,317	38.68	0.08	3,094,345	3.09
C51	forest	0.41	4,136	520	2,151,134	2.15	0.05	107,557	0.11
C6	cultivated land	0.30	2,970	520	1,544,697	1.54	0.08	123,576	0.12
		19.72	197,176		102,551,238	102.55		9,796,396	9.80

[Link to table](#)



Overall Water Planning Layout

Water Demand:

20,400m³/a

Irrigation:

17,600 m³/a

Domestic:

2,800 m³/a

Availability

Rainwater Harvesting:

3,520 to 10,500 m³/a

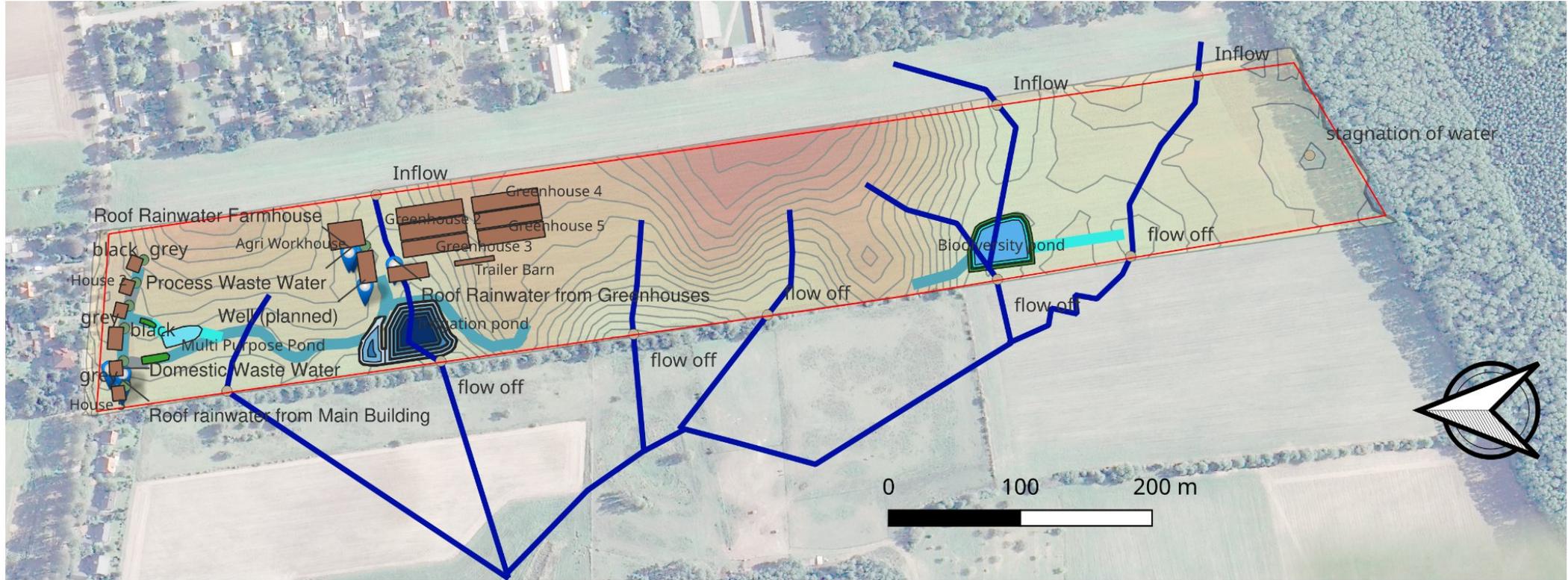
Infiltration / pumping

Max. 12,540m³/a

Gap

-4,000 to +2,000 m³/a

(water positive)



M3 Water Sources and Sinks

Edufarm
 Schönholzerstr. 24,
 16230 Melchow
 52°46'13.7"N 13°42'48.4"E
 12.5 ha
 ~135mx930m
 63-68masl
 25.07.2025
 Ronjon

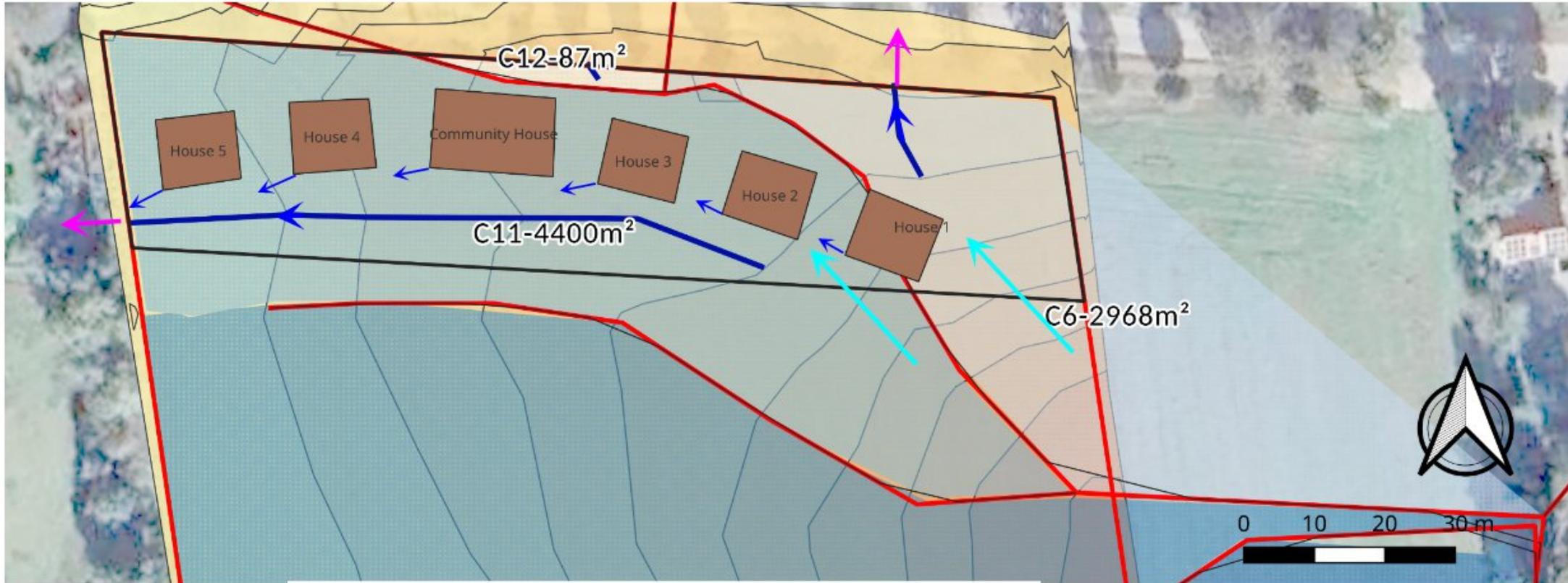
Legend

- buildings
- Buildings
- PC Watermanagement
- Wastewater Sources
- Water In and Outflow
- Water Sources
- Water
- water bodies new

- water canals new
- catchment channel
- cleared rainwater
- greywater
- overflow channel
- overflow to irrig
- rainwater from roofs
- rainwater pipes

- Elevation
- Elevation Survey Lines
- 60.00
- 60.25
- 60.50
- 60.75
- 61.00
- 61.25
- 61.50
- 61.75

- | | | |
|-------|-------|------------------|
| 62.00 | 64.50 | 66.75 |
| 62.25 | 64.75 | 67.00 |
| 62.50 | 65.00 | 67.25 |
| 62.75 | 65.25 | 67.50 |
| 63.00 | 65.50 | 67.75 |
| 63.25 | 65.75 | backgrounds |
| 63.50 | 66.00 | google satellite |
| 63.75 | 66.25 | |
| 64.00 | 66.50 | |
| 64.25 | | |



Catchment areas,
ridges and water flow
Eudfarm
Schönholzerstr. 24
16230 Melchow
52°46'13.7"N 13°42'48.4"E
12.5 ha
~135mx930m
63-68masl
24.08.2025
Region

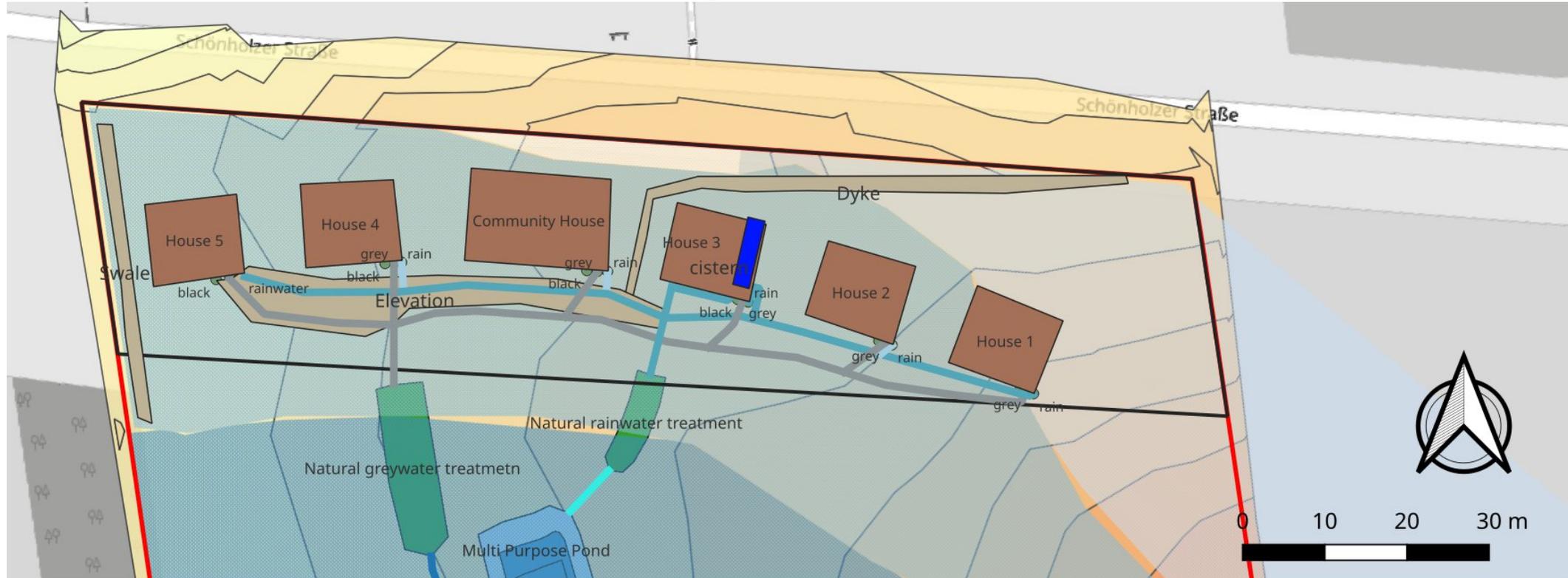
Legend

 Planned Buildings	 2968	 64.50	 66.25
 Residential Site Boundary	 4400	 64.75	 66.50
 Entire Plot Boundary	Elevation	 65.00	Background
 Valleys (waterflow paths)	Elevation Survey Lines	 65.25	google satellite
 Ridges	 63.75	 65.50	 Water entering the site
Micro Watersheds [m²]	 64.00	 65.75	 Water leaving the site
87	 64.25	 66.00	 Waterflow from downspout and roof area

Data Sources

Background map	Google satellite
Plot and residential area boundary	acquired from official surveyor
Countour lines	SRTM data
Elevation survey	acquired from official surveyor

Rainwater Harvesting from residential area



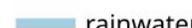
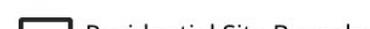
active and passive water harvesting ideas

Edufarm
 Schönholzerstr. 24
 16230 Melchow
 52°46'13.7"N 13°42'48.4"E
 12.5 ha
 ~135m x 930m
 63-68masl
 14.10.2025
 Ronjon

Legend

buildings

-  waterinfrastructure
-  Planned Buildings
- planned water canals
-  cleared rainwater
-  greywater
-  rainwater from roofs

-  rainwater pipes
-  conveyance channel
-  rainwater
-  Potential earthworks
-  Wastewater Sources
-  Residential Site Boundary
-  Entire Plot Boundary

Water

-  87
-  2968
-  4400
-  15771
- Multi Usage Pond
-  64.000

 65,000

-  Reedbed Greywater
-  Reedbed Rainwater

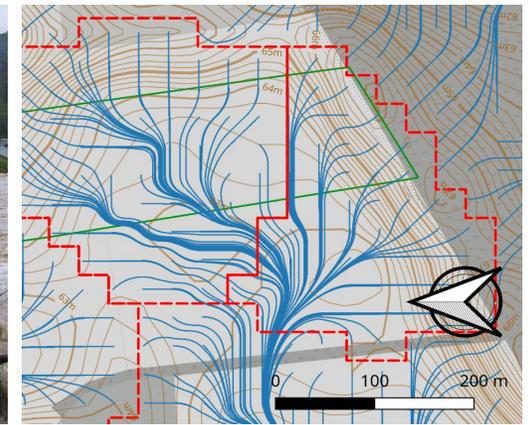
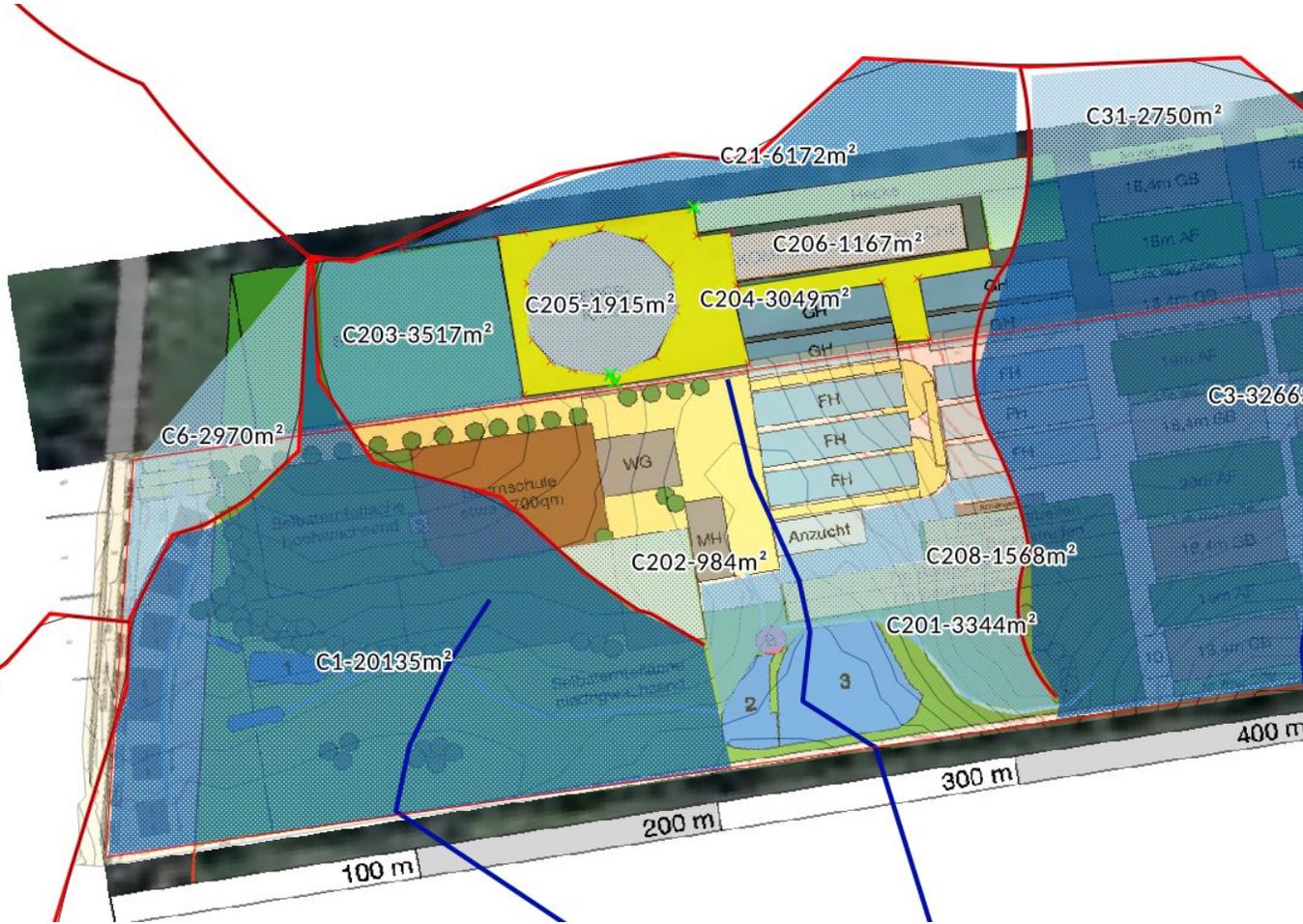
Elevation

- Elevation Survey Lines
-  63.50
-  63.75

-  64.00
-  64.25
-  64.50
-  64.75
-  65.00
-  65.25
-  65.50
-  65.75
-  66.00
-  66.25



Catchment Runoff for pond with extreme rainfall event with planned extension area



2-YEAR				100-YEAR			
6-hr		24-hr		6-hr		24-hr	
in	mm	in	mm	in	mm	in	mm
1.77	45.00	2.09	53.00	4.72	120.00	6.38	162.00
in/hr	mm/hr	in/hr	mm/hr	in/hr	mm/hr	in/hr	mm/hr
1.18	30.00	1.18	30.00	3.15	80.00	3.15	80.00

Maximising Rainwater Harvesting

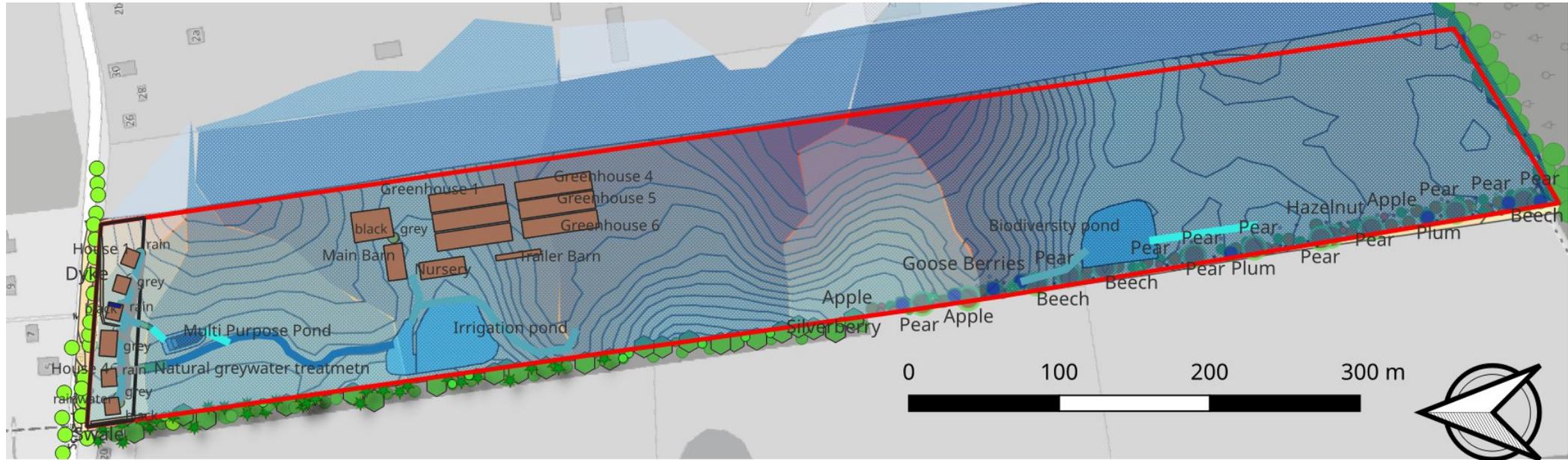
Catchment channels for water running from the premises

Dimensioning of sufficient pond volume

Still probable gap of around 2000m³/a

Active and passive water harvesting

To ensure sustainability
 (Demand <= Natural Water Availability)
 Water Reuse
 has to be added to
 rainwater harvesting



->

Greywater needs to be treated for irrigation

active and passive water harvesting ideas
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 12.5 ha
 ~135mx930m
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 03.11.2025
 Ronjon

Legend

buildings

- waterinfrastructure
- Planned Buildings
- planned water canals
- catchment channel
- cleared rainwater
- greywater
- overflow channel
- overflow to irrig
- rainwater from roofs

- rainwater pipes
- conveyance channel
- rainwater
- Potential earthworks
- Wastewater Sources
- Residential Site Boundary
- Entire Plot Boundary

Water

Micro Watersheds [m²]
 87

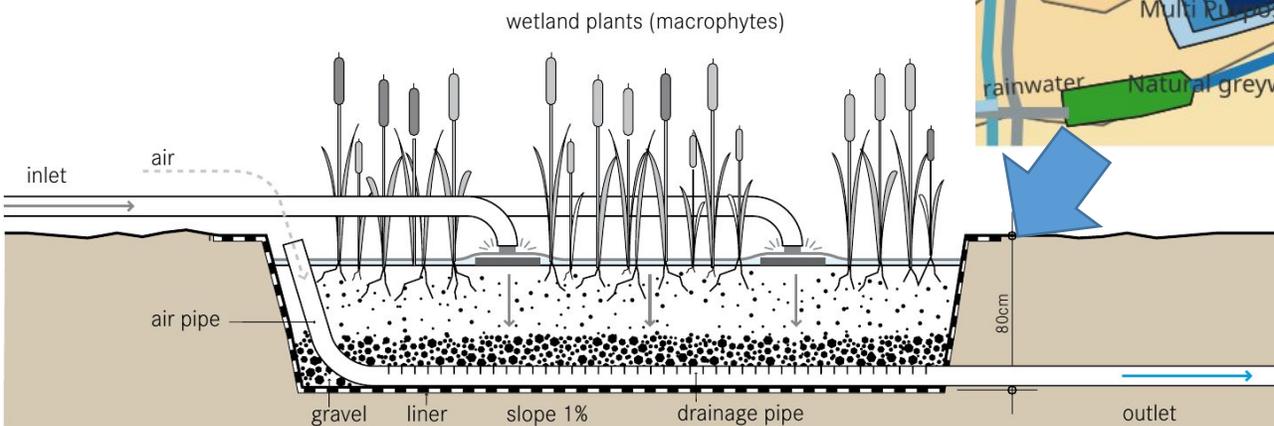
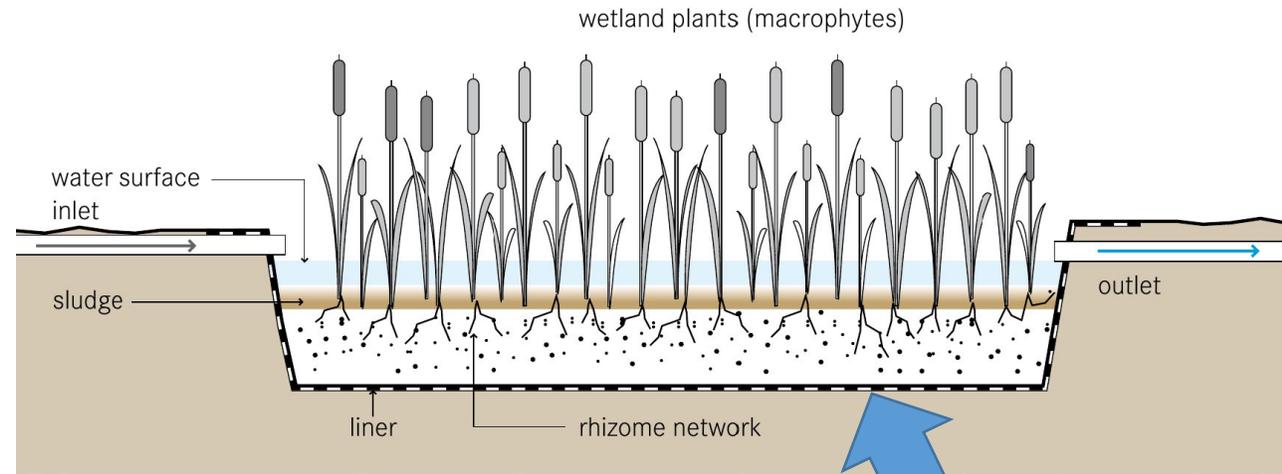
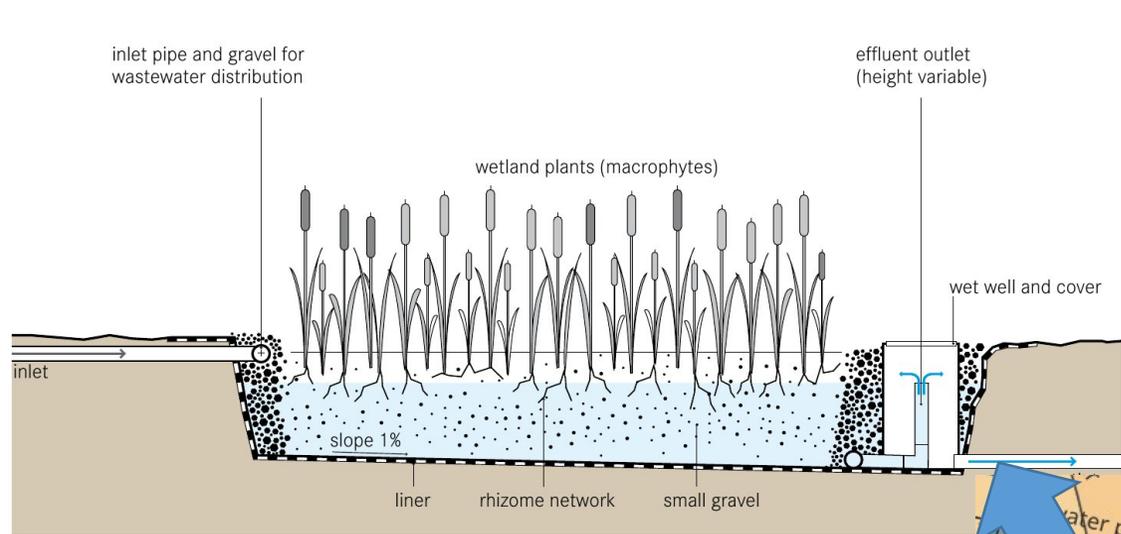
- 924
- 2750
- 2968
- 3905
- 4400
- 6172
- 12282
- 15771
- 31182
- 32663
- 70292
- Multi Usage Pond
- 63,000
- 64,000
- 65,000
- Reedbed Greywater
- Reedbed Rainwater

vegetation

- existing trees
- Apple

- Sorb
- Wild Rose
- Ash
- Robinia
- Maple
- west border hedge
- Apple
- Plum
- Current
- Black Berries
- Goose Berries
- Raspberries
- Hazelnut
- Beech
- Mirabelle
- Pear
- Silverberry

Water Treatment and Reuse





Thank You for your attention

Any Questions, Comments, Remarks?

Sources used:

- *Oregon State University (2024) Permaculture Design Professional course template*
- *Oregon State University (2025) Permaculture Water Management course material*
- *Tilley, E., Ulrich, L., Lüthi, C., Reymond, Ph. and Zurbrügg, C., (2014). Compendium of Sanitation Systems and Technologies. 2nd Revised Edition. Swiss Federal Institute of Aquatic Science and Technology (Eawag). Dübendorf, Switzerland.*

Please feel free to contact: ronjon@ronwater.org

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